Potential income gains for rural households in North Eastern Thailand through trade with organic products

Ulrich B. Morawetz, Rungsaran Wongprawmas, Rainer Haas

University of Natural Resources and Applied Life Science Vienna, Austria; Thammasat University, Thailand

ulrich.morawetz@boku.ac.at

Contributed Paper prepared for presentation at the 105th EAAE Seminar 'International Marketing and International Trade of Quality Food Products', Bologna, Italy, March 8-10, 2007.

Potential income gains for rural households in North Eastern Thailand through trade with organic products

Ulrich B. Morawetz [1], Rungsaran Wongprawmas [2], Rainer Haas [1]
[1]University of Natural Resources and Applied Live Science Vienna, Austria;
[2]Thammasat University, Thailand
ulrich.morawetz@boku.ac.at

Summary

The study groups households in North Eastern Thailand according their income and grade of specialisation in crop production to derive representative household types. For these household types a linear optimization model is run to calculate net incomes under four scenarios. These are certified organic farming, organic farming in the initial and transitional phase and a self-sufficient farming. Simulations for the different management scenarios show that per ha cash profits are about double under certification while they can only be increased by 30 percent under self-sufficient farming, even under favourable assumptions. But transition costs to organic farming are high due to reduced yields at the beginning. According to the figures and model used, only under certified organic production it pays to hire non household workers. Labour hence is a major limiting factor.

KEYWORDS: organic agriculture, Thailand, household income

1. Introduction

Worldwide there is a growing demand for organic products. In the United States the sales of organic foods are estimated to have grown by 15.7 percent in 2005 (NFM 2006) and high growth rates are observed in many other industrialized countries as well. The major consumers of certified organic products are North America, Europe and Japan (Buley, Jährmann et al. 2004).
The growing demand is recognized as opportunity for farmers to increase the value of their products as the consumer's willingness to pay is higher for organic than for conventional products. In many industrialized countries this opportunity to increase the value of agricultural products is supported by subsidies since there is public interest in less environmentally harmful farming. The growing demand and public support has lead to an enormous increase in organic production (Willer and Yossefi 2006).

Due to the demand for organic products in industrialized countries, organic farming in developing countries has increased as well. Non Governmental Organisations (NGO) have been engaged for decades to build up producer co-operations and build international trade links. The co-operations often favour organic production since it reduces input costs, is less environmentally harmful, poses less danger to the health of the farmers and can realize higher at the gate prices. These initiatives typically consist of small scale farmers (Oxfam GB 1994; Udomkit and Winnett 2002; UN ESCAP 2002). But with the increasing demand for organic products the production of organic food became interesting for agricultural enterprises as well. A practiced model that allows a maximum of control for the enterprise is contract farming. Farmers become workers on their own land and agree to comply to the agreement with the enterprise (Setboonsarng, Lueng et al. 2006). As the trade volume increased, traders, certification institutions and governmental bodies that provide support have been established. Additionally, research and education about organic farming is now standard in many agricultural universities around the globe. In the last decade also

international organizations and national development agencies increasingly foster organic production in their programs (UN ESCAP 2002; Buley, Jährmann et al. 2004; Willer and Yossefi 2005; BMF and ADA 2006). They see organic farming as an opportunity to reduce poverty while pushing environmentally less harmful farming.

In Thailand, current organic production is overwhelmingly rice and some organic vegetables and baby corn. It is estimated that about 0.12 percent of arable land is used for organic production. A functioning system of governmental and private, IFOAM accredited, certification institutions have been installed in the last decade. For 2006 it is estimated that the total market value of organic products is 20 million US$ which is about 0.12% of total agricultural exports. The majority of organic rice exports goes to the European Union as the organic standards of the United States are not met by many Thai producers (Eischen, Prasertsri et al. 2006).

The remainder of the paper is organized as follows. The next chapter provides background about organic agricultural policy in Thailand and about the region this paper focuses on. In chapter 3 the objectives of the research are defined. Chapter 4 gives details about the data and method used to form household types, the mathematical model and its calibration. Finally, the results and concluding remarks are given in the last two chapters.

2. Background

In September 2006 a military coup in Thailand over-through the government of Taksin Shinawatra and the interim-government of Surayud Chulanont was installed by the military. In its economic policy Taksin's government was export oriented and, as critics claim, overspending (The Nation 2006). As reaction to this and with the experience of the East Asian Crisis in the late 1990s in mind, the interim government of Surayud Chulanont now champions "sufficiency economy" (originally it was translated as "self-sufficiency" economy but this was quickly changed after first reactions from the business community (Kanoksilp 2006)). How serious the interim government is about sufficiency economy is manifested through mentioning it in the interim constitution.

The theoretical bases of sufficiency economy was promoted by His Majesty King Bhumipol Adulyadej of Thailand since the 1970's. Since the coupe, sufficiency economy has been widely discussed as the understanding of its practical meaning is unclear to many people. In particular it was emphasized that sufficiency economy is not to be confused with a backward self-sufficiency economy (Noi 2006). The concept of sufficiency economy is best developed for small scale farms and is known as "New Theory Farming". In a three phase plan the farm first seeks self-sufficiency, in the second phase it forms co-operations with other farms and in the third phase it is involved in trade (Chaipattana Foundation 2006). Farms following the New Theory Farming model can manage their farms according to organic farming rules. It is therefore no contradiction to run a certified organic farm that follows the ideas of New Theory Farming. New Theory Farming favours, at least in the initial stage, agricultural inputs produced on the farm over inputs bought from the outside. The major difference between New Theory Farming and organic management is that the former is focused on self-sufficiency while the latter produces for the market.

Self-Sufficiency in Thai politics is not a new concept and it has been competing with organic framing for governmental resources already before the coup. In January 2005 the Taksin government approved a national agenda for self-sufficiency. This originally didn't include organic farming and it was only included after lobbying from NGOs. But, the proportion of funds devoted to organic farming remained a small share of the total initiative (Eischen, Prasertsri et al. 2006). The already weak governmental support for certified organic farming is likely to be even less with the new government's economic focus. It thus

remains to business, research and international institutions to promote certified organic farming.
An example for an internationally financed support for organic farming is the research and promotion project for organic agriculture currently done by Thammasat University, Bangkok (Thammasat University 2005). It is financed by the EU and the aim of the project is to develop organic management methods for rice and cassava in North Eastern Thailand with a minimum usage of external input. It intends to reduce cash costs for fertilizer and increase at the gate prices through certification. The project and this paper focuses on North Eastern Thailand where two thirds of Thailand's poor live (Ahmad and Isvilanonda 2003). Rural poverty in the North East is due to the poor soils, low and unstable precipitation and unstable yields (Entwisle, Walsh et al. 2005). The main product is rice which is, nowadays, predominantly grown rain-fed with only one harvest per year. In lower elevations (lowland) paddy rice is grown, while on higher elevations (upland) field crops such as cassava, maize or sugar cane are grown (Fukui, Chumphon et al. 2000). The region was sparsely populated until the end of WWII when mortality fell and the population density increased. Under the population pressure rice cultivation expanded from alluvial plans to surrounding terraces. Much of the forest was displaced for upland cash crops, such as cassava. The population pressure was reduced with the increasing use of contraceptives and the construction of roads which allowed migration to the urban centres in the late 1960s (Entwisle, Walsh et al. 2005). The expansion of agriculture to marginal land made it more vulnerable to weather conditions. But the better connection to the markets that allows off-farm employment and to buy cheap foods helps to buffer these risks (Fukui, Chumphon et al. 2000).
Today income from non farm sources plays a major role in North Eastern Thailand. A study on household income of three villages in Khon Kaen in North Eastern Thailand used data from 140 households from the years 1995, 1998 and 2002 to analyse the income diversity of households (Ahmad and Isvilanonda 2003). The figures show that income from rice is, on village average, as low as 15 to 40 percent of total income. Average income from non-farm and off-farm activities vary between 32 and 63 percent. The agricultural census of 2003 also suggests an important role of non-agricultural incomes, stating that in North Eastern Thailand 60 percent of he households live only or mainly from agriculture while 21 percent live mainly from other sources and another 15 percent live from agriculture and other sources in equal parts (NSO Thailand 2003).

3. Objectives

This paper seeks to describe income portfolios of households in North Eastern Thailand and how they can change due to higher at the gate prices through international trade with organic products and through reduction of input costs.

4. Data and methodology

Income increases through intensification of rice cultivation in the Central Province of Thailand is no viable option in the North East with its water scarcity and poor soils. Therefore, organic agriculture is seen as a way to increase the value of the production in this area and the calculations in this study all refer to this region.

Household types

For household level data a large scale survey from University of Chicago (Townsend 1997) is re-used. The so called "Townsend Project" collected data from North Eastern Province in 1997 just a couple of months before the Asian Economic crisis began with the devaluation of the Thai Bath. In the North Eastern Province two regions (Buriram and Srisaket) were chosen for data collection as for those two, benchmark data were available. Within each of these two provinces 12 tambons (administrative units) were selected by using stratifications

by land cover classes from satellite imagery (Binford, Lee et al. 2004). Within each tambon, four villages were selected at random. From the Community Development Department's enumeration list 15 households in each village were randomly selected. In total about 1400 households were interviewed in North Eastern Thailand in May 1997.
To derive representative households we followed the example of Ellis (2000) and grouped them according to their income and sources of income: the households sampled are divided into three groups, depending on their income. The lowest net income third is below 17.000 Baht per year, the middle group lower than 43,896 Baht and the highest above this value (1997 Thai Baht). Figure 1 shows the distribution of the income where the fat vertical lines indicate the thresholds between the lower, middle and upper third of the income. There is a long tail with high income households while the vast majority earns a far lower. The income is per household and the study is therefore limited to income flows and does not deal with the much more complex issue of poverty.
For each of these three groups net income portfolios are calculated to quantify the sources of income. From Figure 2 the shares of average net income from different sources for households grouped by income can be seen. Income from "Crop" is primarily from rice, "Off-Farm" work consists of all income through paid work (also agricultural work on other farms), "Remittances" contain transfers from (migrated) relatives, government transfers etc. while the category "Other" contains incomes from renting out tools and those incomes specified as "Other" in the survey. Incomes through changes in the stock (e.g. selling of land) were excluded. The figure shows that the main sources of income is from crop cultivation, off-farm work and remittances. "Livestock" and "Other" have only a minor contribution to income. The differences between household groups are not very big, though, for the high income group off-farm work plays a more important role.
The grade of specialization on crop cultivation is used as criteria to form household types within each of the three income groups. The four types have 1) no, 2) more than zero but less than one third, 3) more than a third but less than two thirds and 4) more than two thirds of their net income from crops. In total this results in 12 types. Table 1, describes some characteristics of these household types. In order to mitigate the impact of outliners, the medians are used to describe the groups. Of the third with the lowest income per year, almost half (14.7 % of the total population) has no income from crops. This type is also worst off in terms of most other assets: the median of the maximum of years a family member spent at school is far lower than that of other households. They own less land (but it is positive as this can also be the plot where their house is built) and they have less agricultural and household assets than every other household. Also their social network in terms of relatives and the persons older than 18 years in the household are slightly lower than other households'. Only in terms of debts per income they are in a better situation than the farming households'. What is true for the lowest income third, is not true, for the middle and high income third: there the households without income from crops are not worse off than their farming counterparts. This suggests that there is a better educated group of household specializing on non-farm jobs. Worth to mention is that no household type has savings, some of them even substantial amounts of debts.
Comparing the households with the same share of income from crops, it can be seen that those with higher incomes have more or equal education, more land they own, more relatives, more household and agricultural assets and more family members over 18 years of age. It thus can be assumed that factors as education, agricultural assets, land ownership and the social network contribute to the income.

Mathematical model

A linear one period farm level optimization model is used to describe the household's behaviour under different scenarios (a mathematical summary is given below). Households maximizes cash income by choosing the management method and how much to work off-

farm. Income consist of three sources: Crop cultivation, off-farm work and the remaining income sources (consisting of remittances, livestock and other and noted with an $R^{observed}$). The latter is not modelled but just assumed to be fixed in the short run. The income from off farm work is subject to an upper limit which is set to be the observed value $NF^{observed}$. The idea behind it is that labour markets allow only a certain level of employment in off-farm activities in rural areas. It is assumed that households already work off-farm as much as the labour market allows.

The income from crops is generated through cultivation (x_c gives the ha planted with crop c) and sales (s_c gives the sales in kg) minus labour (V_t^T gives the hired workers days and r_t^T the wage) and input costs (m_c are the input costs for crop c per ha). The model also allows production of cassava on upland fields. But, as shown below, the median values revealed no upland fields for the median households (This is surprising as upland crops are considered as important cash source for households). Farmers can opt between organic and conventional management of their crops (modelled as different crops c). They can employ workers and choose how much off farm work they do (h_t^{off} are the days in month t and w_t^T is the wage for off farm work). Since here only cash flows are modelled, family farm work is supplied at a wage of zero.

As a property of linear models, the optimization algorithms don't choose mixed strategies. The model therefore opts for the choice with the highest marginal income. The wage for off-farm work is set marginally lower than the costs for hired workers. Thus family members prefer to do the farm work themselves.

Mathematically, the model can be summarized as

$$\max \sum_c p_c s_c - r^T \sum_t V^T - \sum_c m_c x_c + \sum_t w_t d_t + R^{observed}$$

s.t.

$$\sum_c l_{t,c} x_c \le L \qquad \forall t$$

$$\sum_c v_{tc} x_c \le h_t^{farm} V^F + V_t^T \qquad \forall t$$

$$y_c x_c = s_c$$

$$h_t^{farm} + h_t^{off} \le V^F d$$

$$\sum_t w_t d_t \le NF^{observed}$$

$$x_c \ge 0 \qquad \forall c$$

$$V_t^T \ge 0 \qquad \forall t$$

$$s_c \ge 0$$

where y_c is the yield per ha, p_c is the price of crop c, L is the total land available in ha, l_{tc} is the fraction of a month that crop c occupies the land, v_{tc} is the labour required for crop c during moth t, and d are the working days per month per person.

Calibration

The data for the endowment of the different household types and the input costs are derived directly from the Townsend Project dataset. Other necessary data had to be taken from other research or had to be assumed. Monetary values are calculated in 2003 Thai Baht.

The data of median endowment and median input costs derived from the Townsend Project data are provided in Table 2 and Table 3. Monetary values are multiplied by a factor of 1.24 to adjust for inflation in the years between 1997 and 2003 (BTEI Thailand 2004). It can be seen that households with higher income also cultivate more lowland if compared with households with the same grade of specialisation. The median of the persons older than 18 years is two for the households with low income while it is three for the households with middle or high income. The medians for the input costs in Table 3 are not as easily structured. Dummy variable regressions also didn't show a significant influence of the "type of household dummy" on the costs. But, in another regression, the size of lowland cultivated could be shown to have a significant influence on the costs per ha (regression not shown here). In absence of better data, the medians presented in Table 3 were used as cash input costs per ha.

The Townsend Project data provide no data on yield. Therefore results from a working paper of the Asian Development Bank which builds on a data collection from Ubon Ratchathani, Surin and Yasothon in North Eastern Thailand in 2003 are used (Setboonsarng, Lueng et al. 2006). According to this study, rice yields per ha are 2181 kg/ha on average, and the price per kg of conventional rice is 5.87 Baht/kg. For farm workers the study suggests a wage of 195 baht/person/day for contract farms.

Working hours per ha per month are taken from Fukui (1993), page 223 ff. In his studies he observed families during their peak working times. This is used as guidance for the work effort during different months. The last 12 columns of Table 4 give the work effort for different months for rice cultivation. Finally, for family members a working month is assumed to have 25 working days.

For calibration of the crop activities, first a base scenario is run. The calculated income from crop cultivation is compared with the observed income and the factor by which they differ is used to scale the calculations in the following scenarios. This factor is called alpha and corrects the model for errors due to misspecification. An alpha smaller than 1 means that the observed income from crops is lower than the results of the model and an alpha greater than 1 means that the observed income from crops is higher than the model outputs. An implicit assumption is that alpha does not change if another management is applied. The values for alpha are given in the last column of Tabel 2. The correlation between the ha cultivated and alpha is 0.93. This indicates that without alpha the income from corps for small scale farms is overestimated and for larger farms underestimated.

Management scenarios

Different management scenarios are applied to the model described above. The scenario "base" describes the income under conventional management. It is used to derive alpha. The scenario "certified" describes a household that cultivates organic rice along the guidelines of an organic certification organization and receives a substantially higher at the gate price. Also input costs are reduced. Yields are as high as under conventional management as farmers are experienced in organic cultivation. The scenario "transition" describes a farm that has been under organic management for two to four years but has not yet been certified. The at the gate price is not as high as for "certified" farms but input costs are reduced. Yields are lower since the soil has not yet fully recovered from chemical fertilisation and the farmer is not as experienced. The scenario "initial" is for farms that have their first or second year of organic management. The at the gate price is only slightly higher than for conventional products but yields are reduced even more than for farms in transition. The last scenario is not about organic management but is a stylized version of "sufficiency" economy. It is only the first step of the three steps suggested by New Theory Farming in which the farm seeks to reduce dependency by reducing input costs. The way it is model here, the work effort is as high as for organic farming but at the gate prices are not as high as for organic products. Yields are as high as under conventional management.

The data for the different scenarios are collected from various sources. The prices for organic farming are taken from the above mentioned Setboonsarng, Lueng et al. (2006) paper. Table 4 shows that even in the initial phase and during transition farmers have slightly higher prices compared to conventional farming. This is possible by selling them on local markets as "pesticide save". Several studies showed that yields under organic management can be as high as under conventional farming (Khunthasuvon, Rajastasereekul et al. 1998; Setboonsarng, Lueng et al. 2006). The Setboonsang, Lueng et al. study even suggests that during the initial and the transitional phase yields are not significantly different. But since samples size is very low and other evidence suggests that yields are temporarily reduced, we assume that yields are reduced by 50 percent during the initial phase and by 25 percent during the transition phase (A less arbitrary determination of yields would require assumptions about many agricultural parameters which are not available in this model). Cash costs for conventional farming depend on the household type. For organic farming scenarios it is assumed that cash const can be reduced due to abandonment of pesticides (100 percent reduction), reduced fertilizer cash costs (47 percent reduction) and lower cost for machinery (24 percent reduction). These reductions are derived from the reductions in cash costs given in the Setboonsang, Lueng et al. paper. Depending on the use of pesticides in the base scenario this is a total reduction of input cost between 40 to 42 percent in comparison to the base scenario. The working hours for organic management are higher as is shown in Table 4. Here, once again, it is difficult to find appropriate values in scientific publications. The values given are pure assumptions. Note, that work effort is identical during peak working seasons in all scenarios. If it was assumed that work effort during peak seasons was higher under organic or sufficient management, this would reduce profits as labour had to be hired.

The figures for the sufficiency scenario are a combination of the price for conventional rice and work effort for organic management. But it is assumed that input costs are reduced by 90 percent. It is unclear if such a high reduction is possible while keeping the yield on the level of conventional farming, but for the sake of argument exaggeration is preferred in this context.

5. Results

Column 1 of Table 5 shows cash profits from one ha of rice cultivation. It is between 9,5 Baht per ha for the households with low income (with crops < 33) to 10,5 Baht per ha for households with high income (with 34<crops < 66). Roughly, household that plant more corps, have higher cash profits per ha (correlation of 0.64). The following 4 columns of Table 5 give the percentage change in cash profit per ha for the four scenarios. With an increase of the price by 70 percent and input costs reduced by about 40 percent, cash profits per ha for certified organic management are increased by about 100 percent for all household types. In the transition phase, when cash input costs are reduced by about 40 percent, but yield is reduced by 25 percent, cash profits per ha remain approximately the same as in the base scenario for all household types. In the initial phase a reduction of cash profits per ha of 48 percent is calculated for all households. This is due to the yield reduction by 50 percent. For the sufficiency scenario, income per ha is increased between 19 and 31 percent. In particular households with high input costs, which are predominantly those not specialized on crop cultivation, gain.

A transition to organic agriculture is, according to these calculations, costly in the initial phase and valuable after certification. Even though a reduction of input cost by 90 percent was assumed, in the sufficiency scenario per ha profit increases only up to 31 percent.

Table 6 gives the total household profits in the base scenario and the changes in percent under different management strategies. In the different scenarios households are forced to apply the respective management, even if it doesn't maximize profit. The results are similar

to those from Table 5. Trivially, household without income from crops are not effected from the management decision. But, as mentioned already above, this is the type with the lowest income. The main winners from certified organic crop production are households whose main income is from crop production. But, if they want to change to organic management all at once, they also face the highest absolute losses during the period of transition.

Under the conventional, initial, transitional and sufficient management scenarios, only family labour is used for cultivation since marginal profits are not high enough to employ workers. This limits the cultivated area to the working capacities of the household during the peak working season. With organic farming, having a higher marginal profit, it becomes feasible to hire workers. The increased cultivated area increases households profits under organic farming more than proportional. Never the less, even under organic management labour is a limiting factor as cost per ha keep on raising with the area cultivated. Figure 3 shows the cash profits per ha for high and low income households with more than 66 percent of their income from agriculture under organic and conventional management. The differences in profits between organic and conventional farmers are substantially and are mainly due to the higher price of organic rice. But the striking fact about cash income is the quick reduction as soon as workers have to be employed. Richer households have more household members and they can therefore cultivate more at lower cash costs.

6. Final remarks

The results presented are derived from a calculation of cash incomes of different household types. The results allow several conclusions which can contribute to the discussion about agricultural policy in Thailand.

The data used show that households with the lowest income have no income from crops. Households with higher income gain in absolute terms more from organic agriculture as they cultivate more land. Organic farming is therefore no policy that favours households with low incomes (directly). Never the less, in relative terms, households with low income but a high specialisation in agriculture can gain substantially.

Differences in per ha cash input costs of different household types do not have a magnitude that plays a decisive role in which management system to choose.

According to the data, a reduction of cash input costs by 90 percent can increase cash profits by up to 31 percent while under organic farming, cash profits per ha increases of 100 percent are possible. International trade with its high price premiums therefore allows increases of income by much more than what can be achieved through reduction of input costs.

Available labour is a limiting factor as wages are relatively high. According to the figures used in this model, cultivation does not pay if labour has to be hired. Under organic management, per ha profits are high enough to hire workers to increase the cultivated area. Labour scarcity is limiting the cultivated area in particular during planting and harvesting time. Organic farming techniques are therefore more suitable if they don't increase the work effort during the peak working season. This raises the question to which degree labour can be substituted by capital in organic agriculture and if an more intensive organic agriculture could be a way out.

Yield reductions during the initial phase of organic farming make it expensive to change to organic management. In particular households that have the majority of their income from crop cultivations can suffer high losses which might not be affordable as many households have debts already. It is therefore critical to keep yields high during the years before certification which is possibly achievable through training and research.

7. References

Ahmad, A. and S. Isvilanonda (2003). Rural Poverty and Agricultural Diversification in Thailand. Second Annual Swedish School of Advanced Asia and Pacific Studies (SSAAP), 24-26 October, 2003., Lund, Sweden.

Binford, M. W., T. J. Lee and R. M. Townsend (2004). "Sampling design for an integrated socioeconomic and ecological survey by using satellite remote sensing and ordination." Proceedings of the National Academy of Sciences of the USA **101**(31): 11517-11522.

BMF and ADA (2006). Guidelines for targeted funding of CGIAR Centers. Vienna, Austria, Federal Ministry of Finance of Austria and Austrian Development Agency**:** 21.

BTEI Thailand (2004). Consumer Price Index 1994 - 2004, Bureau of Trade and Economic Indices; Ministry of Commerce Thailand.

Buley, M., K. Jährmann, J. Kotschi, A. Richert and J. Spitta (2004). Ökologische Landwirtschaft. Ein Beitrag zu einer fairen Globalisierung. Frankfurt am Main, Germany, Gesellschaft für Technische Zusammenarbeit**:** 40.

Chaipattana Foundation (2006). The New Theory, Chaipattana Foundation.

Eischen, E., P. Prasertsri and S. Sirikeratikul (2006). Thailand. Organic Products. Thailand's Organic Outlook. Bangkok, Thailand, Global Agricultural Information Network**:** 25.

Ellis, F. (2000). Rural Livelihoods and Diversity in Developing Countries, Oxford University Press.

Entwisle, B., S. J. Walsh, R. R. Rindfuss and L. K. Vanwey (2005). "Population and Upland Crop Production in Nang

Rong, Thailand." Population and Environment **26**(6): 449-470.

Fukui, H. (1993). Food and Population in a Northeast Thai Village. Honolulu, University of Hawaii Press.

Fukui, H., N. Chumphon and K. Hoshikawa (2000). "Evolution of rain-fed rice cultivation in northeast Thailand: increased production with decreased stability." Global Environmental Researach **3**(2): 145-154.

Kanoksilp, J. (2006). Sufficiency economy difficult to swallow. The Nation. Bangkok.

Khunthasuvon, S., S. Rajastasereekul, P. Hanviriyapant, P. Romyen, S. Fukai, J. Basnayake and E. Skulkhu (1998). "Lowlan rice improvment in northern and northern Thailand 1. Effects of fertiliser application and irrigation." Field Crops Research **59**: 99-108.

NFM (2006). "NFM Market Overview." Natural Food Merchandiser **27**(6): 16-18.

Noi, C. (2006). What does Sufficiency Economy mean? The Nation. Bangkok.

NSO Thailand (2003). Agricultural Cenus 2003 Northeastern Region, National Statistical Office and Ministry of Information and Communication Techonolgy Thailand.

Oxfam GB (1994). Program Impact Report. Oxfam GB's work with partner and allies around the world., Oxfam GB**:** 74.

Setboonsarng, S., P. Lueng and J. Cai (2006). Contract Farming and Poverty Reduction: the Case of Organic Rice Contract Farming in Thailand, Asian Development Bank Institute Discussion Paper No. 49.

Thammasat University (2005). EU-Thailand Economic Co-operation Small Project Facility Grant Application Form. "Enhancing competitiveness of organic rice and tapioca cultivations to stimulate local development and Thai-EU trade relations", Thammasat University, Faculty of Science and Technology.

The Nation (2006). New Economc Direction, Call for defintion of self-sufficiency. The Nation. Bangkok.

Townsend, R. M. (1997). Townsend Thai Project Initial Household Survey, Social Science Computing Service, the University of Chicago, USA. **2006**.

Udomkit, N. and A. Winnett (2002). "Fair Trade in organic rice: a case study from Thailand." Small Enterprise Development **13**(3): 45-53.
UN ESCAP (2002). Organic Agriculture and Rural Poverty Alleviation Potential and best practice in Asia. Bangkok, UN ESCAP.
Willer, H. and M. Yossefi (2005). The World of Organic Agriculture. Statistics and Emerging Trends 2005. Bonn, Germany., IFOAM.
Willer, H. and M. Yossefi (2006). The World of Organic Agriculture. Statistics and Emerging Trends 2006. Bonn, Germany and Frick, Switzerland, IFOAM, FiBL.

Tables

Table 1. Population share, median income (1997 Baht per year) and median characteristics of household types.

income	crop %	pop %	income baht	sav./ inc.	max. school	ha owned	househ. asset	agric. assets	rela-tives
low	0	14.7	8,200	-0.05	4	0.12	65,000	0	12
low	<33	5.4	12,480	-0.15	6	1.44	86,600	10,000	15
low	<66	4.9	11,010	-0.22	6	1.56	105,550	10,500	14
low	>66	7.4	9,849	-0.14	6	2	91,400	20,000	13
middle	0	7.3	28,530	-0.01	6	0.16	102,050	0	12
middle	<33	7.4	27,170	-0.11	8	1.68	125,000	21,500	15
middle	<66	10.1	27,400	-0.14	7	2.56	142,900	27,000	15
middle	>66	8.9	27,390	-0.17	7	2.9	147,900	48,500	14
high	0	8.5	72,000	-0.03	8	0.16	164,800	0	13
high	<33	12.5	82,160	-0.03	9	3.46	216,850	31,500	15
high	<66	7.1	66,710	-0.13	8	4.64	204,500	52,000	16
high	>66	5.8	60,700	0.00	9	4.8	206,400	57,000	15

Table 2. Persons and land endowments used in the model and sources of income in%.

income	crops %	persons >18	upland ha	lowland ha	off-farm income	crop income	other income	alpha
low	<33	2	0	1.12	0.74	0.26	0.00	0.22
low	<66	2	0	1.02	0.28	0.72	0.00	0.64
low	>66	2	0	1.92	0.00	1.00	0.00	1.07
middle	<33	3	0	1.28	0.67	0.28	0.05	0.52
middle	<66	3	0	1.92	0.34	0.61	0.05	1.06
middle	>66	3	0	2.3	0.00	1.00	0.00	2.01
high	<33	3	0	2.08	0.81	0.19	0.00	0.99
high	<66	3	0	3.2	0.28	0.63	0.09	2.67
high	>66	3	0	3.36	0.02	0.98	0.00	4.1

Table 3. Cash input costs per ha in Baht (2003)

income	crops %	fertilizer	pesticides	seeds	machins	total
low	<33	1,875	0	0	750	2,625
low	<66	1,817	0	0	516	2,332
low	>66	1,250	0	0	573	1,823
middle	<33	1,479	0	0	670	2,150
middle	<66	1,432	0	0	625	2,057
middle	>66	1,606	70	0	747	2,422
high	<33	1,559	10	0	694	2,264
high	<66	1,330	0	0	497	1,827
high	>66	1,382	20	0	500	1,902

Table 4. Key data of different management scenarios

	yield	price	cash	work days per month											
	kg/ha	%	cost%	1	2	3	4	5	6	7	8	9	10	11	12
base	2,181	100	100	0	0	0	0	0	10	35	35	5	3	50	50
organic	2,181	170	60	10	10	10	11	20	20	35	35	18	5	50	50
transit.	1,636	122	60	10	10	10	11	20	20	35	35	18	5	50	50
initial	1,091	107	60	10	10	10	11	20	20	35	35	18	5	50	50
suffic.	2,181	100	10	10	10	10	11	20	20	35	35	18	5	50	50

Table 5. Base profit in Baht (2003) per ha and changes in percent under different management.

income	crops %	base	organic	transistion	initial	sufficient
low	<33	9,549	108	2	-48	31
low	<66	9,912	103	1	-48	26
low	>66	10,544	94	-2	-48	19
middle	<33	10,138	99	-1	-48	24
middle	<66	10,253	98	-1	-48	22
middle	>66	9,800	105	1	-48	28
high	<33	9,996	101	0	-48	25
high	<66	10,538	94	-2	-48	19
high	>66	10,446	96	-1	-48	20

Table 6. Household income in Baht (2003) and changes in percent under different management

income	crops %	base	organic	transition	initial	sufficient
low	0	4,400	0	0	0	0
low	<33	8,327	0.28	0.01	-0.12	0.08
low	<66	8,866	0.74	0.01	-0.34	0.19
low	>66	11,284	0.98	-0.02	-0.48	0.19
middle	0	22,000	0	0	0	0
middle	<33	23,808	0.28	0.00	-0.14	0.07
middle	<66	26,784	0.61	-0.01	-0.29	0.14
middle	>66	29,601	1.07	0.01	-0.48	0.28
high	0	62,400	0	0	0	0
high	<33	79,174	0.20	0.00	-0.09	0.05
high	<66	67,101	0.62	-0.01	-0.30	0.12
high	>66	65,993	0.97	-0.01	-0.46	0.20

Figures

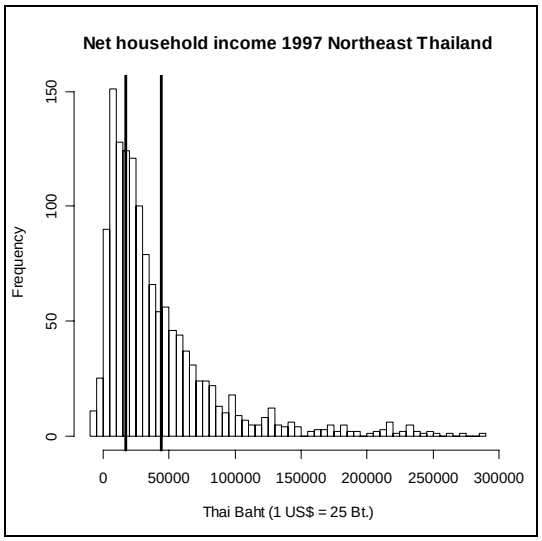

Figure 1. Income distribution of the sample in Baht (1997).

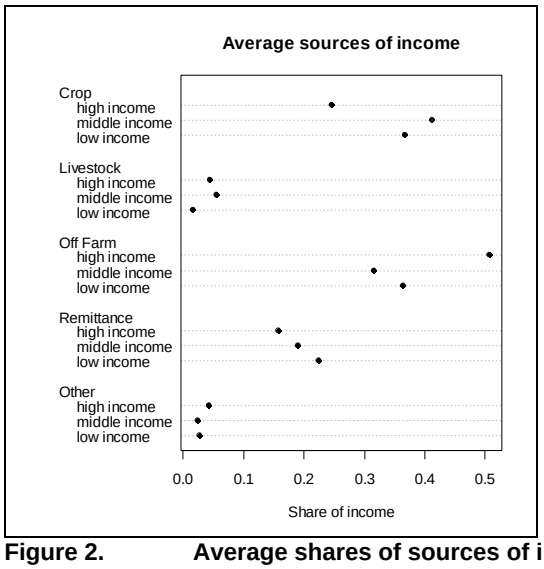

Figure 2. Average shares of sources of income for household groups.

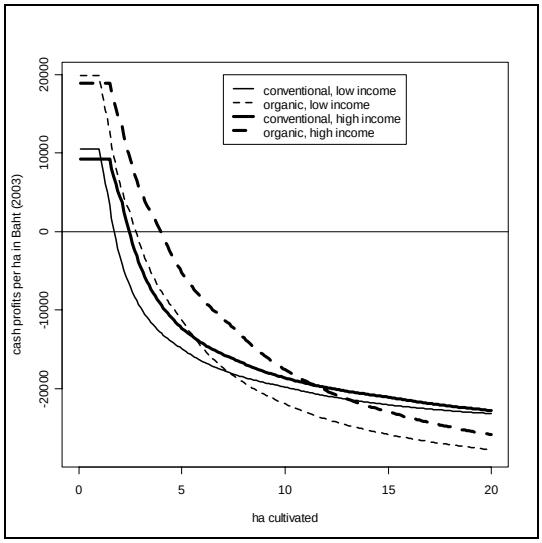

Figure 3. Profits per ha with labour cash costs.

Acknowledgements

This research was possible through the a scholarship financed by the EU Asia Link Program BEAN-QUORUM. Special thanks for their help to my friends at Thammasat University in Thailand.

Contact information

Ulrich B. Morawetz
Universitaet fuer Bodenkultur Wien
Departmen fuer Wirtschafts- und Sozialwissenschaften
Feistmantelstr. 4
A-1180 Wien (Austria)

Phone: +34 - 1 47654 - 3672
Fax: +34 - 1 47654 - 3692
Email: ulrich.morawetz@boku.ac.at