CHAPTER V

BIOENERGY PRACTICE IN THE MEKONG

Agricultural products are our oil, our gold.

Dhanin Chearavanont, Charoen Pokphant, April 2008

There are more than enough energy resources in ASEAN for long term sustainability. But, there will be an energy crisis if we can't change the current centralised energy development pattern.

Wittoon Permpongsacharoen, Mekong Energy and Ecology Network
ASEAN People's Forum, Bangkok, 21 February 2009

The framework for bioenergy trade and sustainable development in Thailand and the Mekong region was described on the basis of theory and policy in previous chapters. Based on the current policy trends, the evidence presented in this chapter serves to illustrate bioenergy development in practice and its implications for sustainable development.[28] The *first* section outlines the factors underlying sustainability of bioenergy. In the *second* section, the complexities, challenges and changes induced by the development of biofuels are woven into the discussion of the six case studies drawn from the field work. These case narratives serve to illustrate the response to bioenergy developments at the local level both on livelihoods and the environment. Section *three* presents the findings from the case studies and the survey questionnaire as well as outlines several main issues raised in the informant interviews and focus groups. The final two sections examine the trends in local bioenergy narratives in Thailand and the Mekong and the need for a regional conceptualisation of agroenergy.

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[28] Chatthip Nartsupha, Charit Tingsabadh, Sitanon Jesdapipat, Seri Phongphit, Apichai Puntasen and Thippawal Srijantr encouraged me to go into the field as much as possible. The field visits undertaken for this research would not have been possible without the support of the many interviewees who gave so generously of their time, energy and enthusiasm. I am grateful for the steadfast encouragement of Samai Jai-In, Athiras and Witchuda Dumdee, Sawaeng Ruaysoongnern, Pra Tawee, the Vanghinlad farmers, Jarun Putson, Nopadol Suanprasert, Soubanh and Thongchanh Sengsoulivong, Chumroen Benchavitvilai, Win Myaing & Family and Htay Aung. Mark Halle (IISD), Christer Holtsberg (SENSA), Thanpuying Suthawan Sathirathai (GSEI) and Krirk-Krai Jirapaet (ITD) provided the inspiration for researching trade and environment in the Mekong. Miguel Oliveira, Claudia Santos, Emmanuel Desplechin, Marcos Savini and Tim Hirsch introduced me to agroenergy in Brazil.

Following the methodology outlined in Chapter II, the analysis in this chapter is informed by over 500 interviews with key informants, 49 focus group discussions, a survey questionnaire of 143 respondents and field work spanning the six Mekong countries undertaken between October 2008 and November 2009 (**Appendix G**). There were several important conferences related to the topic of this thesis during the research period that facilitated access to a broad range of informants and the opportunity for focus group discussions amongst key actors at various levels of the policymaking process (**Appendix H**). This was particularly important to gather together local level agents, experts who operate mainly in the field and agents from international organisations who are dispersed around the globe.

Background field interviews in the Mekong region were carried out to prepare trade and environment assessments of Thailand and Lao PDR from August 2006 to June 2007 for a project undertaken for the International Institute for Trade and Sustainable Development (IISD), the International Institute for Trade and Development (ITD) and the International Union for the Conservation of Nature (IUCN) (Shaw et al 2007a, 2007b).

Finally, the analysis benefits from comparative research on the Brazilian experience with bioenergy, including key informant interviews and field visits in Brazil from November 2009 to March 2010.

5.1 Scoping agroenergy sustainability: land and water

The investigation in this chapter starts from a fundamental premise – sustainable development, as discussed in Chapter II concerning the theoretical and conceptual framework for this research. Sustainability of agroenergy in Thailand relates to two main underlying factors – land and water. This is where an examination of the sustainability of biofuels begins and ends.

First, *land* is central to a discussion of bioenergy. In other words, who owns it, how it is managed, and the choice of which crops to cultivate are central, underlying questions related to assessing agroenergy socio-ecological sustainability and economic feasibility. As noted above, to a significant extent, agricultural production in Thailand and the Mekong region continues to revolve around small-scale farming. Although agribusiness in Thailand

has grown in the sugar and tapioca sectors, large-scale, export-oriented agriculture in Thailand has managed to incorporate farmers through cooperative arrangements.

Thai agricultural expert, Thippawal Srijantr, an agronomist at Kasetsart University, notes the declining productivity of agricultural lands in Thailand's central plains. Her research on the Chao Phraya region supports other work that points to the fact that extensive use of chemical inputs has diminished the soil's productive capacity in many areas around the globe. In *The End of Food*, an exploration of the origins, operations and consequences of the global food economy, Paul Roberts (2009:154) posits that "the real Achilles' heel of the Green Revolution was, and is, fertiliser." The FAO (2007) estimates that over a third of the Green Revolution yield increases were a result of increased fertiliser use. Widespread and intensive use of industrial fertilisers and pesticides in the Chao Phraya Delta is found to have led to excessive nutrient effluents in water sources and to have reduced soil fertility (Molle & Thippawal 2003). Apichai Puntasen (1997), a Thai agriculture and local community expert, describes resource management in the Central Plains as a "discouraging situation."

Second, *water* availability and water use are key variables in assessing sustainability of agriculture in general and in particular related to the planned expansion of oil palm and sugarcane in the Northeast. Adequacy of, and access to water is governed, in turn, by precipitation rates (rainfall), irrigation systems, and groundwater. The FAO estimates that the single biggest use of water worldwide is in the agricultural sector, with 70% of water use going to irrigation (FAO 2009). These factors have important implications for the development of appropriate agroenergy crops in Thailand and the Mekong region. Whilst agricultural systems in Thailand benefit from a combination of rainfall and irrigation, the management of the Mekong River and its tributaries in Northeastern Thailand is a significant consideration in whether there will be sufficient water for agroenergy crop development.[29]

Water use in the Mekong relates to broader issues surrounding managing the shared waters of the Mekong River, including plans to dam the mainstream Mekong for the first time. There are several relevant points. First, rapidly increasing demand for electricity in the region over the past decade and the shift to reduce consumption of fossil fuels in power

[29] The 4,880-kilometre river flows from the Tibetan plateau, through southern China, traversing Burma, then crosses into the Mekong Basin shared by Thailand, Lao PDR, Cambodia and Vietnam and empties out into the South China Sea in southern Vietnam.

generation has led to increased pressure to develop hydropower in the Mekong Basin as a renewable source of energy and foreign exchange earnings to finance development.

Second, and related to the previous point, the Mekong River Commission (MRC), established in 1995 to manage the shared water resources of the Mekong River, is currently facing its most strategic challenge in considering how to deal with proposals to dam the mainstream river.[30] In June 2009, the MRC initiated a wide ranging strategic assessment of plans to develop hydropower dams in the mainstream of the Lower Mekong River Basin on the Lao-Thai border and in Cambodia. Jeremy Bird, Chief Executive Officer of the MRC Secretariat, notes that "the Mekong River system is a highly productive and valuable, but at the same time, fragile resource" in a region facing accelerating demand for water (Interview 2 February 2009).

Third, the fact that China is not a member of the Mekong River Commission is considered to significantly hamper a coordinated assessment that includes upstream dams on the Lancang-Mekong River. According to Bird, the global financial crisis in Southeast Asia has provided a "breathing space," allowing the four lower Mekong countries (Cambodia, Lao PDR, Thailand and Vietnam) the time to better assess how mainstream projects will affect the sustainability of the Mekong River basin.[31]

While the current framework for domestic laws and regulations governing land and water use are well established in Thailand in *theory*, as outlined in Chapter IV, the implementation of laws and regulations in *practice* has been found by most accounts to be lacking (Dore 2003). That is to say, Thailand has in place comprehensive legislation and policies governing land and water management. However, their implementation is insufficiently rigorous. This conclusion is supported by the informant interviews. Conversely, neighbouring countries have either insufficient or unclear domestic laws with respect to land rights and water and pollution quality control.

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[30] In the 1995 Mekong Agreement, the four MRC member countries (Cambodia, Lao PDR, Thailand and Vietnam) committed to undergoing a formal approval process prior to any decision to construct dams on the river. While the upstream countries of China and Myanmar are not members, they participate as observers.

[31] Hydropower on the Mekong tributaries generates 3,235 MW of electricity, with plans to construct dams with an operational capacity of 3,209 MW currently underway. There are 8 existing or planned Mekong mainstream dams in Yunnan and 11 proposed by Cambodia, Lao PDR and Thailand. Over 60 million people in the lower Mekong basin depend on the river system for food, transport and economic activity. Freshwater fisheries in the basin have an annual commercial value of US$2 billion, making it the world's most valuable inland fishery. Eighty percent of the animal protein for Mekong inhabitants comes from the Mekong.

5.2 Case narratives of bioenergy

Isan is the region where the village subsistence economy persisted to the greatest extent.

Chatthip Nartsupha, *The Thai Village Economy in the Past,* 1984

On the face of it, and despite the industrial growth of the past decades, Southeast Asia remains a region of farmers.

Jonathan Rigg, *Southeast Asia: The Human Landscape of Modernisation and Development,* 1997

Nature and society are inextricably linked.

Bruno Latour, CBC podcast interview, 2007

While emphasising the vitality of the rural landscape is Thailand and the Mekong region from different perspectives and at different times, Chatthip Nartsupha and Jonathan Rigg, social economic historians, share the perspective that this landscape involves "more than the soil." However, crafting a "new rural world" from an environmental sustainability perspective is *all* about the soil and the water that nourishes that soil. The human landscape is thus fundamentally dependent on the sustainable management of its natural components: air, water and soil (Rigg 1997).

As discussed in Chapter II, this is the basis of the theory of reflexive modernisation put forward by Ulrich Beck (1992) – a German sociologist with the Max Planck Institute, and Bruno Latour (1993) – a French sociologist at the Institut d'études politiques de Paris, when they discuss risk and the relationship between man and nature in "a new age of modernity" (Interview CBC podcast 2007). In *Risk Society*, Beck (1992) suggests that confronted by the anticipation of environmental catastrophe, we make decision based on a reliance on expert scientific opinion. This is at once *tragic* – as the situation is too complex and makes individuals powerless to act, and *paradoxical* – as we depend on the experts to get us out of the problems that they created.

Similar to Beck, Latour considers that modernity has been based on the separation of nature and society, which has been shown to be a myth as the two are inextricably linked. Moreover, Latour argues, science has long been political, and not the result of pure reason. As such, it cannot serve as the source of certainty. These are elements that need to be taken into account when considering the construction of knowledge for example in the context of agroenergy. In a book entitled *We Have Never Been Modern*, Latour (1993) argues that we

can no longer be emancipated from uncertainty through science. Moreover, Latour posits that "developing countries need to be freed from the politics of OECD science used to respond to environmental challenges."

The task of the times, Latour suggests, is one of composition, as opposed to critique. That is to say we need to "put things back together in this current state of intellectual and environmental ruin." How to do this? As with Beck, Latour calls for a second modernity built detail-by-detail from the bottom up.

To this end, the following section examines the implications for sustainable development of bioenergy case narratives in Thailand and the Mekong. These cases were studied during several field trips to each site. The locations of the case studies included in this research are outlined in the table below.

Table 26: Case study narratives of community and commercial bioenergy

	Agroenergy crop	**Cultivation area**
PART I: Community biodiesel		
Case study 1	Oil palm	Rangsit, **Central Thailand**
Case study 2	Oil nuts (Jatropha)	Vanghinlad, Chumpae, **Northeastern Thailand**
Case study 3	Oil palm	Aoluk, Krabi, **Southern Thailand**
PART II: Commercial agroenergy		
Case study 4	Sugarcane and cassava	Khon Kaen, **Northeastern Thailand**
Case study 5	Oil palm and cassava intercropping; Jatropha	Pakse, Champassak, **Southwestern Lao PDR**
Case study 6	Oil nuts (Jatropha)	Shan state and Mandalay, **Myanmar**

The main approach and methodology employed in the case narratives is semi-structured interviews and focus group discussions with key informants, as well as a survey questionnaire and field visits (See Chapter II). The information collected was analysed qualitatively and quantitatively. This analysis has been interwoven in the case narratives where relevant. A full statistical assessment of the responses to the questionnaire is contained

in **Appendix L**. When possible, focus groups were incorporated into the field visits to include various levels of interviewees to better illustrate the diversity of views and encourage sharing of experience from different perspectives.

At the outset, it is useful to make a distinction between *community* and *commercial* biofuel production and use. This is a particularly useful distinction in Thailand the Mekong region. It is one that experts interviewed insist upon when responding to questions on the biofuels sector.

Community-based small-scale bioenergy – relates to the promotion of biodiesel at the local level to enhance energy and agricultural sufficiency by providing an alternative to fossil fuels for power generation (small machinery and irrigation pumps) and as an alternative to chemical fertilisers and pesticides. Small-scale farmers can also be vertically integrated in the development of the national commercialised biofuel supply chain. First, since the mid-1980s, Thailand has gained valuable experience with the promotion and use of community *biodiesel* for local use. Community-based biodiesel production and use is being promoted to contribute to energy self-sufficiency at the local level. With respect to *ethanol* production, small-scale farmers of sugarcane and cassava are important providers of feedstocks for commercialised production.

Thailand is in the process of implementing Sufficiency Economy projects to promote energy self sufficiency and sustainable agricultural practices in local communities in rural Thailand. Through ACMECS cooperation, Thailand also acts to assist in the development of energy self sufficiency and sustainable agriculture in neighbouring countries. Community-based sustainable biodiesel would benefit from the development of a Thai national interpretation of the Roundtable on Sustainable Palm Oil (RSPO) certification scheme. This process will be assisted by strengthening small-holder oil palm cooperatives. **Appendix P** contains the draft Thai national interpretation of the RSPO guidelines.

Commercial bioenergy – relates to the promotion and use of biofuels to meet the national blending targets for ethanol and biodiesel. Since 2008, Thailand has commercialised both ethanol and biodiesel in the national fuel market. As of February 2008, a 2% blend of biodiesel (B2) is mandatory nationwide, with B5 targets in place for 2011. The main incentive driving biofuel production is domestic use to meet Thailand's renewable energy targets, with "surplus production" exported.

Thailand has already acted to solidify this distinction by adopting different quality standards for commercial and community biodiesel.

Comparative farmer incomes

By way of comparison, the table below outlines the total annual income of local farmers for selected key crops in Thailand. This information was provided by local level informants during the field work interviews. The income for rice is low but it refers to unmilled rice and is the amount that the farmer would receive at the mill.

Table 27: Farmer income for selected crops, 2009

Crop	Inputs	Average yield x price (kg/rai/year) x (Thai Baht/kg)	Farmer's annual income/rai (Thai Baht) ($1 = 33Bt)
Palm oil	Initial water and fertiliser	4,400 kg/rai @ 5 Bt	22,000 Baht **($ 667)** **($4,200/ha)**
Rubber	Initial water and fertiliser	300 kg/rai @ 73 Bt	21,900 Baht **($ 664)** **($4,150/ha)**
Rice (unmilled)	Water and fertilisers used for each crop	400 kg/rai @ 10 Baht/kg x 2 crop cycles	4,000 Baht x 2 = 8,000 Baht **($ 242)** **($1,500/ha)**
Cassava	Minimal water and fertilisers used for each crop	3,800 kg/rai @ 1.50 Baht/kg x 2 crops cycles per year	5,700 Baht x 2 = 10,400 Baht **($ 315)** **($2,000/ha)**

Source: Compiled based on data provided during the informant interviews with Athiras Dumdee (oil palm farmer, Southern Thailand); Samai Jai-In (energy expert, Royal Thai Navy); and Nopadol Suanprasert (former ORAFF Director General)

The case studies in the next section are divided into two parts: (1) community bioenergy initiatives in Thailand; and (2) investment in commercial bioenergy production.

PART ONE: Community bioenergy case narratives in Thailand

Community bioenergy initiatives throughout Thailand are emerging as a strategy with significant potential to shift away from fossil fuels. Informants highlight that this would have a three-fold impact: (i) build local resilience through energy sufficiency; (ii) increase rural incomes; and (iii) restore environmental sustainability of soil, land and water. Field work for this research was conducted primarily in four areas in Thailand: (1) Nong Moo, Rangsit (Central); (2) Vanghinlad, Chumpae, Khon Kaen (Northeast) with training at Wat Sua, Si Prajam, Suphanburi (Western); and (3) Aoluk, Krabi (Southern).

These case studies serve to illustrate how small-scale farmers can exploit modern agronomic techniques to curb soil erosion and raise the productivity of the land and reduce the use of water in the cultivation of agroenergy crops. This includes production of agroenergy crops such as sugarcane and cassava for ethanol, and oil palm, Jatropha and other indigenous or locally available oil nuts for biodiesel.

Setting the context: alternative energy projects at Chitralada Palace

Progress is not just about planting enough rice to eat.
H. M. King Bhumipol Adulyadej, Dusit Palace, December 2003

The historic photo below was taken in May 1985 on the occasion of King Bhumipol's opening of the demonstration ethanol plant at the Royal Chitralada Palace in Bangkok. Producing ethyl alcohol (at 91% purity) at the rate of 2.8 Liters/hour cost up to 56.20 Baht/Liter. After this project began, production of 95% pure ethyl alcohol from molasses (sugarcane) by the Excise Department was sold at 24 Baht/Liter. In October 1994, Chitralada Palace in cooperation with Surathip Company expanded production to supply gasohol for all the cars in the King's Royal Agricultural Projects. The Chitralada plant production rate was 25 Liters/hour at a cost of 32 Baht/Liter. When calculating only the variable cost, the output was 12 Baht/Liter (produced four times each month) (Interview Chitralada Palace 22 May 2009).

The Chitralada diesohol project began in 1998 in cooperation with the Petroleum Authority of Thailand (PTT). The project originally experimented with mixing 95% alcohol with diesel and emulsifiers for use in diesel engines in vehicles and tractors in the project.

Photo 1: Royal Chitralada biodiesel inauguration, 1985

HM King Bhumiphol Adulyadej and Princess Sirindhorn opening the Alternative Energy Projects at the Royal Chitralada Palace, May 1985
(Photo credit: Samai Jai-In, Royal Thai Navy)

CASE NARRATIVE 1

Community-based biodiesel, Rangsit and Wiharndaeng, Saraburi, Thailand

Background

As in many parts of the developing world, millions of rural people in the Mekong region depend on non-renewable traditional biomass energy sources for domestic and commercial activities. Biofuels or more efficient use of biomass can provide an alternative option for rural areas "to generate a trade surplus or to establish a livelihood through traditional farming systems that are self-sustaining and energy efficient" (Interview Chitralada Royal Project 22 May 2009). The project is in Nong Moo Subdistrict, Wiharndaeng District, Saraburi province. Saraburi in Thai means swamp ('sa') town ('buri'). Saraburi is one of the central provinces of Thailand, with a diverse geography in an area of nearly 4,000 kms^2. The eastern section of the province occupies the Chao Phraya river

valley, with high plains and plateaus, with the western section mainly composed of low flatlands. Saraburi is a gateway to Thailand's Northeast, about 100 kms outside Bangkok. Historically, this province has always been prominent in the Thai socio-economic landscape. It contains the first Royal Forest Department Botanical garden, Phu Khae, established in 1941, which covers an area of over 300 hectares, with a third of the land covered by grasslands and forests. The land in the study area of Saraburi is owned and leased by the Crown Property Bureau.

After centuries of rice paddy production, in the 1980s, farmers in Wiharndaeng District, Saraburi were encouraged to shift to cultivating vegetables and seasonal fruits, such as mangoes, oranges and custard apples for domestic consumption and export. Research on the Chao Phraya Delta by Thippawal Srijantr and François Molle (2003), agricultural experts, supports the information obtained from the interviewees concerning the resulting increase in chemical and water inputs, decrease in soil productivity and increase in salinity, with increasingly unfavourable market prices for the resulting fruits and vegetables. Moreover, these products have faced growing competition particularly from Chinese imports following the liberalisation of 88 categories of fruits and vegetables under the Early Harvest Programme between Thailand and China[32] (See Chapter IV for more details).

Full cycle biodiesel palm oil production to rehabilitate acidic soil

Cooperation between the National Science and Technology Development Agency (NSTDA), the National Science and Technology Research Institute (TISTR), the Crown Property Bureau, Kasetsart University and the Royal Thai Navy established a biodiesel production plant in Saraburi. The purpose is to demonstrate how to put into practice sufficiency energy development in rural agricultural communities.

The project area covers 50 acres (20 ha) about 100 kms north of Bangkok, bordering on the provinces of Saraburi, Pathumthani and Nakornayok along the 33rd Rangsit Canal. Irrigation of the Rangsit field was established by King Chulalongkorn (Rama V). The project initiates "an integrated approach to bioenergy development for the local community" covering the entire life cycle, from establishing energy crop plantations (oil palm and Jatropha) in acidic soil, extracting and producing biodiesel, quality control to small-scale biodiesel use.

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[32] As of 1 January 2010, this programme is managed under the ASEAN-China Free Trade Agreement (ACFTA).

Samai Jai-In, a leading energy expert from the Royal Thai Navy, organised the field trip to the Saraburi demonstration project. He is also a member of the National Biofuel Development and Promotion Committee and has been conducting Research and Development programs for the Royal Thai Navy for the past 20 years in several technological-based areas as well as alternative energy. In addition to the Saraburi community biodiesel development project (with the National Science and Technology Development Agency (NSTDA), Ministry of Science and Technology), Samai Jai-In is involved with the development of biofuel programmes in Thailand and Asian region with special focus on community-based programmes. These include the biodiesel pilot project in Chiang Mai (with the Department of Alternative Energy Development & Efficiency (DEDE), Ministry of Energy) and biodiesel pilot project in Samui Island (with Rajabio-diesel and the Renewable Energy Institute of Thailand).

Noting the progress since 2003 in implementing the project, Samai considers that "the guideline for success is to build a model for community self sufficiency." With the use of a zero-waste bio-refinery, Samai explains that small conversion units are available from the project for farmers to meet their energy needs (Interview 15 May 2009).

The development of small-scale oil palm cultivation in the Rangsit area, Samai explains "is reviving the local economy and rehabilitating the soil." Switching to oil palm has been put forward as an alternative option for farmers, whose orange crops were increasingly unproductive due to acidic soil and disease, resulting in decreasing revenues. For Jarun Putson, a local farmer who switched from tangerines to palm oil in 2005, the results over the past four years have been encouraging from both an economic and environmental perspective.

Photo 2: Jarun Putson, orange turned oil palm farmer, Rangsit, central Thailand
Photo 3: Samai Jai-In with Jarun Putson, Rangsit, central Thailand

Rangsit Oil Palm Cooperative is organised by Aksorn Noisawang, Jarun Putson and about 300 families, covering an area of about 800 hectares. Jarun has 7 rai (about 1 ha) of land on which he cultivates oil palm. Jarun's palm productivity, Samai Jai-In notes, "is breaking a new record again: 5.8 tons of fresh fruit bunches(FFB)/rai/year in 2009 up from 4.8 tons in 2008. The expectation is to reach 8 tons/rai/yr by 2011 when the palm is fully matured, which will represent a 100% improvement in the average productivity of Thailand oil palm" (Correspondence Samai 2 Nov 2009).

With the assistance of Samai Jai-In, in October 2009, the Rangsit Coop negotiated a five-year long term purchasing agreement with Bangchak Petroleum, whereby Bangchak will purchase the entire production of crude palm oil of the Cooperative. The price will be announced by the Department of Internal Trade. The Cooperative will divert the necessary crude palm oil (CPO) to produce biodiesel for its farm machinery. The plan is to extend this model to another ten cooperatives in acidic soil areas in nearby provinces. This type of "small and smart" system was designed by the National Metal and Materials Technology Center (MTEC). Samai maintains it is the way to incorporate smallholder palm oil producer through cooperatives with big companies (Correspondence 28 Oct 2009).

This project is being undertaken by the Asia Biomass Centre, which was established by National Science and Technology Development Agency (NSTDA) in March 2006 to enhance the knowledge and capacity to support biofuel development. The aim of the Asia Biomass Centre is "to address the energy, economic, and environmental needs of its rural communities through the use of their most plentiful resource" – agriculture. It seeks to foster "responsible energy generation, new business development, economic growth, educational outreach and environmental stewardship." The goal of projects, such as the one in Saraburi, is to support research on energy and the environment, "by adding value to the commercial use of biological resources."[33] The Centre is exploring the possibility of providing 'third party verification' of emerging renewable resource processes in rural applications. This will enable sustainability to be assessed and verified, which will improve the farmers options to market their products. The model used in Saraburi follows the small and smart model of biodiesel production as illustrated in the figure below.

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[33] See www.nstda.or.th.

Figure 16: Small and smart model of biodiesel production

Source: Samai, presentation to the Asia Biofuels Dialogue, November 2009 (Samai 2009)

The Saraburi Integrated Biodiesel Production Demonstration Plant encompasses 1,300 rai (about 208 hectares) owned by the Crown Property Bureau and surrounded by the land allocated to farmers for agricultural development by the Agricultural Land Reform Office. As noted above, the majority of this land, formerly Thailand's largest orange plantation has been left barren due to infertile acidic soil. The project to commemorate the 60th anniversary celebrations of HM King Bhumiphol to the Throne forms part of the Integrated Bioenergy Sufficiency Community Development Project, including cultivation of acidic soil, plantation management, energy crop test fields and biodiesel production and quality control. Much like the positive aspects learnt from the Green Revolution – an aspect covered in the concluding chapter of this research, the project has utilised "the knowledge of science and technology to systematically resolve local agriculture problems and develop a sustainable bioenergy community."

This demonstration project also consists of an area for energy crops, e.g. Jatropha and oil palm, plantation, small oil extraction process and machines for community-scale oil production, a 200 Liter biodiesel pilot-scale reactor (managed by TISTR), and solid fuel/pellet production from biomass for gasification. The intention is for the demonstration plant to

provide technological transfer research and development projects to the community (coordinated by MTEC which is a member of NSTDA).

During the field visit of a United Nations Industrial Development Organisation (UNIDO) delegation to the biodiesel demonstration project at Bangkok University in May 2009, Samai makes the case that "small can be beautiful – if it is smart and integrated." This demonstration plant cost 300,000 Baht (about US $10,000) to build and has a capacity of 100 Litres, operating on used vegetable oil. The intention of UNIDO is to use its global network of Cleaner Production Centers, especially in China, India, Brazil and South Africa, to enhance the potential of bioenergy technologies through South-South cooperation (Interview with Luetkenhorst 15 May 2009). The Saraburi integrated commercial biodiesel demonstration plant is a dry process; there is no waste water explains a worker at the plant (Interview Wachara 15 May 2009).

In September 2009, the Thai government launched a plan to lease public land for agroenergy production, with the objective of increasing the value and productivity of public land, creating jobs and providing assistance to the rural poor. The plan is to lease 1 million rai of public land that is laying fallow to poor farmers to grow energy crops such as oil palm to support the country's nascent alternative energy industry. Rural households will be offered three-year leases for up to 15 rai (2.4 ha) of land at the annual rate of 20 to 50 Baht ($0.60 to $1.50) per rai. The government plans to invest in supporting infrastructure as part of the "Thailand: Investing from Strength to Strength" programme, including irrigation networks. The Treasury Department, as the manager of Thailand's public lands, is coordinating with the Agricultural Ministry to assist in the selection of suitable crops. The Bank for Agriculture and Agricultural Cooperatives (BAAC) will provide seed capital for farmers leasing public land.[34]

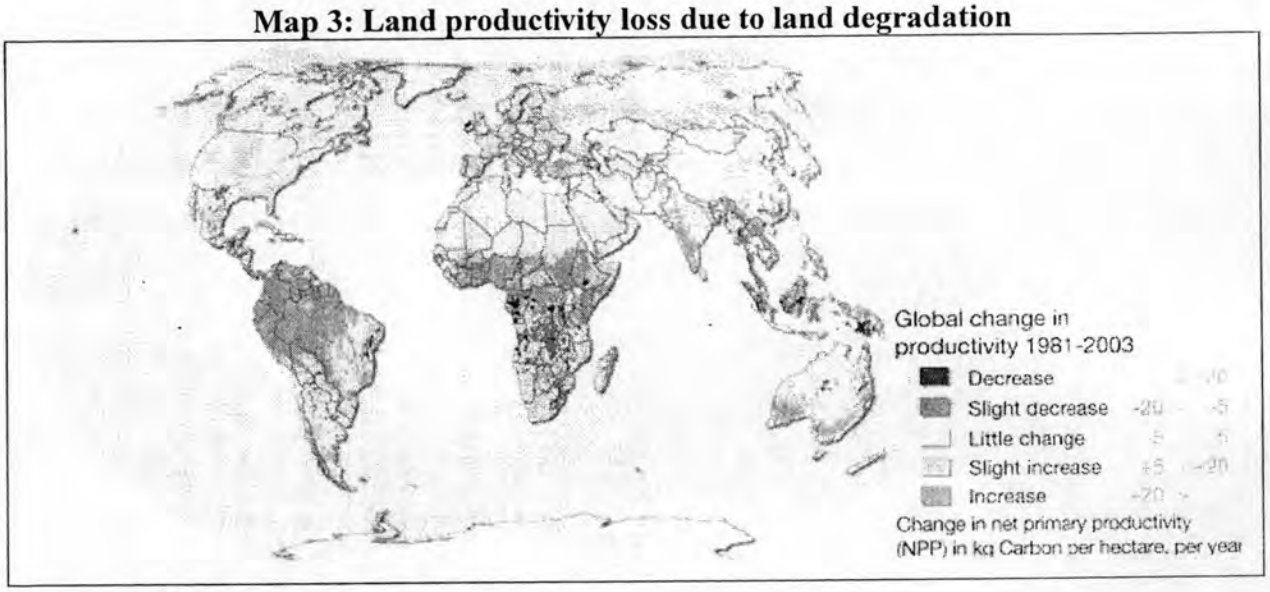
As outlined by Prasit Suebchana, Deputy Director-General of Thailand's Treasury Department, it is generally considered by Thai policymakers that land in the southern provinces has a high potential for growing oil palm trees, while sugarcane is suitable for the central plains given the availability of water and cassava in the northeastern provinces (Wichit 2009). Some degree of controversy exists, however, concerning who considers what can successfully be planted where. This is a striking point that was raised throughout the

[34] In 2007, the BAAC launched a campaign to encourage farmers to shift towards energy crops, such as sugarcane, cassava and oil palm. The Bank estimates that it has lent 10 billion Baht to date under the programme and loans have increased by about 10% per annum.

interviews and in the field visits. Which crops can successfully be cultivated where? Most local level informants in the Northeast, for example, consider that the soils in Isan are too sandy and there is insufficient water to sustain oil palm, rubber or sugarcane. As forests were cut down to make way for agricultural expansion over the past 50 years in Thailand, soil erosion has followed (Hirsch 1997; Rigg 2001). In Rangsit, the concern is salinity of the soil.

This is a concern worldwide. According to the United Nations Environment Programme (UNEP 2009), land productivity in some areas of the world has declined by as much as 50% due to soil erosion and desertification (see figure below). Thus, there is a need to rehabilitate degraded and salinated lands.

Map 3: Land productivity loss due to land degradation



Source: UNEP 2009 (from Bai et. al. 2008)

While Africa is estimated to be the continent experiencing the most severe impacts of land degradation, unsustainable agricultural practices may lead to increased salinisation of soil, nutrient depletion and erosion. UNEP estimates that there are 950 million hectares of salt-affected lands, which represents nearly 33% of the potentially arable land area of the world. Moreover, approximately 20% of irrigated land worldwide (450,000 km^2) is salt-affected, resulting in the loss of production from 2,500 - 5,000 km^2 every year as a result of salinity (UNEP 2009). Therefore, the impacts of land degradation due to salinsation and nutrient depletion on crop yields in Southeast Asia have significant economic consequences (ESCAP 2009).

Sustainable palm oil

Thailand is in the process of establishing its national interpretation for RSPO certification (**Appendix P**). Interviews were undertaken with informants during the Sustainable Palm Oil Certification workshop organised by the Office of Agricultural Economics, Ministry of Agriculture and the German Technical Cooperation (GTZ) in Bangkok on 2 June 2009.[35]

Eight principles have been developed by the Roundtable on Sustainable Palm Oil (RSPO) as a basis to assess sustainability in the palm oil industry. These principles are a main point of reference in the palm oil sector, serving as a template for efforts to establish sustainability guidelines in other sectors, such as soya and sugarcane. The RSPO principles and criteria are attractive because they allow for each country to elaborate on sustainability based on local conditions. The Secretariat of the Convention on Biological Diversity (CBD) has collated efforts in the international arena to develop sustainability guidelines for biofuels (**Appendix O**). Certification is one way forward suggested by interviewees to ensure the various aspects of sustainability.

Summary of the Rangsit-Saraburi case narrative

This case study illustrates a successful project to improve farmers' income, rehabilitate saline soils and contribute community crude palm oil to the national supply chain. The purchasing agreement between the Rangsit Oil Palm Cooperative and Bangchak Petroleum provides security for the Rangsit farmers and helps to ensure the supply of biodiesel to meet the national target. The case exhibits the need to intensify vertical integration of small-scale agroenergy production into the commercialised bioenergy supply chain.

[35] In December 2009, Unilever, the largest global palm oil consumer, ushered in a new approach in the industry when it suspended purchases with a key Indonesian supplier, Sinar Mas, based on environmental considerations. Sinar Mas has been accused of illegal deforestation and peatland clearance in Indonesia, which are practices that cause carbon dioxide emissions. Indonesia has the third largest emissions of greenhouse gases after China and the US. This voluntary suspension by Unilever will have important implications for the palm oil sector as a whole as the private sector positions itself for stricter measures in importing markets in OECD countries.

CASE NARRATIVE 2

Vanghinlad, Chumpae, Khon Kaen, Northeastern Thailand & Community Learning Center for Energy Sufficiency and Organic Agriculture, Si Prajam, Suphanburi

Background

Over the past decade, Sawaeng Ruaysoongnern, a professor in the Faculty of Agriculture at Khon Kaen University in Northeastern Thailand, has been working with mainly rice and cassava farmers at the local level to implement organic agriculture and energy self sufficiency. With funding from his university along with assistance from the local Tambon administration and the District Office of the Ministry of Agriculture, Sawaeng is helping to establish Community Learning Centers in the Northeast of Thailand. With support from the Ministry of Agriculture and the Bank of Agricultural Cooperatives, there are 136 Agricultural Learning Centers in Thailand.

Sawaeng is working at the local level in Chumpae District, Khon Kaen province with nearly 100 households from Vanghinlad Tambon who own on average 12 rai of land. The project is promoting organic agricultural practices and direct use of biodiesel from various locally produced oil nuts, including Jatropha (*Sabudam* in Thai). The aim is to increase energy sufficiency for farm vehicles and irrigation pumps, as well as reduce fertiliser and water use in the agricultural cycle of Vanghinlad farmers.

The farmers in Vanghinlad Tambon cultivate mainly paddy rice alongside increasing amounts of acreage for sugarcane. In February 2009, Sawaeng and Charan arranged for the Vanghinlad farmers to learn about biodiesel processing at Wat Sua, Si Prajan, Kanchanaburi. Through his center at the Tiger Temple compound on the outskirts of Souphanburi, Pra Tawee, a Buddhist monk for over a decade, is dedicated to providing more sustainable agricultural livelihood options for rural communities in Thailand. Pra Tawee has been pressing oil nuts for use in small engines for 30 years. Since 2001, he has been travelling the country talking to farmers about energy sufficiency.

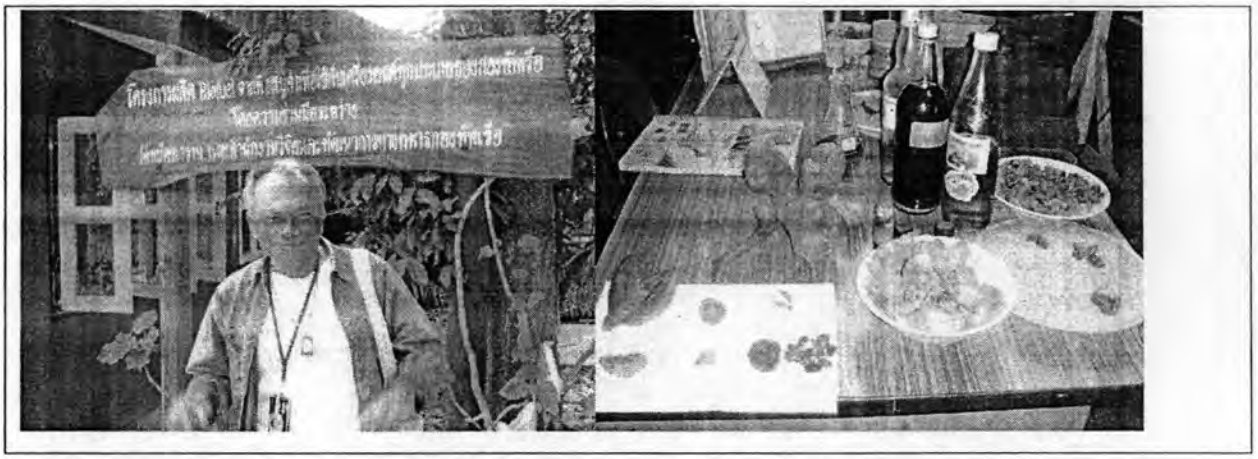


Photo 4: Sawaeng Ruaysoongnern, Learning Center for Energy Sufficiency, Si Prajam
Photo 5: Local oil nuts for direct press biodiesel prepared by Pra Tawee, Wat Sua, Learning Center for Energy Sufficiency, Si Prajam

Pra Tawee and Sawaeng Ruaysoongnern are developing a variety of local oil nuts to test for biodiesel use at the local level in order to increase alternatives for energy and food sufficiency. These are illustrated in the photo above.

- Samrong
- Ta bang bok
- Ka jib dang
- Payanarat
- Sarape nan
- Ta ku
- Photo 6: Sabudam (Jatropha)
- Ketchiak (Roselle)

Sufficiency Economy Community through biodiesel

Sawaeng Ruaysoongnern is arranging for the community to explore local options for energy sufficiency to support the Vanghinlad Community Enterprise Network. Similar networks exist throughout Thailand to develop a Jatropha and other local oil nut biodiesel production models. The project is comprised of three phases: (i) selection of Jatropha or other oil nut varieties and cultivation; (ii) teaching the biodiesel production techniques; and (ii) installation of machinery, such as hulling and processing machine presses and oil filters.

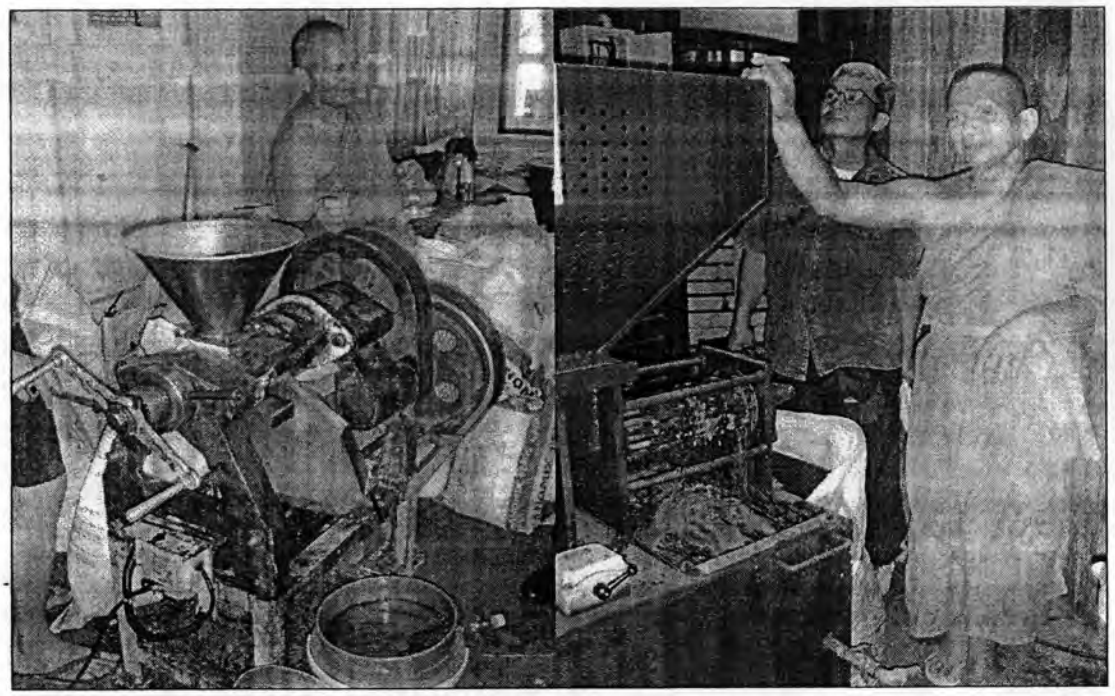


Photo 7: Pra Tawee, community biodiesel press, Learning Center for Energy Sufficiency
Photo 8: Pra Tawee demonstrates an oil nut press, Wat Sua, Si Prajam

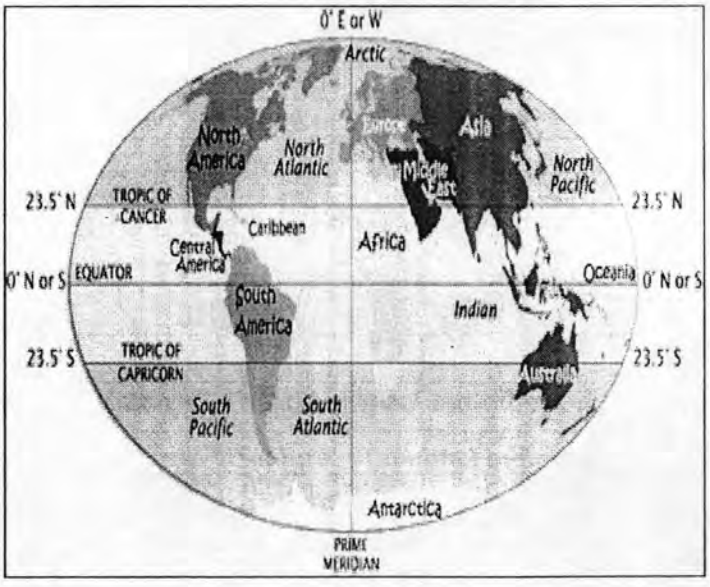
The project brings together Khon Kaen University, local and provincial government authorities and local farming communities. In the first phase, Sawaeng teaches the community about how to prepare the land and, in cooperation with Pra Tawee, assesses the best oil nut varieties (see photo above), and planting techniques. Following the harvesting of the oil seeds, the villagers are taught how to extract the oil from the seeds using hand-operated machine presses (some presses, one interviewee noted, were formerly used to squeeze coconut juice). The next step is to test the operation of agricultural machinery. During the second phase, Sawaeng and his team arrange for the installation of the necessary machinery – a husking machine, a screw press and a filter system. With the financial assistance of the Royal Thai Navy and the Department for Sufficiency Economy, the Si Prajam Energy Sufficiency Learning Center in Suphanburi operates as a central teaching facility for surrounding communities.

Box 2: Jatropha Curcas (*Sabudam* in Thai)

Originating in Mexico, *Jatropha Curcas* is a drought-resistant perennial crop that thrives in marginal soils and dry climates. It was brought to the Mekong by Portuguese traders in the 16th century. Today, it is commonly used as a living fence in the region to demarcate property and agricultural lands. It is considered to contribute to limiting soil erosion. It reaches maturity in 2 to 5 years, is productive for up to 40 years and yields seeds containing 30% oil. This oil is combustible as liquid fuel without additional refinement to power simple diesel engines (vehicles or electricity generators), as well as in cooking stoves and oil lamps (LIRE 2009). In case 5 of this research, KoLao in Lao PDR uses the residual Jatropha cakes as a fertiliser due to the high nitrogen, phosphorous and potassium content. Pra Tawee and Sawaeng Ruaysoongnern are implementing Sufficiency Economy projects throughout Thailand to use Jatropha and other oil nut residues in briquettes in cooking and heating at the local village level (case 2).

The Mekong region falls in what is referred to as the *oil seed belt*. As illustrated in the map below, the optimal cultivation areas for Jatropha and other oil seeds are greater than for oil palm, encompassing a beltway of 23.5 degrees on either side of the equator.

Map 4: Jatropha cultivation beltway



Thong Moh, Director of the Learning Center for Organic Agriculture, and Daycha, Director of the Kao Kuan Foundation in Souphanburi are also trying to engage Thai farmers in agricultural practices that are more environmentally resilient and less reliant on chemical

inputs (above photo). The purpose is to increase human health and ecological sustainability, while decreasing costs and building resilience in local communities (Interview with Thong 2009).

Photo 9: Thong Mo, organic agricultural expert and teacher, Supanburi
Photo 10: Pra Tawee with oil-nut biodiesel and biochar briquettes, Si Prajam

Are biofuels just another cash crop?

This case illustrates the benefits of promoting small-scale sustainable agriculture and community energy sufficiency. Bennett Haynes works with the Community Biodiesel Learning Center concept to train local farmers how to make biodiesel from recycled cooking oil through a simple process that produces an efficient, sustainable alternative for farmers' walking tractors (SFS 2009). Haynes notes that farmers throughout the Alternative Agriculture Network in Isan "are able to produce small amounts of biodiesel from used cooking oil and use it in their tractors" (correspondence 24 December 2009).

The Alternative Agriculture Network is a network of small-scale farmers in Northeastern Thailand composed of over 3,000 families, including farmers, activists and NGOs, that has worked for over 20 years to support:

> independent careers, self-reliance, creating power and control over production inputs, and access to resources. We work together on preserving and expanding local seeds for use in alternative agriculture. We create spaces in the market to promote safe food for urban consumers. We struggle

> against policies that are obstacles in the development of family and community self-reliance (for example, GMO technology and corporate-controlled contract farming systems) (AAN website 2010).

Reflecting on his work at the Surin Farmers Support until early 2009, Haynes wonders if:

> the government will ever genuinely support small-scale biodiesel production, given the lack of sustained support for alternative energy thus far. It seems the government is more interested in building dams and producing gasohol from cassava and sugarcane monocultures (correspondence 24 December 2009).

All the Vanghinlad farmer informants still mainly cultivate paddy rice. However, cassava, sugarcane, and even rubber and oil palm are increasing in the Northeast in response to rising prices for those crops. According to the discussions in the local community focus group, Vanghinlad farmers are attracted to the Community Biodiesel Learning Center for three basic reasons: to increase their earnings, lower input costs from fossil fuels and improve their health related to chemical use (Focus groups 21 January, 18 February 2009).

Farm-gate prices for rice in Thailand vary but are generally low. For example, in December 2009, the following represents the earnings profile of an Isan rice farmer: 400 kg of rice/rai at 15 Baht/kg for a farmer from cultivating 5 rai (around 1 ha) of land. The net earnings per crop would be approximately 30,000 Baht (US$ 1,800) (correspondence with Haynes 24 December 2009).

However, there is a considerable range for each variable of that equation. When the input costs for chemical fertiliser are factored in, the net earnings decrease significantly. For example, if a farmer uses only 2 bags per rai, which Bennett estimates is a relatively low amount, and each bag costs around 1,000 Baht (US$ 30) in 2009, then a 5 rai farmer is already spending 10,000 (US$ 300) just for fertiliser. Therefore, "the various input costs (e.g., seeds, fuel, pesticides, hired labour, fertilisers) will keep chipping away at the initial cash received," and for farmers who may already be heavily in debt, "they may not make any money at all after paying everyone off at the end of the season." The earnings, Bennett calculates, can even be as low as 4,000 Baht (US$ 121) per crop.

Prayong (77) recalls the introduction of chemicals on the farm of his father about 46 years ago. In the 1960s, chemical fertilisers and pesticides were first introduced in Northeastern Thailand with impressive gains in yields and reduction of pests.

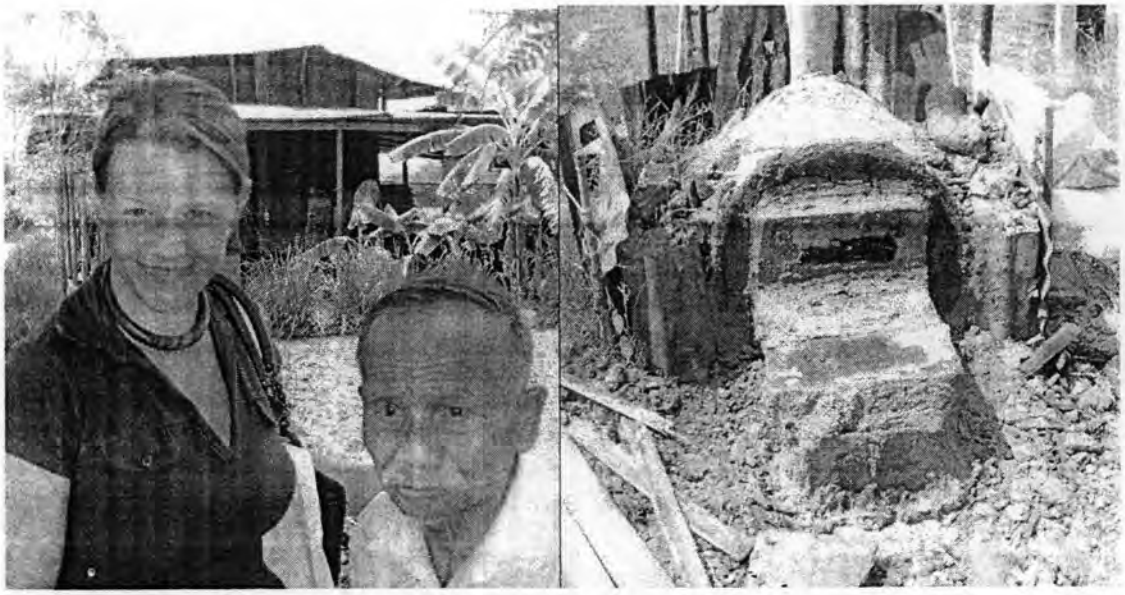


Photo 11: The author with Noy Putdawian, 78 year old Isan farmer from Baan Non Rean, Chumpae, northeastern Thailand
Photo 12: Earthen kiln used to heat the biochar briquettes, Energy Sufficiency Learning Center, Supanburi

Noting that his father did not own any land, Noy Putdawian says that over the past 30 years he has amassed 14 rai (2.2 ha) in Baan Non Rean, Chumpae, Isan, on which he plants rice and some corn. Khun Noy is amongst the busload of 30 farmers accompanying Sawaeng on the field trip to the Learning Center for Energy Sufficiency at Wat Sua in Si Prajam and the Learning Center for Organic Agriculture outside Suphanburi. Asked if he would consider shifting to another crop, Khun Noy responds he would "never" plant sugarcane or oil palm because they need too much water for the sandy soils of the Northeast (Interview 18 February 2009). Khun Noy says that Jatropha is good as a biofuel for use on the farm because it is already grown as fencing to separate plots of land or for medicinal uses. Khun Noy and his wife (75 years old) have seven children, four of whom are still on the farm. He says that he will divide his land amongst his children and their families, leaving two rai to each.

This is the story of rice farmers in Thailand told in volumes of analysis on the trajectory of agriculture. The Office of Agricultural Economics (OAE) estimates that in 2006 the farm sector declined to 40% of the population from around 50% a decade ago, accounting for about 24 million farmers. Last year this figure decreased to 23.8 million. If this trend continues, Apichart Jongskul, Secretary General of OAE estimates, about 37% of the population is likely to be engaged in farming by 2013 (Interview 2 June 2009).

Siriluck and Kammeier (2003) note that "it is difficult for the extension officers, especially those who work at the tambon level to encourage sustainable agriculture (such as the King's model of a self-sufficient rural economy), while at the same time promoting export-oriented production of cash crops."

At the same time as Thailand has been engaged in an intensive industrialisation process driven by export orientation, there remains an undercurrent of local dynamism. Some critics argue it was the result of neglect, not design or strength (Pasuk & Baker 1998; Molle & Thippawal 2003).

Sonboom (55 years) owns 20 rai of land in Vanghinlad on which he grows mainly sugarcane. He burns the sugarcane stalks at the end of the harvest period because he claims that it is good for the regrowth of poor, sandy soils characteristic of the Northeast. When asked about his chemical inputs, he says he uses a lot. He claims that if he uses less, the yield will decrease. However, he adds that he is willing to change his practices to use more organic fertilisers.

Photo 13: Local level policy coordination on biofuels, Vanghinlad, Khon Kaen, northeastern Thailand
Photo 14: Sawaeng Ruaysoongnern with Vanghinlad farmers at farmers' school to learn about sustainable farming practices

Policy coordination

During the field visit, four levels of administration are present to promote the Sufficiency Economy Centre: Pra Tawee (monk and teacher), Charon (District Agricultural Office, Ministry of Agriculture), Arun Potipatsa (Assembly of the Tambon) and Burin Sritrai (Member of Parliament), with teaching guidance from Sawaeng (Faculty of Agriculture, Khon Kaen University) (above photo). This is the type of community cooperation that is

found at the local level in Thailand. Interviewees note that this level of cooperation is lacking in neighbouring Lao PDR and Cambodia, and certainly in Myanmar. Only recently, for example, Lao Farmers Group Enterprises were formed to organise local farming communities (Laofab discussion 15 January 2010).

Summary of the Vanghinlad case narrative

This case offers insight into the current chemical intensive practices in the Northeast. It also illustrates the significant scope to use existing Learning Centers for organic agriculture and energy sufficiency to promote a shift to greater sustainability while increasing yields and farmers' incomes. There is a strong alternative movement in Thailand towards the Sufficiency Economy concept to promote sustainable agricultural practices and lessen smallholders reliance on expensive imports of chemical inputs in the agricultural sector. Integrated pest management can improve crop yields while bringing greater sustainability. Yet, it needs to be promoted. The current practice is to subsidise chemical fertilisers and pesticides. In order to build on the results in the field, there is a need to enhance the local voice in centralised decision making in policies and planning to diversify from rice to other crops such as palm oil.

CASE NARRATIVE 3

Community biodiesel plantations and crushing plant, Aoluk, Krabi, Southern Thailand

Background

Athiras and Witchuda Dumdee rented a booth to demonstrate their family biodiesel production and use at the World Alternative Energy Sciences Expo held in Bangkok in March 2009. Organised by the Ministry of Science and Technology, this international exposition served to highlight alternative energy initiatives in Thailand. The Dumdees own and operate Dumdee Biodiesel Company Limited, a small-scale palm oil production in Aoluk, Krabi, Southern Thailand. Dumdee Biodiesel, along with nearly 40 other local producers in the vicinity, sends its Fresh Fruit Bunches (FFB) of oil palm to the Krabi Oil Palm Farmers Cooperatives Federation (KOFCF) crushing plant in Aoluk for processing into crude palm oil.

Photo 15: Pra Sunee and Athiras Dumdee with Sawaeng Ruaysoongnern (Khon Khaen University) on the TV monitor teaching the sufficiency economy concept, World Alternative Energy Sciences Expo, Bangkok March 2009

From the perspective of Athiras Dumdee, palm oil is empowering change. Athiras estimates that he can produce 400 Liters per batch of crude palm oil B100 at the Aoluk Community Cooperative (Interview 11 April 2009).

Photo 16: Athiras Dumdee with biodiesel

Photo 17: Ohm Dumdee showcasing his innovations for oil palm

Question: How much chemical fertiliser and pesticide do you use on your plantation?

Response: Chemical fertilisers: 6 kgs/palm tree/year & 4-6 kgs of organic or compost fertiliser/tree/year. No pesticides are used.

Question: What is your yield/rai/day of palm oil?

Response: Since 2008, in the last two years, the average yield/rai/year has been 4,400 kgs; which represents an increase from the average yield/rai/year was 3,500 kgs in the initial years of production.

Question: What is the price you get per kg of Fresh Fruit Bunch (FFB)?

Response: 3-5 baht per kg of FFB.

Question: How many rai in total of oil palm trees do you own?

Response: 35 rai with approximately 22 trees per rai. On average each oil palm tree produces 15 FFBs per year, averaging 150 kgs per tree and producing 3,000 kgs/rai/year (see table 5.2 above on the average annual incomes for different crops).

Question: What other costs do you have to take into account in calculating your profits?

Answer: The main cost is chemical fertilisers. A bag of 50 kgs of fertiliser costs 1,300 Baht depending on the price of petroleum. That means 6 kgs/tree/yr @ 26 Baht/kg = 156 Baht/tree x 22 trees/rai = 3,432 Baht/rai of fertiliser/yr x 35 rai = 120,120 Baht/yr (US$ 3,600) on fertilisers.

Table 28: Small-scale oil palm cultivation, Dumdee Biodiesel Co., Ltd, Aoluk, Krabi

Factor of production	Costs per year
Chemical fertiliser	2,500 – 3,500 Baht/rai ($75-106)
Labour	1,000 Baht/rai ($30)
Transport	150 Baht/tonne ($4.50) (0.10 Baht/kg of FFB paid to the broker to transport to the crushing mill)

Source: Aoluk field visit on 11 April 2009 and follow-up correspondence on 12 August 2009

Athiras explains that he uses the TISI standard for virgin palm oil, for which there are 14 specifications. For the field visit, he arranged for the participation of local government officials and Suppachai Klungkaew, head of the Community Biodiesel Producer Network located in Korat, the Thai national network representing 120 producers. There are 500 community biodiesel producing centers in Thailand.

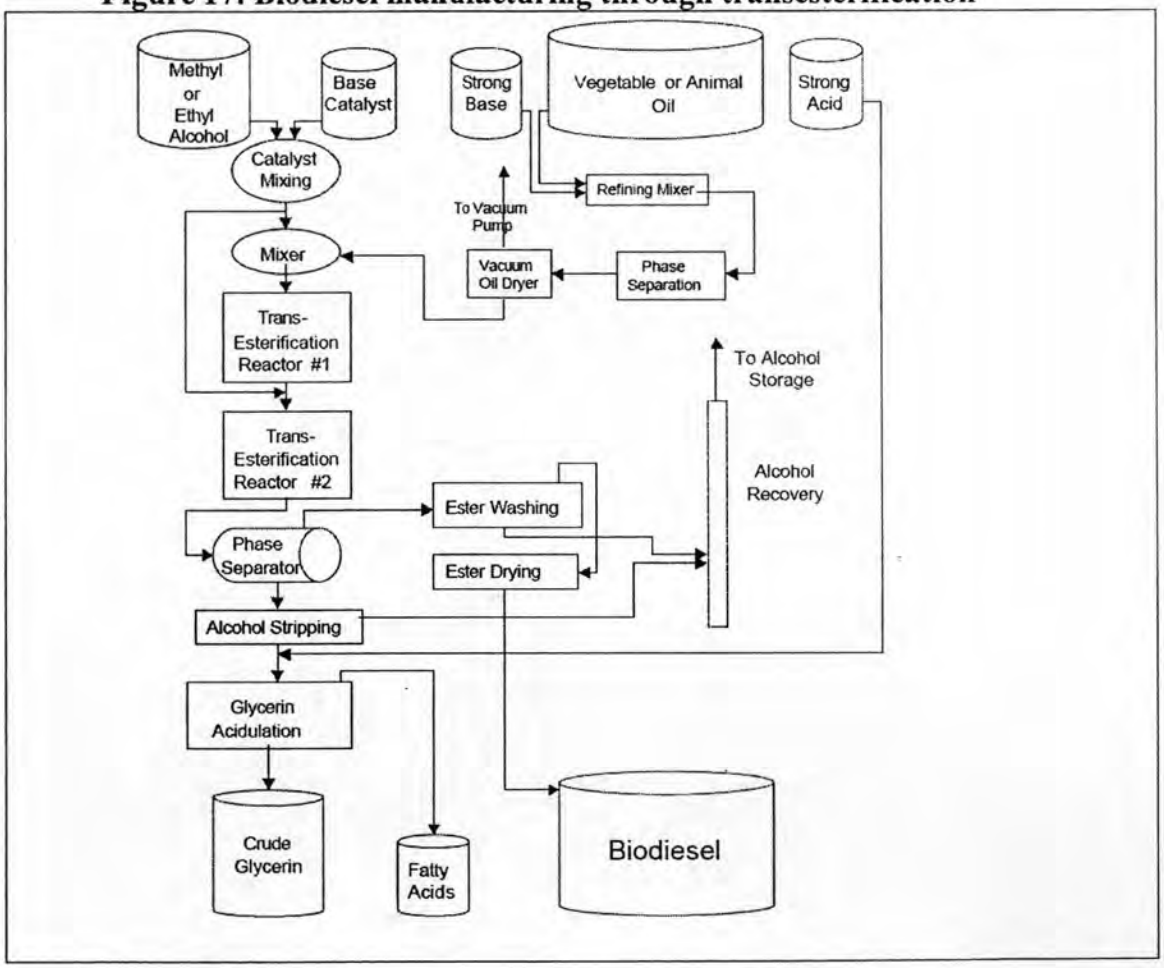
As the head of the Nakhon Si Thammarat provincial energy office, Uthai Bhuripongsadhon highlights the benefits of the surge in the demand for palm oil to meet the national blending mandate for biodiesel. He says that southern Thailand is transitioning from rubber to oil palm plantations, as was the case in Malaysia in the 1990s. The reasons are essentially two-fold. First, harvesting oil palm requires less workers and less skilled labour in comparison with rubber. Second, palm oil has more flexible uses in the food, feed and fuel supply chains. Irrespective of the fate of biodiesel, therefore, there will continue to be a solid demand for palm oil, Uthai suggests, for a variety of end uses. In this respect, Uthai observes, there has been greater downstream integration of palm oil in the Thai processing of food when compared with rubber integration in the automotive sector (see table 5.5). Many families, however, still have equal amounts of rubber and oil palm cultivated on their land in the south, he notes.

Chokchai Playdoung, the head of the first cooperative crushing plant in Thailand, explains the crushing process for pure biodiesel (B100) in the mill, which meets commercial standards as set by TISI for crude palm oil (figure below). The Krabi Oil Palm Farmers

Cooperative Federation (KOFCF) Limited was formed in 1997, with funding from the Office of Small and Medium Enterprise Promotion (OSMEP) and a loan of 270 million Baht from the Department of Cooperative Promotion, Ministry of Agriculture. It is the only cooperative of the 18 oil palm crushing mills in Krabi; the other 17 are privately owned. It began production in 2004 and, at the time of the field visit in April 2009, was crushing 1,000 tonnes of FFBs per day. It employs 130 workers. The cooperative crushing mill handles FFBs 10,000 smallholder families, covering 250,000 rais of land. The members of the Krabi Oil Palm Farmers Cooperation each own around 25 rai per household.

Athiras gets his oil palm seeds from a private oil palm nursery in Krabi that imports them from Costa Rica. Malaysian would be the closest and logical place from which to import these seeds, but its laws prohibit their export.

Figure 17: Biodiesel manufacturing through transesterification



Source: Shepley 2008

According to Chokchai, of the total crude palm oil (CPO) production at the Krabi cooperative, 95% is sold as an input to the food sector and 5% goes to the refinery in Samut Songran to be manufactured for commercial biodiesel (above figure). The base catalyst mixed with methyl alcohol is potassium hydroxide, which is imported from South Korea.

Noting the importance of domestic standards for biodiesel set out by the Ministry of Energy between commercial and community, Athiras says that the cost of certification is expensive. He quotes the price of 20,000 (US$ 600) to 50,000 Baht (US$ 1,500) to certify the quality of biodiesel. This underlines the importance of the cooperatives for smallholder palm oil production to gain certification jointly.

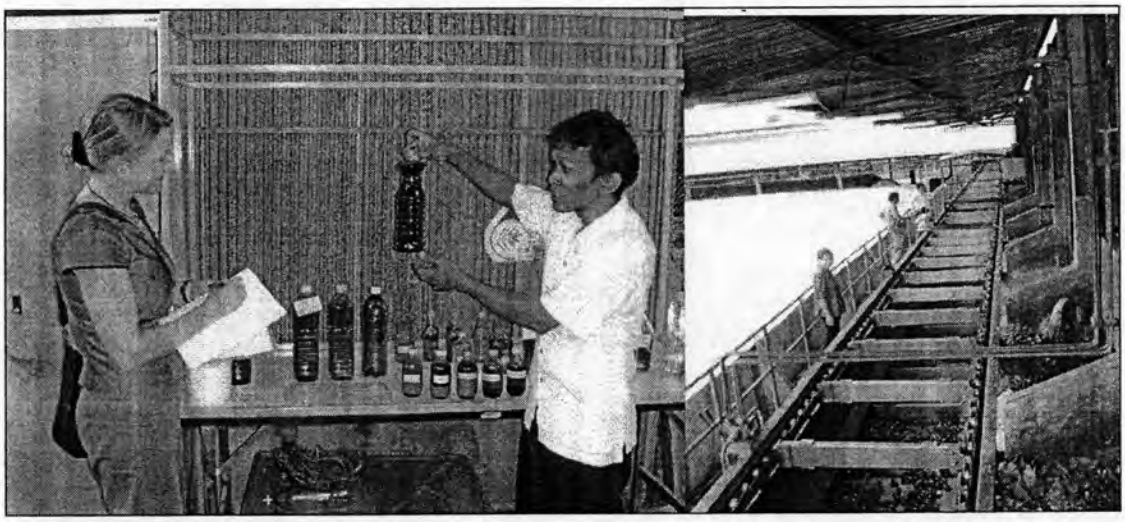


Photo 18: Athiras Dumdee explains his palm oil processing techniques to the author, Aoluk, Krabi, southern Thailand
Photo 19: Wichuda Dumdee at the Krabi Oil Palm Farmers Cooperatives Federation crushing plant, where she sends her Fresh Fruit Bunches to be processed into Crude Palm Oil

Explaining the need for plantations to be located within a 100 km radius of a crushing mill, Athiras emphasises that the price received for a Fresh Fruit Bunch at the mill depends on the quality or grade, which, in turn, is highly dependent on how quickly the palm oil is processed. Once the FFB is harvested, the farmer has only 72 hours to transport it to the mill to ensure the highest grade palm oil.

Table 29: Fresh Fruit Bunch utilisation, Krabi

Fresh Fruit Bunch (FFB) (and use)	Percentage of total
Discarded empty fruit bunch (used to grow straw mushrooms)	22%
Palm oil for food	18%
Fibre-fuel	14%
Shale (for biomass energy generation)	6%
Kernel	5%
Waste water	35%

Source: Interview with Chokchai, Krabi (11 April 2009)

The environmental considerations at the crushing mill are as follows. The mill uses 300 m^2 of water each day, which passes through a waste treatment process on the premises of the mill. A wastewater control report is sent to the Department of Industrial works at the Ministry of Industry each month. The shale from the final processing is sold for biomass fuel generation for electricity.

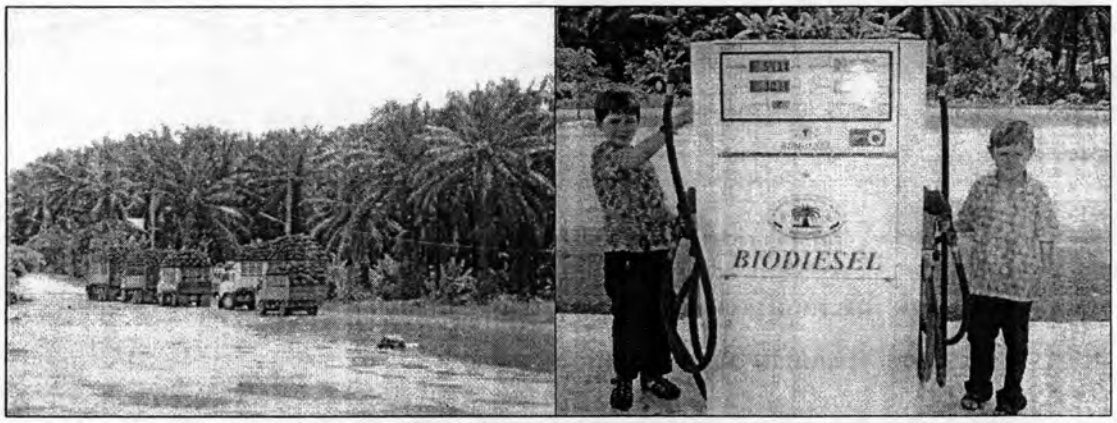


Photo 20: Trucks entering the Cooperative crushing mill with 30 tonnes of Fresh Fruit Bunches, Krabi
Photo 21: Benjamin and Gabriel Shaw Cannabrava pump community biodiesel

Oil palm plantations are mainly located in the South of Thailand where the water and climatic conditions are most suitable. Krabi, in addition to Surat Thani and Chumpon, are the provinces with the most extensive oil palm plantations.

Athiras Dumdee relies on rain and groundwater for his oil palms. There is no other irrigation system on his plantation. During the first three to four years after being planted,

Athiras says, oil palms require an average of about 300 litres of water per day. In conclusion, Athiras raised three aspects during the field trip to his plantations and the community oil palm crushing plant. First, there is scope to increase yields and decrease costs on the plantations. For example, GTZ is leading an effort in the Krabi area to work with cooperatives to achieve this objective. Second, there are efficiency gains to be captured in oil palm processing at the mill through cogeneration of by-products and wastewater into electricity to be used to operate the mill or sold to the grid. Third, the standard of community biodiesel is commensurate with the quality of the Fresh Fruit Bunches from individual producers in the cooperative. In this respect, there is room to improve the management of the process to enable increasing predictability to meet the current standards (Athiras Interview 11 April 2009).

Photo 22: Intercropping of oil palm and rubber is not recommended by the Office of the Rubber Replanting Aid Fund (ORRAF), Krabi, southern Thailand (ORRAF field trip, June 2009)[36]

From rubber to oil palm in the South

The rise of the palm oil narrative in the South is interlinked with the shift of rubber to the North and Northeast argues Banterng Thungin, an officer at the Phuket branch of the Office of the Rubber Replanting Aid Fund (ORRAF). Originally from Yala in Southern

[36] Athiras Dumdee clarifies that intercropping does not work because there would be insufficient sunlight for the rubber tree. Oil palm can be intercropped in for first three years with small and short life crops, such as soybean, peanut, lemon grass, vegetables or pineapple (correspondence 21 January 2010).

Thailand, he has worked all over Thailand because of the ORRAF policy to rotate officers every four years. His last posts were in the Ubon and then Loei ORRAF offices in the Northeast. Banterng tells the story of the phasing out of rubber in Southern Thailand over the past few decades to make way mainly for tourism but also for oil palm (Interview 9 June 2009). There is a labour shortage and the mainly illegal Myanmar workers do not have sufficient rubber tapping skills, Boonsong Thavorn, a fourth generation rubber tapper in Phang Nga argues.

With higher prices for rubber and ORRAF support, the rubber tappers have gone back to their native Isan in Northeastern Thailand to shift their lands from cassava or rice to rubber. Noting that this switch has resulted in a three-fold increase in income for those farmers in Isan, Banterng says that "owning rubber trees is like having an ATM machine in your backyard – if you need cash you can just go out and tap into a source of funds." With other crops, he explains, you have to wait to harvest the crop and that only happens once or twice a year. Good tapping techniques translate into higher yields and allow the tree to reach a maturity of 25-30 years, explains Sorayuth Samutrsaran, a tapper trainer for over 30 years associated with the Pa Klog Rubber Cooperative in Phuket. Sorayuth explains good rubber tapping techniques: (1) use a sharp knife; make a single 1.7 cm slice into the bark (not too deep into the tree); (2) use the proper wrist movement; and (3) cut every other day on the same side or every day another cut. The Pa Klog Coop includes 600 families or approximately 1,000 farmers.

In this way, there is a resonance between the practical experience of the cassava turned rubber farmer in Isan as described through the voice of a local expert from ORRAF and the Ministry of Agriculture's plans to expand rubber cultivation in the Northeast by 1 million rai by 2011. In contrast, the farmers interviewed in the first case narrative from Khon Kaen indicated that both soil quality and water quantity were likely to prove to be insufficient for either rubber or oil palm in their region.

ORRAF celebrates its golden jubilee in 2010 (2553) commemorating fifty years of coordinated rubber policy and planning that led to Thailand capturing 40% of the global rubber market.[37] Nopadol Suanprasert, ORRAF Director General during the height of rubber prices in the 1990s, emphasises the strong rubber culture in the organisation, with strong

[37] See www.rubber.co.th.

human ties with national rubber networks including government officials from the local to the national level, research institutes, cooperatives and the private sector. As a key state trading enterprise in Thailand, ORRAF has created a network of officers with a national breadth of experience (Interview Nopadol 10 June 2009).

Apichart Jonskul, Secretary General of the Office of Agricultural Economics, Ministry of Agriculture, puts forward the vision of Thailand as the bioenergy hub of the Mekong, centralising the processing of agroenergy crops from the region for domestic consumption. To this end, Apichart is a proponent of creating a state enterprise for bioenergy similar to ORRAF for rubber to order to provide sufficient institutional support (Interview 13 January 2009).

The comparison between rubber and oil palm often emerged during the informant interviews and focus group discussions. The main points of comparison raised are outlined in the table below. In this respect, four general points can be drawn from the interviews. First, government support for rubber in Thailand is considered to be a leading example of how to do things correctly interviewees repeatedly emphasised. There needs to be a way to support the income of farmers until the tree is mature. This means that the government, in fact, is being called upon to make choices in which crop is planted by farmers and in which regions. Second, labour shortage was a concern in all the field interviews undertaken in virtually all regions in Thailand. Yet, migration from neighbouring regions was not seen as a medium term solution. Three, assessment of land, water and soil conditions for a given crop varied from government ministries in Bangkok to the field. The question of whether there is sufficient water availability and soil quality, for example, to plant rubber or oil palm in the Northeast has yet to be determined. Fourth, there should be greater vertical integration of agricultural production in creating value added in domestic or regional industries. For example, latex rubber into the automotive sector or oil palm in the food, fuel and automotive sectors.

If farmers prefer rubber, Samai Jai-In suggests, it may be because there is more experience with and support for that sector in Thailand in comparison with oil palm (Correspondence 15 January 2010).

Table 30: Comparison of rubber and oil palm in Thailand

Elements of comparison	Rubber	Oil palm
National target	⊮ 1 million rai expansion ⊮ Increase integration of rubber in domestic manufacturing from 10 to 20% by 2011 to add value to the sector ⊮ Currently has 40% share of global rubber market	⊮ 4 million rai expansion ⊮ 1 million rai expansion in the Mekong region ⊮ Currently is third main CPO producer after Malaysia and Indonesia
Institutional and financial support	⊮ Office of the Rubber Replanting Aid Fund (ORRAF) assistance and funding started 50 years ago (funded by export tax on rubber) ⊮ Support for cooperatives ⊮ Extension services ⊮ Training of rubber tappers in ORRAF (Krabi, Phuket, Surat Thani & Loei)	⊮ Ministry of Agriculture direction ⊮ Fresh fruit bunch (FFB) price support guarantee ⊮ Cooperatives ⊮ No extension services ⊮ Demonstration projects and Field Crop Research Centers (Nong Kai, Surat Thani)
Primary purpose	⊮ Export raw rubber ⊮ Use in automotive sector (tyres, trims) ⊮ Pararubber for furniture sector	⊮ Multiple uses (food, feed, fuel) ⊮ oil import substitution for domestic consumption to meet biodiesel B2 blending targets
Price sharing arrangement	⊮ 60/40 split between tapper/owner	⊮ Worker – 0.50 st/kg ⊮ Owner – 3.5 Bt/kg
Export-Import measures	⊮ Tax on rubber exports to contribute to the ORRAF fund	⊮ Restrictions on imports of crude palm oil
Land requirements	⊮ Can grow on slopes ⊮ Soil depth – 3 m	⊮ Cannot grow on slopes ⊮ Soil depth – 0.5 m ⊮ Can grow in saline and water logged soils
Maturation period	⊮ First tapping after 5-7 years	⊮ First harvest in 3 years
Intercropping potential	⊮ Intercrop with pineapple, cassava for initial 5-7 years	⊮ Intercrop with cassava initial 2-3 years
Water inputs	⊮ Requires a minimum rainfall of 1,500 mm/year ⊮ No irrigation required ⊮ Processing – 1 L/100 rubber sheets (each sheet 1 Kg)	⊮ Requires minimum rainfall of 2,000 mm/year ⊮ Requires an average of 300 litres/day for initial 3-4 years
Chemical inputs	⊮ Marginal pesticides/fertilisers during initial 2 years	⊮ Marginal pesticides/fertilisers during initial 2 years
Labour	⊮ Requires skilled & intensive labour ⊮ Bring workers home to North & Northeast to expand rubber plantations	⊮ Does not require much nor skilled labour ⊮ Use degraded lands (former fruit orchards) in Central Thailand

Lifespan of the tree	⊮ 20-25 years, with value from pararubber wood	⊮ 14-16 years
Processing inputs & requirements	⊮ Water to wash rubber latex ⊮ Formic acid (mainly imported from Germany) ⊮ Thai Rubber Standard	⊮ Water for boiler steam to sterilise FFB ⊮ Need to be within 100 kms of mill ⊮ Thai community & commercial biodiesel standards
Value addition	⊮ 90% of raw rubber sheets exported (50% of total sectoral revenue), mainly to Malaysia (which processes for export mainly to China) (Malaysian Rubber Board 2009) ⊮ 10% used domestically in manufacturing (50% of total sectoral revenue) ***GOAL – expand to 20% by 2011***	⊮ Substitute for costly and fluctuating petroleum imports
percentage of cost of feedstock in finished product	⊮ 70%	⊮ 50%

Source: Compiled based on field visits and interviews with Athiras Dumdee (palm oil entrepreneur, Aoluk, Krabi); ORAFF field officers and rubber tapper trainers in Phuket and Krabi; Samai Jai-In (energy expert, Royal Thai Navy & Saraburi biodiesel demonstration project); Nopadol Suanprasert (former ORAFF Director General)

Water management

We put the community at the center of change to build up awareness about water use.

Somkhit Singsong, Houy Sam Mo River Sub-Basin, Upper Chi River

Regional Symposium on Lessons from River Basin Committees, Bangkok, March 2009

Water and its management and scarcity are essential elements of the future of agroenergy in Thailand and the Mekong region. Water is a key factor affecting agricultural yield and output. ESCAP (2009) estimates that agriculture accounts for 79% of the total water withdrawals in the Asia-Pacific region. In the case of sugarcane, for example, most production is located in rain-fed areas, with 10% in irrigated zones. Increasing the efficiency of water use to avoid shortages needs to be supported by proper pricing of water to reflect its scarcity.

The importance of agriculture was recognised in Thailand's economic stimulus package in 2009, which will support agricultural infrastructure development, for example to improve irrigation systems. Commenting on the agricultural outlook at the turn of the century, Nipon Poapongsakorn, head of the Thailand Development Research Institute and former Dean

of the Economics Faculty of Thammasat University, identifies scarcity of water and pesticide use as major factors that are jeopardising Thailand's comparative advantage.

Nipon notes that "there is no lack of water policies in Thailand," with 20 water-related laws, administered by over 30 departments in (Mingsarn 1997; Fahn 2003). The common feature between these policies, he adds, is that they deal with the provision of water as opposed to its allocation. As with water, pesticide policies have acted to discourage sustainability. To manage pesticide use, Nipon calls for an excise tax, financial incentive for famers to adopt integrated pest management (IPM) and, importantly, consolidation of existing policies that work at cross purposes.[38]

Lack of coordination and overlapping roles, Blake and Rattaphon (2006) note, led to "abandoned water infrastructure commonly seen in villages across northeast Thailand." With the creation of the Ministry of Natural Resources and Environment in 2002, responsibility for water resources planning, management and conservation was transferred to the Department of Water Resources. This Department developed a National Water Policy using an Integrated Water Resources Management approach, according to which Thailand is divided into 25 sub-areas based on basin catchments (like the River Chee or River Mun basins) or less well defined smaller river basins (Blake & Rattaphon 2006).

In early 2010, Thailand considered banning off-season rice farming due to concerns over "a looming water crisis" (Bangkok Post 18 January 2010). Intensified agricultural practices are also depleting the fertility of the soil as the land continuously cultivated with second and third crops. Experts consider that water levels have fallen in the Chao Phraya River basin due to rising demand for water following the increase in rice planting as a result of higher prices.

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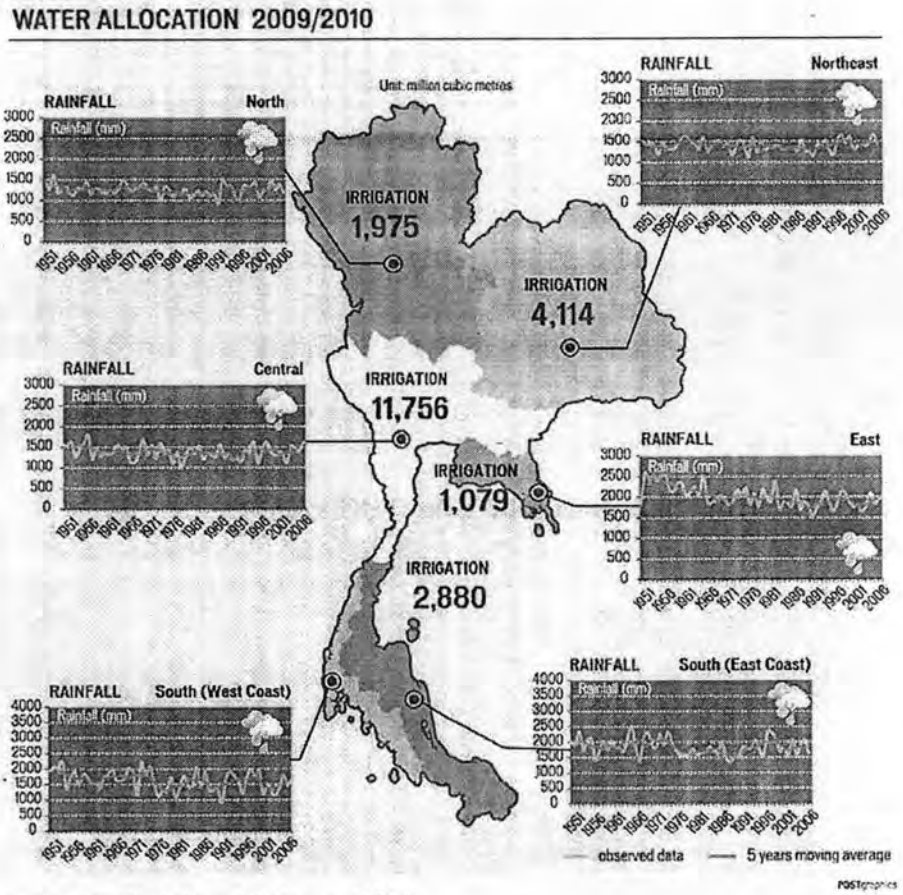
[38] Nipon notes that due to lack of legal enforcement, "Thailand has become an international dumping ground for highly hazardous pesticides."

Figure 18: Water allocation 2009-2010



Source: Bangkok Post 18 January 2010

Life cycle assessment

The current emphasis in Thailand has been to further life cycle analysis and sustainability assessments of biofuel systems (Nguyen, Gheewala & Garivait 2007, 2008). To date, evidence in Thailand indicates that there are opportunities to adapt new technologies to increase energy efficiency in biofuel conversion and through the use of agricultural excess residues.

To illustrate the variations in the results of sustainability assessments, depending on the perspective, consider the following. Recognising that its ambitious 5.75% target for biofuels in the transport sector by 2010 will require considerable imports, the EU Sustainability Directive stipulates that this target must be met with biofuels that fulfill sustainability criteria (EC 2009). To meet the EU criterion to achieve greenhouse gas emissions savings of 35%, a recent study examines the greenhouse emissions savings of

indigenous Irish rape seed and imported Thai palm oil (Thamsiriroj and Murphy 2009). Given that palm oil generates more biodiesel per hectare than rape seed and has less demand for fertiliser and fuel inputs, greenhouse gas reductions of 29% and 55% were calculated for Irish rape seed and Thai palm oil systems respectively. In other words, it appears to be more climate friendly for Ireland to meet the EU biofuel targets by importing Thai palm oil.

Summary of the Aoluk case narrative

This case exemplifies the progress towards integrating small-scale oil palm production through community cooperatives in the national supply chain for biodiesel. There has been a significant shift to capture efficiency gains in oil palm processing at the mill through cogeneration of by-products and wastewater into electricity. This allows the plant to be self-generating and provides additional income by feeding in the surplus into the national electricity grid. Palm oil mills have increased efficiency in two ways: (i) water use through better integration of waste water to generate electricity; and (ii) agricultural residue use through cogeneration of energy to run the plant and feed into the grid. In order to ensure uniformity of quality of Fresh Fruit Bunches from individual smallholder producers in the cooperative, the creation of a bioenergy research institute similar to the Thai Rubber Research Institute (TRRI) and the Office of the Rubber Replanting Aid Fund (ORRAF) would enable quality control and monitoring, as well as provide financial support and training.

Photo 23 and Photo 24: Field research at the Krabi Oil Palm Farmers Cooperatives Federation crushing plant, Krabi, southern Thailand, April 2009

PART TWO: Investing in bioenergy in the Mekong region

Knowledge is kept like a sword – only drawn when it has to be used.
Samai Jai-In, alternative energy expert, Royal Thai Navy, 15 May 2009

The first set of case studies examined local biodiesel initiatives. Issues related to the agro-industrial process of ethanol and biodiesel production and use are raised in this second set of case narratives. Field work for the next three case studies was conducted in: (4) Khon Kaen, Northeastern Thailand; (5) Pakse, Champassak and Vientiane, Lao PDR; and (6) Mandalay and Taunggi, Shan State, Myanmar.

Three core concerns related to the three pillars of sustainable development have been woven into the discussion of each case. First, and foremost, the analysis raises issues concerning the *economic* viability of developing biofuels on a commercial scale in Thailand, particularly for ethanol. Second, reference is made to the *environmental* factors of land, water and forestry issues in the context of biofuels development. These issues have played a dominant role in activating social movements and changing social relations in Thailand since at least the 1990s. Third, aspects of the *social* implications of the commercialisation of agroenergy crops are discussed. This includes, for example, the implications of labour migration in the region to harvest agroenergy crops and the potential impacts, in turn, on local communities.

The quote above from Samai Jai-In refers to a feudal society concept concerning knowledge, according to which knowledge is held tight like a weapon and not shared. This is the analogy Samai offers to explain the room for improvement in transferring Thai concepts and practices both within Thailand and to neighbouring Mekong countries (correspondence February 2010). Notwithstanding Thailand's progress towards providing technical assistance to implement the sufficiency economy community model, interviewees refer to the general reluctance in the Mekong to share knowledge and act in the interest of the common good – the example often cited is the lack of effective cooperation between the riparian states for the shared water resources of the Mekong river (Interview Bird 2 February 2009).

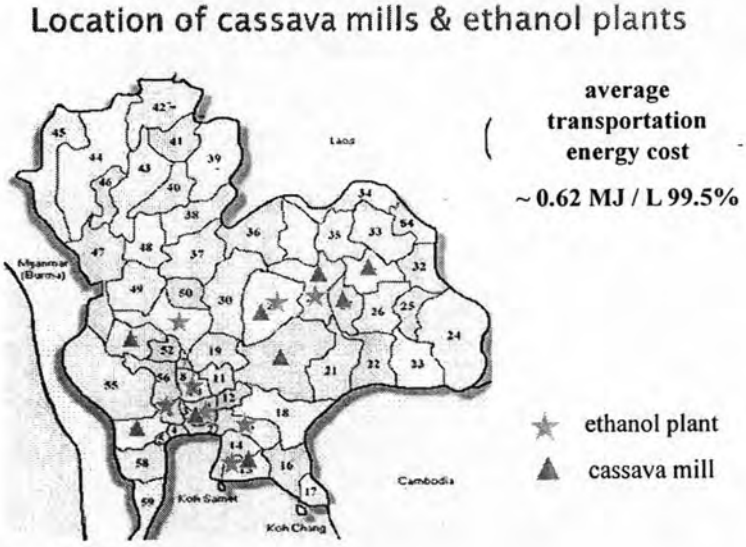
CASE NARRATIVE 4

Commercial ethanol in Khon Kaen, Northeastern Thailand

Background

There are 48 ethanol plants licensed in Thailand, of which 12 are currently operating (DEDE 2010) (Figure below). The Nguyen-Thai ethanol plant outside Khon Kaen is the only one currently operating for both cassava and sugarcane feedstocks to produce ethanol.

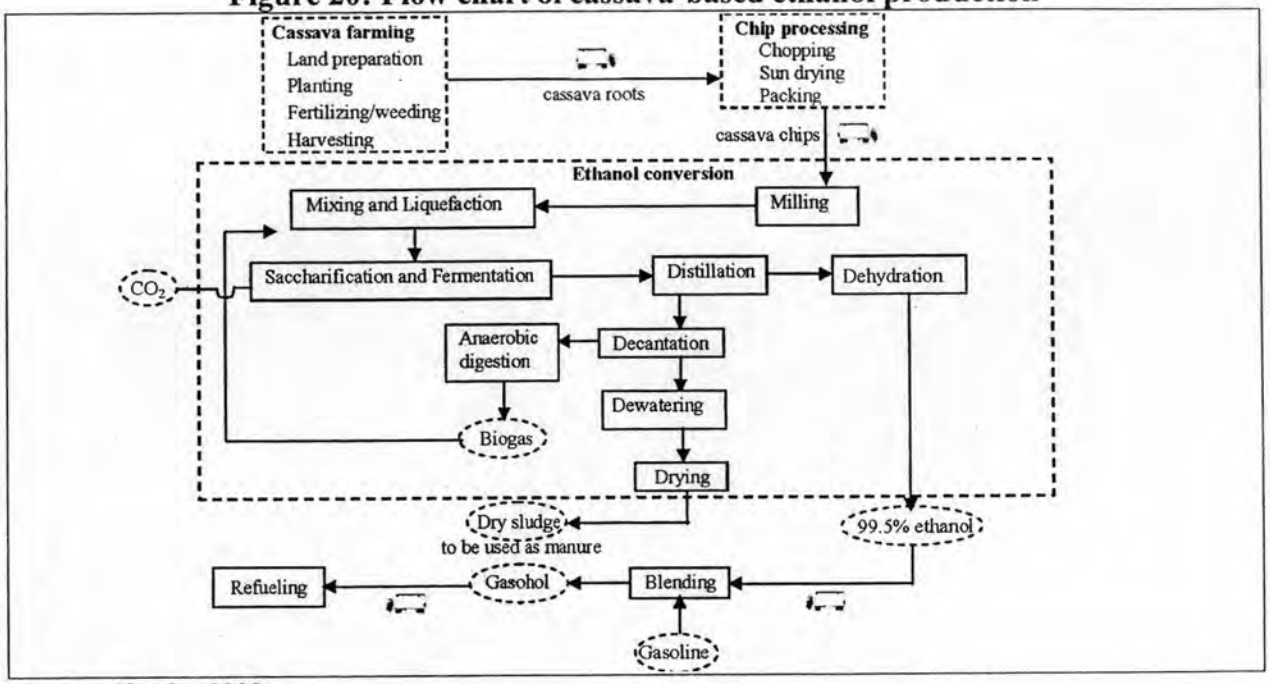
Figure 19: Location of cassava mills and ethanol plants



Source: DEDE 2009

In response to the question of how cassava can be more competitive as an agroenergy feedstock, interviewees noted the need to: (i) increase yields; and (ii) reduce feedstock production costs. This can be accomplished by breeding new varieties of more efficient strains and decreasing the costs of processing costs by reducing energy consumption. The majority of cassava factories have anaerobic digesters to convert wastewater into biogas to generate electricity to run the factory or to feed into the power grid. The figure below charts the production process of cassava-based ethanol.

Figure 20: Flow chart of cassava-based ethanol production



Source: Shepley 2008

Klanarong Sriroth, a cassava expert at Kasetsart University's Agricultural and Agro-industrial Product Improvement Institute, is working to improve cassava yields. This will in turn contribute to making tapioca-based ethanol more economically viable in Thailand (Interview 24 February 2009).

As noted above, the strategy at the World Tapioca Conference in January 2009 was to highlight Thailand's competitive advantage in cassava, including as a potential agroenergy feedstock. Notably, the tapioca conference was organised by the Ministry of Agriculture and the World Alternative Energy Sciences Expo was organised by the Ministry of Energy, without much mutual participation. This observation confirms the results of the survey according to which the vast majority (97.9%) of respondents considered coordination could be improved between the various ministries involved in bioenergy development.

The International Energy Agency estimates the following average yields for ethanol crops in leading ethanol producing countries in table 5.3 and biodiesel crops in table 5.4.

Table 31: Comparison of the ethanol yield for various agroenergy crops

Country and agroenergy crop	Average yield of ethanol (litres per hectare)
Brazil – sugarcane	8,000
United States – beets	5,200

Thailand – sugarcane	***5,200***
India – sugarcane	5,100
United States – corn	3,000
Thailand – cassava	***3,000***
European Union – wheat	2,300

Source: IEA 2008

Table 32: Comparison of the biodiesel yield in Thailand

Thailand	Average yield of biodiesel (litres per hectare)
Palm oil	5,000
Coconut	2,260
Jatropha	1,590

Source: IEA 2008

In terms of land availability for agroenergy crop cultivation, Samai along with many other interviewees, emphasise that "Thailand should not plan on getting rich from exporting rice." There needs to be a concerted shift to alternative in the agricultural sector. First and foremost, it is difficult to add value to rice, an observation made by several interviewees. Therefore, the plan is to diversify the second rice crop annually to an agroenergy crop, or alternatively to encourage more intercropping. For example, at least in the initial three years, oil palms can be intercropped with cassava. In 2008, Thailand's agricultural crop acreage was the following:

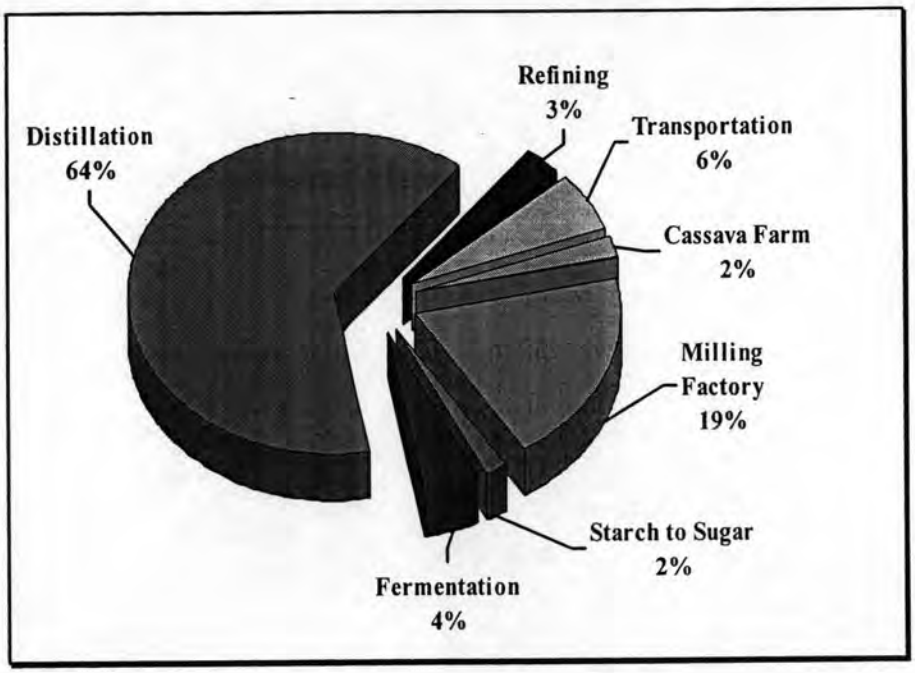
- 20.8 Million hectares cultivated
    - 9.2 Million hectares of rice (1.6 M/ha second crop)
    - 1.8 Million hectares of rubber
    - 1.2 Million hectares of cassava
    - 1 Million hectares of sugarcane
    - 1 Million hectares of maize
    - 0.4 Million hectares of oil palm

Research is underway to manage land to support the diversification to agroenergy crops as well as to improve the efficiency of turning agricultural waste residues from the production process of the major crops into energy (e.g., biogas). In this respect, many

interviewees noted the stimulus provided by the Clean Development Mechanism to increase efficiency in commercialised agricultural processing.

Since 2001, when Thailand embarked on a more rigorous promotion and use of ethanol, researchers have started to collect data on the costs and benefits associated with bioenergy production and use. Most studies have calculated a net energy gain from the ethanol production process (Nguyen, Gheewala & Garivait 2007, 2008; JGSEE 2009).

Figure 21: Energy costs from ethanol processing



Source: KMUTT 2009

4

Whilst feedstock prices are the main input cost in ethanol production, distillation accounts for 64% of the energy costs associated with ethanol processing. This is an area in which efficiency gains can be captured, Professor Gheewala explains. Various technical studies are examining other areas of comparison between biofuels and gasoline. For example, a recent study provides a preliminary comparison of gasohol versus gasoline emissions in the Bangkok area (KMUTT 2009).

Estimates show that over half of the cost of ethanol production is from the feedstock price (Nguyen, Gheewala & Garivait 2007, 2008; Shepley 2008). In order to increase the competitiveness of ethanol in comparison with gasoline, interviewees noted Thailand's ongoing efforts to focus on a combination of increasing crop yields and decreasing chemical

inputs in the crop production process.

There are also efficiency gains to be captured in the ethanol sector. Ugrit Asadatorn, Managing Director of Thai Roong Ruang Energy, Vice-president of Thai Ethanol Manufacturers Association and Director of The Office of Cane and Sugar Board, is well placed to tell the story of efficiency in Thai agricultural processing over the past few years. Thai Roong Ruang Energy began to develop Thailand's first cellulose-based ethanol plant in Saraburi in July 2008. The company has a licence to produce 400,000 litres of ethanol a year, including from the molasses by-product, bagasse. Bagasse can also be made from wood chips, maize leaves and stalks and rice husks and straw. Over half of the funding for the one billion Baht plant came from the Japanese New Energy and Industrial Technology Development Organisation (NEITDO), including Japanese technology. The production of 10,000 litres of bagasse-based ethanol a day requires 130 tonnes of feedstocks and the molasses-based production requires 400 tonnes of raw materials to make 110,000 litres. Thai Roong Ruang Energy was also building a biogas power plant to be powered by the waste water from its sugar and ethanol plants to achieve greater cost savings (Bangkok Post 20 June 2008).

Sourcing feedstocks in the Mekong: crop pledging programmes

Thailand, along with China and Vietnam, dominate the regional resource politics and are actively investing in agroenergy in their own and neighbouring Mekong countries (Lao PDR, Cambodia and Myanmar). The bioenergy narrative is further encouraged by the potential contribution to mitigating greenhouse gas emissions. Whether the rapid increase in agroenergy plantations justifies these aspirations needs to be carefully monitored. There is increasing awareness of the socio-ecological implications of land concessions, large monocrop plantations and contract farming in the absence of a regional intergovernmental body to establish and enforce certain minimum standards and norms.

While the role of agriculture may need to be re-evaluated to increase domestic value-added, many interviewees referred to the risk of an emerging unsustainable agroenergy model in the Mekong. This is a model whereby Thailand, for example, externalises the socio-ecological costs of biofuels by sources the feedstocks from neighbouring Mekong agricultural lands. Alternatively, it is a model in which Thailand's domestic agricultural policies cause production distortions in neighbouring countries. This model is illustrated in the *Great Gamble* scenario that is put forward as a policy option in the next chapter.

Two examples are illustrative of the consequences of Thailand's domestic agricultural support policies on neighbouring Mekong countries and the contrast of these policies with the government incentives in the context of ACMECS regional cooperation. Thailand has provided support to certain agricultural sectors through price-pledging schemes, whereby the government agrees to buy products at a price above the market price. As has been the case in many other countries seeking to protect certain sectors of the economy from cyclical demand swings, stockpiling commodities is considered by some experts to be inefficient (correspondence Dubbledam 12-14 December 2009).

Thailand's sugar price supports: In March 2006, the Thai Government increased domestic sugar prices by 3 Baht/kg to cover the gap between domestic prices and export prices. The new prices were still below the world market price by around 2-3 Baht/kg. The result was that sugar was aggressively smuggled into neighbouring countries for sale at higher market prices. Since 2000, the Cane and Sugar Fund has accumulated a sizeable debt to the Bank for Agriculture and Agricultural Cooperatives of 20 billion Baht (US$475 million) from the price support program when market prices were lower than the minimum guaranteed sugarcane prices. The burden is on the Thai consumers who have to pay more for sugar.

Thailand's price intervention for corn: In October 2008, Thailand banned imports of corn from neighbouring countries to protect domestic producers. The commercial attaché to the Thai Embassy in Lao PDR, Mr. Chalaemphon Pongchabubnapa, acknowledged "the adverse affect the ban is having on Lao farmers" (Vientiane Times 7 Jan 2009). Lao PDR exports about 200,000 tonnes of corn annually to Thailand. Hundreds of farmers in Xayaboury province and other border regions rely on income from corn sales to Thailand and many farmers switched to corn under contract with Thai investors. Following a decrease in the market price of corn from 8 to 3.7 Baht in October 2008, Thai farmers put pressure on the Government to establish a minimum price for the crop to stabilise incomes.

In January 2009, the Thai Commerce Ministry announced it would increase the volume of corn under its pledging programme to guarantee the price of one million tonnes of corn. In the words of one Thai corn feed mill producer, is it efficient to increase the domestic subsidy volume despite oversupply from neighbouring countries? The cost of protecting domestic corn production is high for Thailand. It is estimated that supporting the price of 750,000 tonnes of corn requires a budget of 6.37 billion Baht. If the subsidy is extended to a

million tonnes of corn, this would require another 2.12 billion Baht (The Nation 20 January 2009).

This example illustrates how Thailand in practice deals with neighbouring countries to protect its domestic producers. Moreover, Thailand's import ban goes against the commitment by ASEAN members to create an ASEAN free trade area by 2015 and to extend preferences to newer members, such as Lao PDR.

The difficulty of preventing imports of agricultural products (e.g., corn, cassava, rice) from Burma, Lao PDR and Cambodia has become increasingly clear over the course of 2009. The Thai price intervention programme makes this trade even more enticing and perverse. Since the promotion of contract farming in neighbouring countries (i.e., under ACMECS), demand for these crop subsidies has increased. Whereas in a normal year, it would suffice for the subsidy to apply to 500,000 tonnes of corn, in 2009, the coverage surpassed 700,000 tonnes. To meet expanding demand in Thailand, according to Internal Trade Department figures, corn production in neighbouring countries increased from 100,000 tonnes to 1.24 million tonnes in 2009. The reason behind this rapid increase was Thailand's guaranteed prices resulting in a substantial price difference. For example, the price of corn in neighbouring countries in early 2009 ranged from 3.50 to 4 Baht/kg in comparison with Thailand's guaranteed price of 8.50 Baht/kg. That is to say that the price for corn is more than double that in neighbouring countries due to Thai price support.

Deputy Commerce Minister Alongkorn Ponlaboot announced that to address "illegal dumping" of corn, the Ministry proposed to tie quotas for price supports to the volume of production in each Thai province, with a limit of 100,000 Baht ($3,000). In addition, Alongkorn said that "Thailand will support the establishment of ethanol plants in neighbouring countries to prevent 'illegal corn' from contract farming entering the Kingdom" (Bangkok Post 23 January 2009).

The Vientiane Times reported on the situation in the following manner:

> The price of sweetcorn dropped from 1,200 kip [$1.20] per kg to just 800 kip [$0.80] per kg from after Thailand banned imports of raw corn from October [2008] to January [2009] as part of efforts to protect its domestic producers. The three-month ban forced local growers to sell their crops at lower prices to avoid their produce rotting in the fields (16 December 2009).

In sum, the Thai Government's encouragement of Thai investment in bioenergy value addition in Lao PDR would be beneficial *if* it encourages processing. Nevertheless, critics

point out that the point of sources agroenergy feedstocks in neighbouring countries is precisely to bring down feedstock prices (the main cost in the price of biofuels) and meet the feedstock demand in Thai processing mills (Interview with Sakkarin 19 January 2009).

Moreover, Nipon Paopongsakorn, the President of the prestigious Thailand Development Research Institute notes, "price intervention schemes tend to benefit large-scale farmers in irrigated areas with large outputs" (Bangkok Post 20 April 2009). Neither Thai farmers nor neighbouring Mekong farmers, therefore, are the main beneficiaries of these support programmes. Instead, argues the head of the Thai Farmers Association, Prasit Boonchuey, farmers need investment to increase efficiency and productivity.

Certification

One way to address the social and environmental impacts of biofuels is to establish and enforce *sustainability criteria.* This is the path forward for biofuels charted by some governments, international organisations and non-governmental efforts to assess rising concerns. Attempts have focused on establishing criteria and indicators, and certification schemes. Most criteria to assess sectoral sustainability take into account the socio-environmental effects of *direct* biofuel production with respect to the land and production processes employed. However, as emphasised by the Dutch Cramer Commission (2007) and World Wide Fund for Nature (WWF) reports (Dehue et. al. 2007), the most serious sustainability issues are those related to the *indirect* impacts of large-scale biofuel production, mainly displacement of other agricultural activities and subsistence farming, as well as changes in land use from forests or grass to crops (Searchinger 2009). Criteria developed by the Roundtable on Sustainable Biofuels (2008) include life cycle greenhouse gas emissions, biodiversity, agricultural practices and social impacts.

Notwithstanding WTO compatibility issues, the trend is to move towards life cycle analysis of the sustainability of the entire chain of production, including the way in which a product is produced and its carbon footprint.

Compliance with the Roundtable on Sustainable Biofuel criteria may provide an incentive to address negative environmental impacts. As with the evolution of eco-labelling and certification over the past two decades, sustainability criteria are deemed to be a *central*

yet controversial aspect of the development of bioenergy, particularly from a trade perspective.

The development of high quality performance standards for biofuels is vital to facilitating an integrated bioenergy market in Asia. Thailand recently finalised dual product quality standards for biodiesel (community and commercial) and a standard for ethanol. Discussions are beginning at the Asian regional level on social and environmental indicators related to biofuels. Thailand's main trading partners, the European Union, the United States and Japan, are enacting strict sustainability regulations for biofuel imports. This means that any future development of trade in biofuels may depend on certifying the sustainability of the chain of production for energy crops (Segschneider 2009; CIFOR 2009). For example, the 2003 directive adopted by the EU establishes a target of 10% for transport energy by 2020 and requires that the biofuels meet sustainability standards (EC 2009).

Certification of sustainability represents at the same time a valuable marketing tool and a costly non tariff barrier to trade, especially for developing countries. A recent study on EU-ASEAN trade relations estimates that around 20-25% of EU biofuel consumption by 2020 will be derived from imports. Sustainability criteria agreed by the EU in March 2009 will determine market access for palm oil and ethanol imports (ECOFYS 2009). In this regard, Brazil, Malaysia and Indonesia are among the key biofuel exporters threatening to bring a complaint to the WTO on the basis of trade discrimination. Moreover, as predominantly voluntary instruments applied to the production process, sustainability certification schemes do not necessarily address macro-level impacts, such as increased food prices and displacement of food for fuel.

Summary of the Khon Kaen case narrative

This case illustrates the complexities in coordinating a shift towards agroenergy. One of the main concerns is the cost of production of agroenergy feedstocks in order for biofuels to compete with petroleum. In this respect, the Clean Development Mechanism of the climate change convention has provided incentives to increase efficiency of energy use in agricultural processing, including through cogeneration from wastewater and agricultural residue by-products. Another way Thai companies have found to bring down costs is to import feedstocks or invest in contract farming of agroenergy crops in neighbouring countries, such as Cambodia, Lao PDR and Myanmar. In this way, Thailand is likely to export the socio-

ecological impacts of its agroenergy policies if certain safeguards are not implemented. Measures such as guidelines for investment and certification would serve to improve the conditions for sustainability. Another way is to encourage bioenergy processing plants to be built in neighbouring countries to contribute to a regional vision to shift to renewable energy sources.

CASE NARRATIVE 5

Agroenergy investment in the Right Bank of the Mekong, Champassak, Lao PDR[39]

The negotiating power of farmers needs to be improved.

Thongchanh Sengsoulivong, Provincial Agriculture & Forestry Office,
Pakse, 25 March 2009

Background

Foreign investment in Champassak is estimated to have increased fivefold over the past three years (CPI 2009). Alongside rubber, investment from Thailand, Vietnam and Korea is focused on oil palm, cassava and sugarcane plantations, much of which is slated to contribute to the investor's domestic biofuel targets.

KoLao is a Korean company investing in Jatropha in Lao PDR. It is an often-cited example given that it was among the first to invest in Jatropha in Lao PDR starting in 2006. Its main plantation areas are located outside Vientiane (central Lao PDR), and on the right bank of the Mekong river in Champassak province, southwestern Lao PDR, which borders Thailand's Northeastern region of Isan (covered in case narrative 2).

Since 2007, KoLao has been solely focused on planting Jatropha in Lao PDR as a feedstock for biodiesel, with the expectation for profits to emerge by 2012. Howon Choi, the head of KoLao, notes that following an investment of US$300,000, the intention is to plant 40,000 hectares of Jatropha, with seeds from pilot projects sent to Korea for testing and biodiesel demonstration. The KoLao Group also has plans to build processing plants in Lao PDR. The economic recession has delayed the infrastructure investment leading one Thai biofuels entrepreneur interviewee to speculation that KoLao will likely transport the Jatropha seeds back to Korea for processing to meet the renewable energy targets for biodiesel.

Choi refers to the importance of building a "Mekong Jatropha Belt" of feedstock for biodiesel. Plantations are based on the '2+3' farm operation, whereby villagers contribute land and labour, and the company supplies the capital, technology and market. Contracts are signed with smallholder farmers that specify the minimum price for Jatropha seed, for example, US$275/tonne of Jatropha seed. At its nursery on the Right Bank of the Mekong in

[39] Field research was organised by Soubanh and Thongchanh Sengsoulivong, at the suggestion of Chatthip Nartsupha.

Box 3: Champassak Priority Investment Area: Agriculture

"World-wide soaring food prices and increasing demand turn agriculture into a lucrative business. Champassak's outstanding strategic position between Thailand, Cambodia and Vietnam offers a wide array of markets for agricultural commodities to neighbouring countries. Climate and soil offer best conditions for commercial agriculture and a diversity in production. Cash crop production of coffee, organic tea, rubber, vegetables, fruits and cashew has high potential. The lowlands of the province and the Mekong River basin are suitable for livestock rising, rice, cassava, Jatropha and sugarcane production as well as aquaculture. It is said that possibly the best coffee growing region in Southeast Asia is on the Boloven Plateau in Southern Laos, Champassak Province."

Source: Department of Planning & Investment for Champassak Province, Ministry of Planning and Investment, Lao PDR http://www.dpichamp.com/index.php/en/investment-opportunities

Champassak, KoLao is making organic fertiliser for use in the demonstration plantations Ban Meuy.

KoLao Jatropha cultivation is based on an average of 2 hectares per household. In contrast to biofuel development in Brazil and Latin America, agroenergy models such as that promoted by KoLao are based on biofuel production as a *supplementary* source of income to the major crop cultivation of rice and corn. That is to say that Jatropha is not being promoted as a main revenue source for smallholder farmers. After more evidence is gathered over the next few years, the decision can be made to expand Jatropha cultivation based on its suitability as a crop in each area.

Sinethakong Inthavong (31 years old) is the Bioenergy crop manager at the 100 hectare KoLao Jatropha nursery and demonstration project outside Ban Meuy village on the poor soils of the right bank of the Mekong river, 75 kms south of Pakse. He studied agronomy at Nabong Agricultural and Forestry College. He explains that the nursery uses what he refers to as "rice husk manure" to fertilise the Jatropha seedlings. This organic fertiliser consists of 80% manure, 15% rice husks, 5% rice bran and 1 Litre/tonne of molasses. The only fertiliser used at the outset of cultivation is urea (ammonia – NH_3) imported from Thailand. The nursery also provides Jatropha seeds and stalks to villagers to be intercropped in corn fields.

An agronomist at the Rice Research and Cash Crop Centre, Viengsavanh Inthapanya, explained that the Centre is recommending bio-fertilisers to protect the environment and reduce chemical fertiliser imports. In Vientiane, chemical fertiliser sells from 190,000 ($21) to 213,500 kip ($27) for a 50 kg container. Viengsavanh estimates that only about 15%

of Lao farmers use bio-fertilisers, which is still greater than those using chemical fertilisers (10%). As farmers mechanise their ploughing and switch from buffalos to tractors, there is less bovine manure for bio-fertilisers. Bio-fertilisers are a low cost way to boost rice yields (Vientiane Times 23 January 2010).

Map 5: Lao PDR

Phoutsady Hienmanivong (25 years) and Khonemany Changdala (25 years) have been working at the Ban Meuy KoLao nursery since they graduated in forestry at the National University of Laos in 2007. They receive a monthly salary of $150 to manage the nursery and distribute Jatropha seedlings to villagers to be intercropped in local fields. By way of comparison, an average salary for a government official is $30 per month.

Photo 25: Thai contract farming in Champassak, Lao PDR
Photo 26: Thongchanh Sengsoulivong (Provincial Agriculture and Forestry Office (PAFO) tours a Thai oil palm & cassava intercropping concession with Ursula Shaw, Pathoumphon District, Champassak, Lao PDR

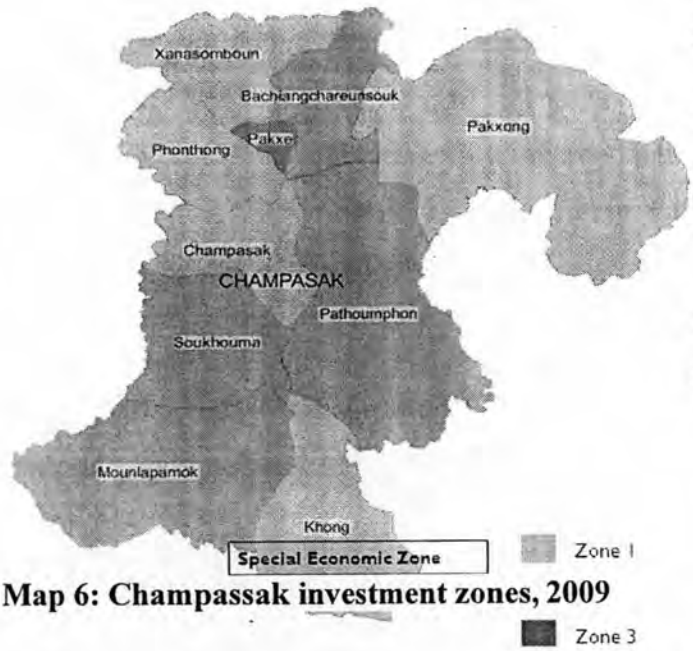
In July 2009, the local Mekong Agro-industry Company announced that it would begin producing biodiesel from Jatropha in 2010 to supply the domestic market (Vientiane Times 9 July 2009). The biodiesel refinery will cost $14 million and be constructed in the Savan-Seno Special Economic Zone Authority in Savannakhet province.

Chamnieng Nuntavong is the owner of Chamnieng Co., Ltd., a Thai company that has a concession to grow cassava intercropped with oil palm. Another 50-year land concession for the Pathoumphon Prosperity Agriculture Co., Ltd. for 258.38 hectares was approved on 16 May 2006. The managers are a couple of local farmers from Ban Honaynamphak village in Prathoumphon district – Khamphanh Sipaphai (50 years) and his wife, Vongmany Sipaphai (46 years). The signpost at the entrance to the plantation states that the initial investment was $1,216,361. Khamphanh says that in September 2006, started growing Surat 2 palm intercropped with cassava. The price paid per hectare is $10/ha/year in this concession. In this respect, Thongchanh admits that there is no clear policy on the rate to be charged in concessions; it depends on the agreement reached between the government authorities and the investor. The government does not want to fix the rate.

Tou Sayaseng (73) another local farmer working on the land in this concession says that cassava will be intercropped with the oil palm for the initial three years. Once the canopy fills in for the oil palm, it is not possible to intercrop anymore. Water is good for oil palm, Tou says, but bad for cassava (Interviews 25 March 2009).

The *Investment calling list* website of the Department of Planning and Investment of Champassak Province lists various bioenergy investments in the forestry and agricultural sector, including "renewable energy crop production of Jatropha, sugarcane, oil palm and cassava" in the Western districts; oil palm in Pathoumphon district and an ethanol and biodiesel factory in Sanasomboun district.[40]

The website map below from the Department of Planning and Investment of Champassak states that, depending on the availability of economic infrastructure, the province is sub-divided into three investment zones:



Map 6: Champassak investment zones, 2009

Zone 1: No economic infrastructure to facilitate investments

Zone 2: Moderate level of economic infrastructure is available to accommodate investments

Zone 3: Good economic infrastructure is available for investments

Gerry Duckitt, agricultural advisor for the Global Association for People and the Environment (GAPE), explains that provincial authorities sign contracts with the investor to grow a certain crop on 10,000 hectares. Then they find the land even if it is land that has been farmed for years by villagers, it is government-owned land. The terms are direct compensation for the farmers and employment as labourers on the concession, as in the case of the Pathoumphon Prosperity Agriculture Co. Ltd. Duckitt and his colleague Ian Baird, a Canadian fisheries expert who has become a specialist on the land tenure plight of the Brao peoples in Southern Lao PDR, are educating villagers about their legal rights (Interview 25 March 2009).

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[40] (http://www.dpichamp.com/index.php/en/investment-calling-list) accessed on 21 January 2010, last updated on 25 May 2009.

Four opportunities to improve sustainable and equitable development were identified by the interviewees and during the focus group discussions in Lao PDR. First, increase farmer input to bring about a participatory approach to land and agricultural planning. Second, and to ensure the previous point, there is a need to establish farmers associations to strengthen the negotiating hand of farming communities and raise awareness of various related issues, including the promotion of socio-ecological best practices. Third, it is vital to maintain biodiversity and indigenous crop varieties as a basis for resilient agricultural systems.

Fourth, labour demand will increasingly be an issue in the not too distant future. As in Southern Thailand, estimates are that the rubber plantations will require a significant tapper workforce. Thongchanh does a back of the following back of the envelope calculation: 5 tappers/ha x 20,000 hectares in Champassak and Savannaket = 100,000 tappers that will be needed when the trees mature around 2012 (Interview 25 March 2009). The workers it is suggested will come from mainly from Vietnam.

At a seminar organised by the Netherlands Development Organisation (SNV) in Bangkok in March 2009, development experts discussed the feasibility and implications of the emerging bioenergy sector for local rural livelihoods in the Mekong. The report prepared by SNV and WWF for the meeting, *Developing Sustainable Pro-Poor Biofuels* (2009), presents case studies and analyses different potential biofuel feedstocks. Focusing on the biodiesel potential of Jatropha, discussion in this focus group revolved around four key issues: (1) food versus fuel – considering the possibility of biofuel feedstocks threatening food security given that smallholders in the region to date have been self sufficient in rice and livestock; (2) land use and tenure security – there is a risk that large-scale plantations will dominate small-scale production, negatively effecting land security; (3) poverty alleviation – developing agroenergy crops has the potential to increase incomes and provide energy security if the model used involves smallholder production and community use of biofuels; (4) climate change and environment – whilst the environmental effects can be envisaged in general, the cumulative effects of climate change on agriculture need to be further researched.

Moreover, if agroenergy crops use low inputs and shift from slash-and-burn/shifting cultivation techniques, greenhouse gas emissions may be negligible. The caveat noted by several interviewees interviewed on the sidelines of the SNV meeting is that expansion of plantations does not result in accelerating deforestation. In this respect, Maurice Schill and

Eelco Bann, leaders in SNV's Smallholder Cash Crop Network in Vientiane, Lao PDR, emphasise the importance of developing and implementing sustainability standards and guidelines, along the lines of the Roundtable for Sustainable Biofuels.

Researchers at the Lao Institute for Renewable Energy (LIRE) have been following the rapid development of Jatropha in Lao PDR as a biofuel feedstock since 2005 (LIRE 2009). Jakob Rietzler, the managing director of LIRE, considers that transferring the burden of contributing to the national energy security to farmers in rural areas – the weakest link in the chain – should be considered carefully in order to avoid further disappointments for small-scale farmers (Interview 10 March 2009).

During a lengthy debate on Laofab in March 2009, Steven Shepley, a longtime development economist working in the region, noted that biofuels are only economically viable when crude oil reaches around $150. Shepley emphasised the major lessons from a study he drafted for SNV covering biofuels in Nepal, Lao PDR, Cambodia and Vietnam (SNV 2009):

-2 smallholders benefit most from community-based biofuel initiatives.
-2 smallholder benefit least from plantation scale biofuel contract farming and labour hire to plantation operators.
-2 The greatest benefits to smallholders arise when they capture and control value added and gain energy security at the household and community levels,
-2 Smallholder based biofuel feedstock production is difficult to organise for successful enterprise profitability and requires other than standard 2+3 business models to succeed
-2 Biofuel processing enterprises that rely solely on feedstock supply from unorganised smallholder farm enterprises in the biofuel value chains experience raw material constraints
-2 Foreign biofuel companies tend to apply business models and approaches to organising from their own countries, which often do not work
-2 Jatropha grown in hedges and processed into crude Jatropha oil (CJO) at the smallholder household level will likely achieve a high energy balance. Small hand operated extruders and filtration systems use no fossil fuels. The energy expenditure in hedge Jatropha production and oil extraction is mostly human energy (manpower).

-2 Contract farming tends to drive production of feedstocks into eco-region and high conservation areas as the holding of smallholders, most without access to irrigation, are mainly reserved for household food safety net purposes and farmers are pushed into non-agricultural areas to meet contract farming requirements.

Jamey Hadden, in charge of strategic development for Green Energy Company Limited operating in Vietnam, laments the fact that outside the region biofuels are generally viewed in a negative light. Hadden argues for a more nuanced approach to this emerging sector in the Mekong region because there are "good" and "bad" biofuels. This was the point made by Brazilian president Lula at the World Food Summit in 2008. In arid and semi-arid land in northern and central Vietnam, Green Energy is developing 2,000 hectares of Jatropha. Hadden says that Green Energy is the first company to put sustainability guidelines in a contract in Vietnam. Hadden based these guidelines on the principles of the Roundtable on Sustainable Biofuels. Working in cooperation with the Vietnam National Centre for Jatropha Cultivation and Sustainable Biofuels, Green Energy is bridging the gap between larger companies and the state to develop agroenergy alternatives for local farmers.

Photo 27: Thai bioenergy concession, a 100 hectare rubber plantation outside Pakse, Champassak
Photo 28: Thongchanh Sengsoulivong , District Agriculture & Forestry Office, in Pakse, Champassak, Lao PDR

The interviewees in the six countries included in this research are clear that the larger issue in the Mekong region is how to manage limited water and land resources to ensure that agroenergy crops are environmentally sustainable.

Thongchanh Sengsoulivong has to deal with issues related to contract farming and land concessions on a daily basis in his capacity as an employee of the Champassak Provincial Agriculture and Forestry Office (PAFO). As a former Director of the Champassak

Agriculture and Forestry College, he is concerned about the socio-environmental impacts of the displacement of workers from their lands in the province. This has happened quickly, he adds, over the past few years.

During the interviews and focus group discussions, it was clear that there are also concerns that this form of land management is undermining the independence and self sufficiency of farmers. The description of biofuels development in Champassak enunciated by Thongchanh responds to several of the questions posed throughout the investigation for this research concerning the viability of agroenergy development in the Mekong. Despite increasing concern about the negative consequences of biofuels, alongside rubber, the three main investors in Lao PDR (China, Thailand and Vietnam) are forging ahead with extensive cassava and oil palm plantations.

Importantly, the practice of biofuels development and the potential for trade has already been initiated in a way that is isolated from the broader international policy debate on the economic and environmental effects. Field visits illustrate that agroenergy crop development is a practical reality on the ground in the six countries in the Mekong region covered in this research. At the empirical level, thus, it is more a question of how and not whether biofuels are being cultivated at this stage. While the risks and benefits from bioenergy will need to be further studied, the trajectory of change is rapidly shifting from traditional forms of subsistence agricultural to commercialised capitalist forms.

Research carried out in Ban Hat Nyao, Luang Namtha, Northern Lao PDR - the pioneering Hmong rubber village, explored the local governance structures and how the rubber production is managed at the local level. The research team from NAFRI found a complex and robust management system, illustrating the importance of creating sufficient "space for local institutions to grow, adapt and evolve on their own" (Nitkham et al 2009).

Photo 29: Field study guided by Thongchanh Sengsoulivong, Ministry of Agriculture and Forestry, Champassak; with Ursula Shaw; Soubanh Sengsoulivong, Office of the Prime Minister, Vientiane and the author, KoLao cultivation of Jatropha on marginal lands, Right Bank, Champassak, Lao PDR

Weighing the evidence with contract farming

Contract farming is a strategy to reduce the risks and facilitate the benefits of agricultural crop production. This model is based on what is referred to as a *2+3 arrangement*, whereby the farmer contributes the land and labour and the investor provides the financing, seeds and market for the product.

Somsak Thongsri, Field Crop Research Institute officer at the Ministry of Agriculture in Bangkok, discusses the differences between contract farming and trading in feedstocks in the Mekong region. The perceived advantage of contract farming is to guarantee the price and supply of agricultural products. However, in practise, Somsak notes, "it does not work as smoothly as it could and it has been difficult to organise production in Lao PDR" (Interview 13 January 2009).

There are two clear schools of thought in the literature on the potential role of contract farming – for and against this arrangement. As the case study of foreign investment in agroenergy in Lao PDR that follows indicates, it is necessary to understand the local management system to optimise the gains for all parties from contract farming. Professor Phrek Gypmantasiri, Chiang Mai University notes that Mekong governments are actively promoting contract farming through ACMECS. The objectives are multifold: to increase market access, provide a higher and more secure income for farmers, reduce the risk of price fluctuations, to provide credit and financial support and introduce higher value crops. Yet,

Phrek says "the actual practice illustrates a growing gap given the proliferation of objectives" (Interview 20 January 2009). In Lao PDR, for example, farmers' organisations or cooperatives are lacking to help farmers to negotiate optimal terms and conditions of contracts.

Sutana Thanyakhan, a Thai scholar engaged by the Mekong Institute in Khon Kaen to examine the impacts of contract farming on livelihoods of rural farmers in the Mekong, outlines three salient limitations of this arrangement: (1) investments tends to be short term so even if the company provides inputs, they do not have an incentive to invest in maintaining soil productivity; (2) it is difficult to guarantee a stable price in practice as prices at the end of the cropping season differ from the estimates at the beginning of the season; and (3) decision making is virtually taken out of the hands of the local farmers given that the logistics and production plans are carried out by the companies (Interview 20 January 2009).

Sakkarin Niyomsilpa, the head researcher at the International Institute for Trade and Development in Bangkok, is among the many interviewees emphasising the role of the state in determining contract farming arrangements. He reiterates the example outlined above of the inconsistency of Thailand's regional agro-industrial policies. The government policy encourages the Thai private sector to invest capital and technology through contract farming in the context of ACMECS. Yet, Thailand banned imports of Thai contracted maize from neighbouring countries, only allowing the guaranteed price subsidy to go to domestic production (Sakkarin Interview 20 January 2009). This leads Sakkarin alongside many others, particularly Thai private sector investor interviewees, to criticise the lack of security in investing in agroenergy through the contract farming schemes encouraged under ACMECS.

Table 33: Different planting arrangements

Arrangement	Farmer input	Potential benefits	Potential concerns
Smallholder	Land Labour Capital	Farmers receive the profits	Farmers assume the risks Quality control
Contract farming	Land Labour	Farmers provided with initial investment	Uncertainty of labour
Land concession	Labour	Farmers can intercrop with rice	No guarantee of returns

Source: prepared based the author

History is part of the agricultural story in Lao PDR as it is told by Thongchanh Sengsoulivong. History offers an explanation, Thongchanh advances, for why there are few farmers associations in Laos and why it has been difficult for farmers to negotiate better deals. After the revolution in 1925, the Lao government rushed in to put farmers in cooperatives, forcing them to work together with a political motivation as opposed to the aim of increasing productivity or improving income and management. Farmers' cooperatives were "top-down approaches to building political community organisations" (Thongchanh Interview 24 March 2009). Moreover, Thongchanh explains, "farmers associations put in place expectations with tasks and responsibilities that serve to complicate the happy relaxing farmer's life of *Yen Sabia Saong*."

Before working for as an agricultural extension officer for the province, Thongchanh was a teacher at the Champassak Agricultural and Forestry College in Pakse – what he refers to as the "farmers' field school." Prior to the 1980s, Thongchanh says, most Lao rice farming was practiced with traditional cultivation and local rice varieties (there are over 1,000 registered varieties in Lao PDR). Rural livelihoods over generations was tightly attached to an abundance of diverse natural resource, non-timber forest products (high protein ant larvae is still sold by the side of the road in Champassak) and aquatic life from the Mekong. Over the past 10-15 years, subsistence farming has gradually been replaced by intensified agricultural production. The government has supported efforts to increase production to contribute to rising GDP and trade with the objective of graduating from the LDC category by 2020 and integrating into the international community. Lao PDR will join the WTO in 2011.

Mechanisation has had a double impact – it has brought the benefit of increased yields at the same time as requiring costly and environmentally damaging chemical fertilisers that now replace the manure of the water buffalo that helped the farmers to plough the fields. Thongchanh struggles to maintain community-based natural resource management that will enhance and sustain the links and balance between local communities and the surrounding biodiversity that should coexist. The process of agricultural modernisation has destroyed the balance with surrounding biodiversity. The impacts on natural resources and local livelihoods include: soil degradation, water pollution, disease, high production costs, and disappearing local varieties and indigenous knowledge (Thongchanh 2005).

Thongchanh outlines four strategies being pursued by his office to improve natural resource management in Champassak: (i) maintain food security; (ii) increase investment in agriculture and possibilities for trade with neighbouring countries; (iii) reduce shifting cultivation practices and convert farmers to permanent cultivation; and (iv) implement sustainable forestry management to increase forest cover to 70% by 2020 (Interview March 2009).

Evidence from Brazil

Contract farming has only rather recently gained ground in the Mekong region. As described by Joao Guilherme Sabino Ometto, the Vice President of the main industry federations in Brazil – FIESP, a variation of this practice is also being developed in the state of Sao Paulo, the largest sugarcane growing state in Brazil (Ometto 2009). Ometto describes how agro-business and small-scale farmers are forging new partnerships in the production of ethanol from sugarcane plantations. Ometto provides two examples in the agricultural communities of Monte Alegre, Motuca, Araraquara and Horto Guarany, Pradopolis, Ribeirao Preto. The settled farmers contribute land and labour while the equipment, capital and raw materials are supplied by the agro-industry (correspondence with Ometto, May 2009).

Brazil's sugarcane plantations are large-scale, with nearly 75% of land used for ethanol production from large producers. However, around 60,000 smallholder producers have formed cooperatives in Southeastern Brazil. These cooperatives have maintained agricultural productivity by linking payment to sucrose content of the sugarcane (Ometto, May 2009).

Miguel Oliveira, a Brazilian agriculturalist from Minas Gerais, notes the overwhelming consensus in Brazil to phase-out the practice of burning the sugarcane at the end of the season in order to facilitate manual harvesting. As a result, Mário César Luiz Pereira, the manager of Lasa soya and ethanol company in Ipameri, Goías, central Brazil, estimates that of the 800 sugarcane cutters employed in 2009 on the plantation, there are none in 2010. After over three decades, they have been replaced by six Massey Ferguson harvesters doing around the clock shifts. The situation is so dramatic, Pereira explains, since the law phasing out the environmentally destructive and labour intensive practice was passed in 2009 (Interview February 2010).

Land concessions

The concern of Lao society is not so much investment from foreigners, but the loss of land and freedom in the country. What is usually called investment in development may end up that we will not be able to stand on our own feet. In the long run, it will be like neo-colonialism.

Khanthalivanh Lamphong (trans Soudachan Tornero), 5 January 2010, LaoFAB

The scale and speed of the expansion of plantations in the Mekong has not gone unnoticed. There is an increasing body of literature on contract farming and land concessions in the Mekong. There is increasing concern expressed by expert reports and in the international press over what has come to be called "land grabs."[41] The emergence of foreign investment in land is explained by experts as follows. High oil prices in recent years contributed to soaring food prices and prompted many countries to invest in agricultural production to ensure food security. This has led, in turn, to current crop surpluses and depressed prices.

Foreign direct investment involving land is not a new phenomenon. Three aspects of this emerging form of investment are novel. The first relates to the sheer scale of what is being referred to as neo-colonial "land grabs." The International Food Policy Research Institute (IFPRI 2009), a research institute based in Washington D.C., calculates that between 15 and 20 million hectares of agricultural land in developing countries have been included in land deals, worth in the range of between US$20 and 30 billion.

Second, the majority of these deals are initiated between governments. For example, following visits of both heads of state, Cambodia decided to lease considerable tracks of agricultural land to investors from Kuwait in 2008.[42] Third, these deals are interested primarily in food staples and biofuels, not primarily cash crops in general as in the past.

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[41] See www.landcoalition.org.

[42] A special report on this issue in the *Economist* (21 May 2009) examines the recent proliferation of government initiated land transaction over the past few years. For example, in 2008, the governments of Sudan and Qatar established a joint venture to invest in Sudan; Kuwait and Sudan agreed on a strategic partnership; Saudi officials have visited Australia, Brazil, Egypt, Ethiopia, Kazakhstan, the Philippines, South Africa, Sudan, Turkey, Ukraine and Vietnam with the aim to negotiate land acquisitions to enhance their food supplies.

In May 2008, in response to mounting concerns, the Lao Government placed a moratorium on foreign land concessions. This moratorium was lifted in June 2009. Cambodia limits concessions to 10,000 hectares in the national Land Law (2001).[43]

Commenting on the "land grabbing" controversy in late 2008, Paul Collier, a development expert, published a provocative article in *Foreign Affairs* in which he argued that a "middle- and upper-class love affair with peasant agriculture" has clouded the African development debate with "romanticism." Citing the example of Brazil – where masses of indigenous landholders were displaced in favour of large-scale farms – Collier concludes that "to ignore commercial agriculture as a force for rural development and enhanced food supply is surely ideological."

Put another way, this perspective may not be ideological, but rather idealist. We live in a world which is still deeply rooted in traditional agricultural paths at the same time as the farmer's future is economically uncertain. There are, of course, emerging ways for governments to mitigate the trend towards large-scale mechanised commercial agriculture. In this way, there are many agricultural practitioners who would argue that the situation goes beyond ideology. Moreover, in the words of a lifelong agro-industrialist, "it requires a healthy dose of idealism" (Oliveira interview 2 January 2010). Cautious optimists, such as Miguel Domingos Oliveira, who has devoted his life to the land and local politics, recognise the social necessity of small-scale agriculture "to fix man to the land" as a means to avoid social tensions (Interview 3 January 2010). Oliveira, an octogenarian and veteran agriculturalist, has twice been the mayor of Araguari, Minas Gerais - one of the richest agricultural areas of central Brazil, and has engaged in cattle ranching and soya, sugarcane and manioc (cassava) cultivation.

Proponents of agro-industrial plantations in Thailand such as Narongchai Akrasanee, the chairman of Thailand's EXIM Bank, argue that the next chapter in the development model will see the convergence of food and fuel prices at much higher levels with a need for increased agricultural efficiency and productivity (Interview 27 January 2009). As a development economist, Narongchai summarises one of the key messages that also emerged from the informant interviews, Thailand needs to put its "surplus" food and industrial capacity

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[43] As posted by Keith Barney on LaoFAB on 16 April 2010, the Cambodian Ministry of Agriuculture, Forestries and Fisheries is among the few Mekong countries to maintain a web-based Information Center on the Economic Land Concessions at http://www.elc.maff.gov.kh/index.html, updated November 2009 and June 2010.

towards reducing the significant national energy deficit in order to increase opportunities and close the increasing equity divide between rich and poor in the Mekong.

There is hardly a hat that Narongchai has not worn - as a former Minister of Commerce who understands the rationale behind import substitution industrialisation, which was the topic of his Johns Hopkins doctoral dissertation, and former Dean of Economics of Thammasat University and Senator, Narongchai emphasises the vital role of political leadership and commitment to enable solutions. In his current private sector capacity and leading the Mekong Business Forum, Narongchai calls for leadership and creativity to build a master plan for infrastructure in the Mekong.

Figure 22: Cartoon depicting an Arab investor selling Thai rice to Thais

This leadership, however, is currently lacking. Khanthalivanh Lamphong's quote above refers to the "neo-colonial" aspect of investment in Lao PDR. In this regard, Thai investment in agroenergy in Champassak is a case in point. Thailand has strict regulations concerning foreign direct investment in the agricultural sector, yet Thai investors are heavily invested in agroenergy feedstocks and rubber in Champassak. The cartoon above illustrates the debate surrounding the attempts in mid-2009 by Arab investors to invest in agricultural land in Thailand.[44] There is a significant degree of irony in this characterisation given that Thai investors have secured agricultural land and contract farming arrangements in neighbouring countries despite criticism about the terms of this engagement. In the cartoon

[44] The Bangkok Post poll of 15 January 2010 asked if Middle Eastern countries should be allowed to set up rice processing factories in Thailand. The response was 76% against such investment.

above, a Thai trader may be substituted for the Arab and instead of rice, the trader is selling biofuels processed from Laotian tapioca for example. This cartoon illustrates Khanthalivanh's characterisation of investment patterns resembling past colonial practice, whereby the natural resource base of the country was plundered without concern for the local consequences. It reveals the importance of implementing a mutually compatible model for agricultural development in the Mekong as a basis for coordinated prosperity.

This thesis argues that it is in the enlightened interests of Thailand to craft a regional modernity for the sustainable management and use of the *linked* natural resources in the Mekong. There is, therefore, a need for a regional construction of modernity based on ecosystem connectivity in addition to the human and economic bonds that bridge the Mekong River.

Developing a national biofuel policy

As is the case in Thailand, in June 2009, the Lao Government announced that it will promote biofuel production as a national energy security strategy in response to the financial burden of rising oil imports (Vientiane Times 4 June 2009). To this end, the government is drafting a national strategy on biofuel development for Cabinet approval. This announcement was made at a workshop on the "Future Resource Economy and Policies in Laos until 2020" in Vientiane, 3 June 2009. A clear roadmap would represent a first step to encouraging the private sector not only in Lao PDR but to encourage foreign direct investment in agroenergy. Yet, as in the case of Thailand, this is a necessary but not sufficient step towards ensuring sustainability. The plan is to encourage biofuel use in the transport sector, with the proposed target of 30% of total fuel consumption by 2020 (Vientiane Times 4 June 2009). This is double Thailand's target of 14% by 2030.

Chanthaviphone Inthavong, the head of the Land and Natural Resource and Information Centre, agrues that "the governance and sustainable management of land and natural resources in Laos is strengthened through improvements to information access, participation and capacity of key actors" (Vientiane Times 14 January 2010).

Lao PDR lies outside the oil palm belt (10 degrees latitude) and productivity yields for rubber and oil palm are still uncertain. Moreover, it is unclear whether agroenergy crops would be grown to supply feedstock to Thailand's processing plants or for domestic

processing. To reap the full benefits from the biofuels chain of production, Lao PDR should also consider developing the infrastructure to process the crops, thereby ensuring value addition in the agricultural sector.

Summary of the Champassak case narrative

This case narrative illustrates the unsustainablity of the business as usual scenario that promotes large-scale monocropping of agroenergy feedstocks. Foreign direct investment in agroenergy in Champassak provides mixed evidence. Thai investment in Champassak has been in large-scale monocrop plantations of cassava, oil palm and rubber, with the likelihood of negative implications for socio-ecological sustainability. Korean investment on the Right Bank of the Mekong, on the other hand, has used degraded soils to plant Jatropha in a sustainable manner. However, if the intention is to export the Jatropha feedstocks to Korea for processing, the gains to Lao PDR from this model of agroenergy investment are limited.

To improve governance of land and natural resources, mechanisms need to be in place for individuals, communities and civil society to contribute to policy reform and dialogue. These mechanisms are best formulated at the regional level through ACMECS to ensure that the development of biofuels through FDI contract farming arrangements is socio-ecologically sustainable. This requires incentives for: (i) proactive and voluntary sustainability criteria to enhance socio-ecological conditions and (ii) value addition to process the feedstocks. There is a need for regulations governing investment in agroenergy and zoning plans to be coordinated at all levels and within a Mekong regional context. This would enable the establishment of land use planning to allocate certain crops to specific areas and allocate concessions accordingly. It would also ensure that companies using contract farming as the business model consider the local context for each district, village and family. In order to scale-up sustainable agriculture there is a need to raise farmers' awareness and understanding of the potential benefits of sustainable agriculture practices through the creation of cooperatives.

CASE NARRATIVE 6

Agroenergy investment in Mandalay & Naypyidaw,[45] Shan State, Myanmar

Jatropha is an on-farm experiment to provide energy alternatives in the Mekong.
Chumroen Benchavitvilai, Bioenergy Development Company, May 2009

Background

Following a decree in December 2005, Myanmar initiated a nationwide campaign to cultivate Jatropha curcas for biodiesel production in an effort to reduce petroleum imports. By 2009, the goal stipulated by the Myanmar Ministry of Agriculture and Irrigation was to plant 3.2 million hectares of Jatropha (*Jet suu* in Burmese). The state-run Myanmar Industrial Crops Enterprise (MICE 2009) jointly established a bioresearch centre with Korea's Haejohyub Bioenergy Myanmar Corporation. The Myanmar Perennial Crops Enterprise was created to oversee bioenergy development in 2006 (MPCE 2009). Initially, the government target was to cultivate 8,000 acres (3.24 million hectares) of Jatropha by 2008, yielding an expected 50,000 barrels of biodiesel annually. In mid-2009, Chumroen Benchavitvilai, a Thai private sector bioenergy investor in the Mekong, estimates from government figures that there are approximately 4,668 acres (1.89 million hectares) of Jatropha under cultivation nation-wide (Chumroen 2009; correspondence February 2010).

It is argued by energy experts in the region that offering an alternative to fuelwood as a primary source to fulfil basic energy needs is an important way to slow deforestation and address climate change. Yu (2003) estimates that approximately 64% of the primary energy in Myanmar is supplied from fuelwood, charcoal and biomass mainly from natural forests. Shifting the energy matrix in Myanmar, thus, would advance the sustainability of natural resource use while simultaneously making the energy matrix more sustainable.

A recent report by the United States Agricultural Service (USDA 2009) highlights that biodiesel production in Myanmar "remains insignificant and is primarily derived from

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[45] The author was able to undertake two field trips to Burma. However, the third visit planned in May-June 2009 to Shan state was postponed indefinitely after the regime's increased security restrictions on foreigners following Daw Aung Sang Su Kyi's imprisonment in May. Consequently, travel further a field in Myanmar was not possible. This section, thus, has been informed by Chumroen Benchavitvilai the private sector organiser who was able to make the trip. Two earlier field visits in 2007 and 2008 around Mandalay were undertaken with the assistance of U Win Myaing, as well as by correspondence thereafter with U Htay Aung (Jatropha cultivator outside Nai Pyi Daw).

Jatropha seed oil." Nevertheless, it notes that Jatropha plants reach maturity only after five years for commercial production. In this respect, Chumroen Benchavitvilai outlines several factors underlying the lack of productivity of Jatropha in Myanmar: (i) the variety planted; (ii) the planting techniques and systematic pruning; (iii) location; (iv) use of fertiliser; (v) use of water; and (vi) measures to protect against virus infection (Interview November 2009).

In addition to the above factors, the US Department of Agriculture report (USDA 2009) notes that most of the Jatropha seeds were left uncollected (96%) because "there was no management system for Jatropha planted as scattered or fence types or along the road side and public spaces." This meant that "most of the fruits were left uncollected since people fear arrest from harvesting the Jatropha since it belongs to the Government."

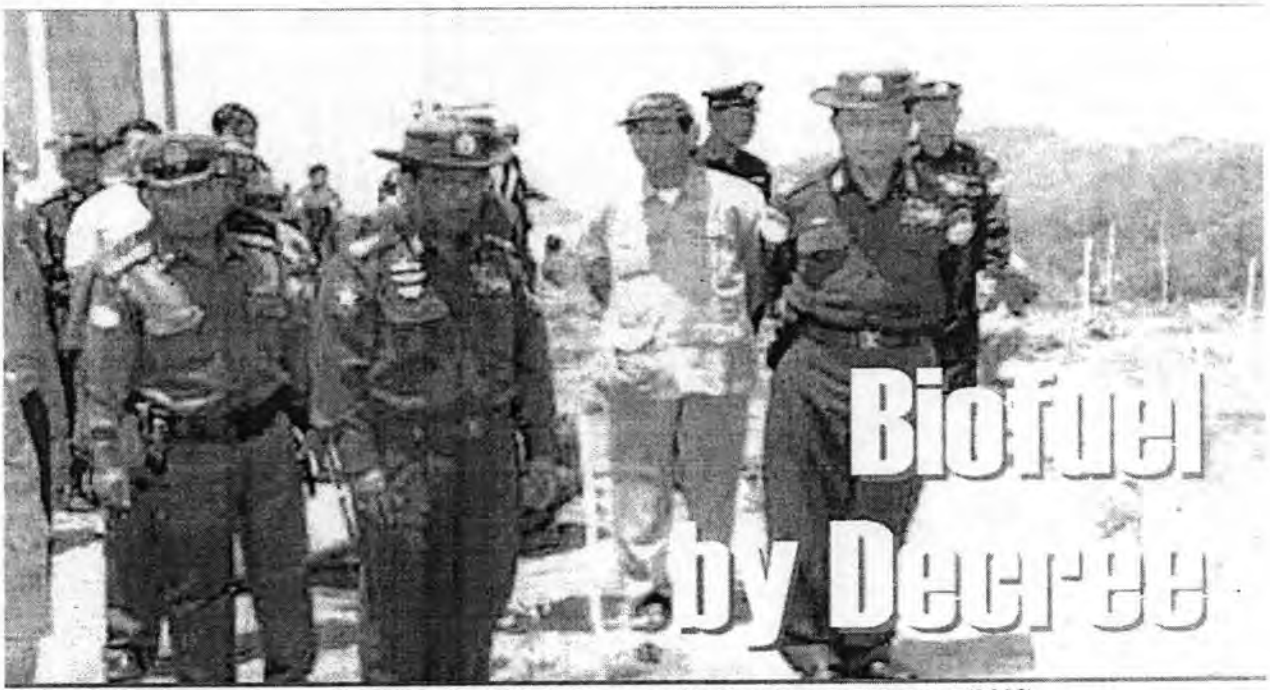


Photo 30: Biofuel by Decree in Myanmar, Ethnic Community Development Forum (2008)

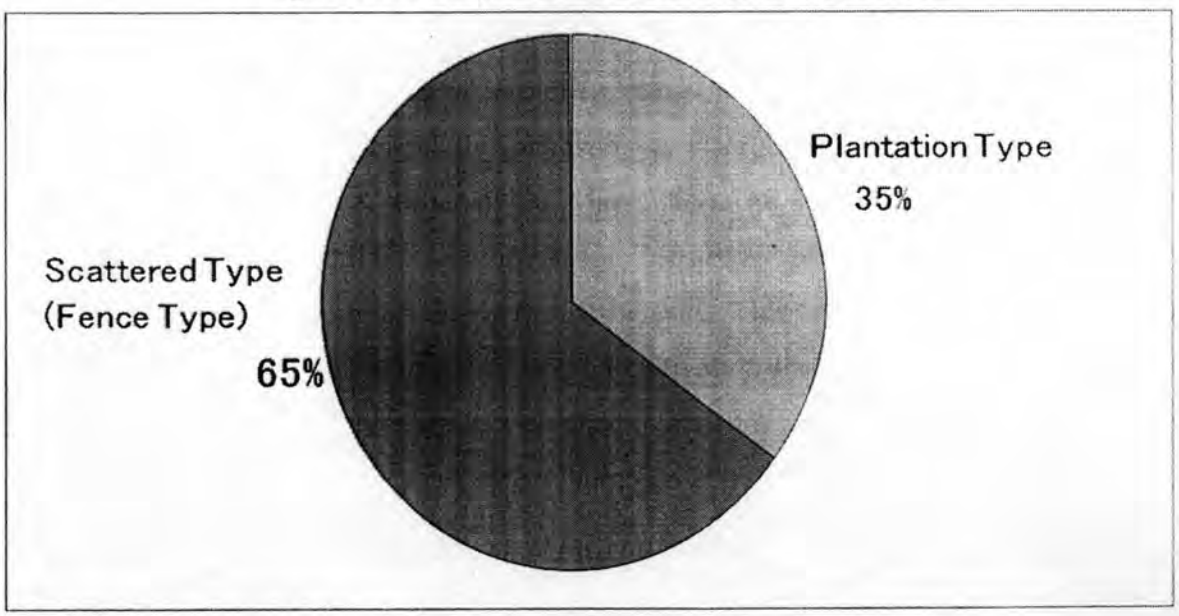
While it is difficult to establish the lay of the land for agroenergy in Myanmar due to the lack of sufficient transparency in general, the Burma Environmental Working Group is amongst those NGOs operating in Thailand which have been documenting investment trends in commercial plantations in Myanmar. In a recent assessment (2009), the Group documented that the Chinese Yuzana Company, which is closely connected to the central government (SPDC), received a concession for over 200,000 acres of land along the edge of the Hugawng Valley Tiger Reserve, on which it has used about 4,000 acres to cultivate sugarcane and

cassava crops reportedly for agroenergy. According to the Group, this resulted in the confiscation of farmland from indigenous peoples living in Shan state.

Commercial Jatropha plantations

The prospects for Jatropha have been well publicised in the past few years (SNV 2009). These high expectations, in many respects, have failed to materialise experts explain for two main reasons. First, in order to produce good quality biodiesel, Jatropha needs more water and chemical inputs than originally estimated. Planting Jatropha on marginal lands with minimal inputs has not resulted in sufficient yields to make the production of biodiesel economically viable or commercially interesting as a larger-scale alternative energy source (Focus Group Chumroen & Pritchett 20 May 2009). As indicated in the previous case narrative, small-scale traditional use of Jatropha as hedges around other crops may have a contribution to make towards rural energy sufficiency. This is the primary intention behind the development of "scattered" hedge Jatropha cultivation throughout Myanmar since 2005. Scattered fence Jatropha cultivation is estimated to account for 65% of total production, with 35% for plantations, mainly in Shan state (Chumroen 2009).

Figure 23: Jatropha cultivation area by type, 2008



Source: Chumroen 2009

These "scattered" type cultivations are along the roadside, field edges and small unused areas around garden plots. U Htay Aung has a Jatropha plantation in Nyaipyidaw. It is

estimated from even casual trips to Myanmar that Jatropha is being grown everywhere, from a small, scattered- scale alongside airport landing strips, road sides and in between Bagan temples, to larger-scale Shan state plantations (field trips 2007 and 2008).

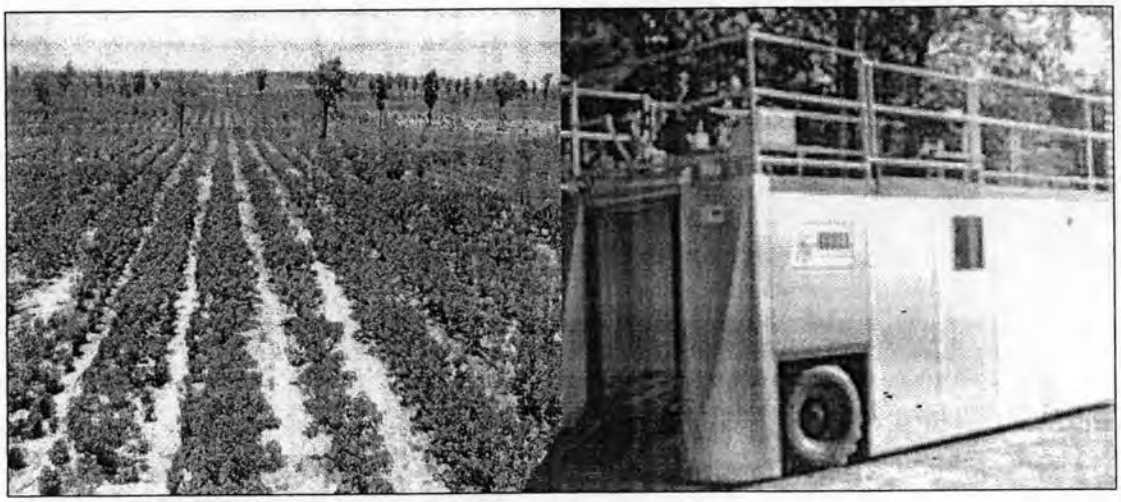


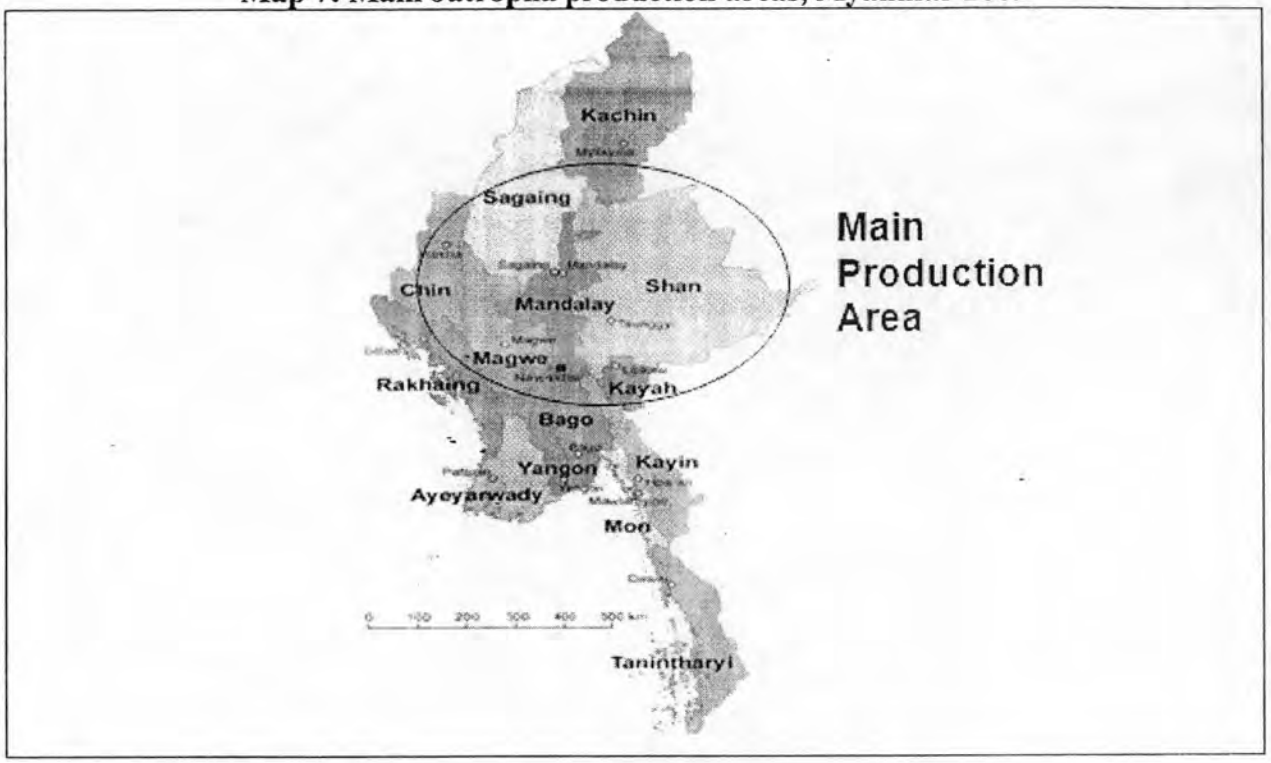
Photo 31: Jatropha plantation, Magway, Myanmar

Photo 32: Mechanical Jatropha harvester, Thailand

Second, the fact that Jatropha needs to be harvested manually and continuously makes the process costly and burdensome for those investors in the Mekong region who are looking to make the endeavour commercially lucrative. The above photo illustrates the harvesting machine that the Thai private sector, Bioenergy Development is developing in Kanchanaburi.

Photo 33 and Photo 34: Jatropha cultivation manuals by the Myanmar Ministry of Agriculture and Irrigation (photo credit: Chumroen 2009)

Map 7: Main Jatropha production areas, Myanmar 2009



Source: Chumroen 2009

A registered Thai company, Bioenergy Development Company Limited (BED) is developing a variety of biofuel crops in Thailand, focusing on the feedstock of oil plants. This company has already started outsourcing these varieties to contractual Jatropha plantations in Taunggi, Shan state, Myanmar; Nam Suang, Lao PDR; and Kampong Spue and Bantien Meanjuy, Cambodia. This company is improving Jatropha varieties and testing a variety of other native and foreign oil seeds. The company is developing native oil nut varieties, such as Niger seed (Guizotia Abyssinica); and foreign species, such as Mustard, canola and rape seed (from the Brasilcus family) and Camelina sativa. These oil crop varieties are considered by the head of the Bioenergy Development Company, Chumroen Benchavitvilai, to have good potential for high yields in the Mekong region areas chosen for plantation development (Interview 10 March 2009).

The main areas under development in Myanmar are located in the map above – in Magwe, Mandalay, Sagaing and Shan. The main production area circled in red in the above map represents a total of over 2.5 million acres or 55% of the country's total Jatropha acreage.

Shan state alone accounts for nearly 1 million acres of Jatropha (Chumroen 2009 based on MPCE/MOAI).

In 2004, the Organisation of Petroleum Exporting Countries (OPEC) funded a project for the Food and Agriculture Organisation (FAO) to provide technical assistance to Myanmar to develop oil crops. The FAO report (2009) on oil crop development describes the institutional setting in Myanmar as a complex maze of institutions often with overlapping responsibilities and little coordination between agencies. The recommendation is to consolidate several institutions which have overlapping responsibilities into one institution that covers the breadth of areas related to oil crops, including oil processing, policy, is advisable. The main objective of this restricting would be to avoid the present situation in which "institutions follow opposite policies (e.g. MAPT privatises while MAS plans to build new solvent extraction plants). Coordination with the private sector is also lacking. Moreover, farmers "are not represented in any form of independent institutions."

Photo 35: Jatropha plantation, Magway, Myanmar (credit: Chumroen BED)

Photo 36: Scattered fence type, Magway, Dept of Agricultural Research (credit: Chumroen BED)

The vegetable oil derived from rape, canola and mustard seeds could be used for both as edible (cooking) oil and as feedstock for biodiesel as alternative to imported fossil fuels.

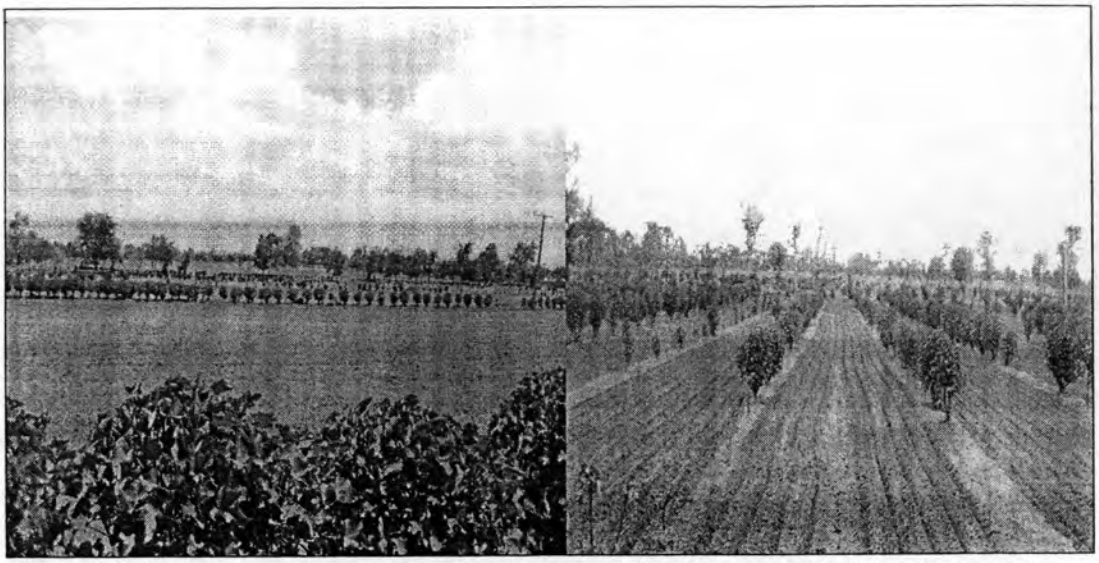
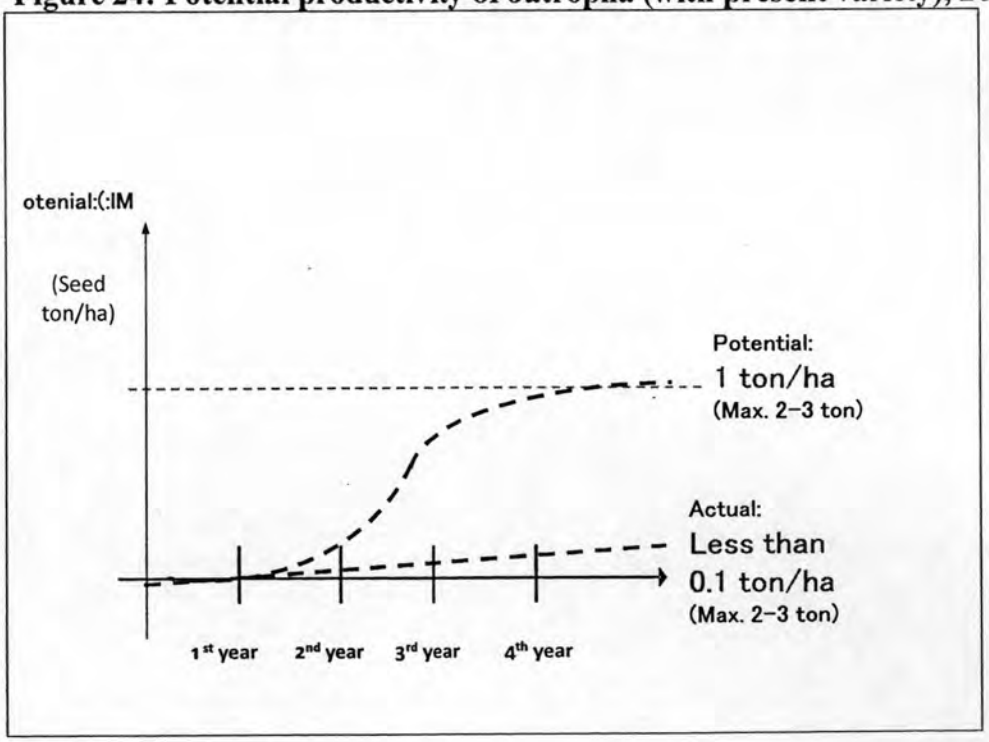


Photo 37: Scattered fence-type Jatropha along agrifields, Myanmar (credit: Chumroen)
Photo 38: Jatropha intercropping, Lungyaw farms, Magway, Myanmar (credit: Chumroen)

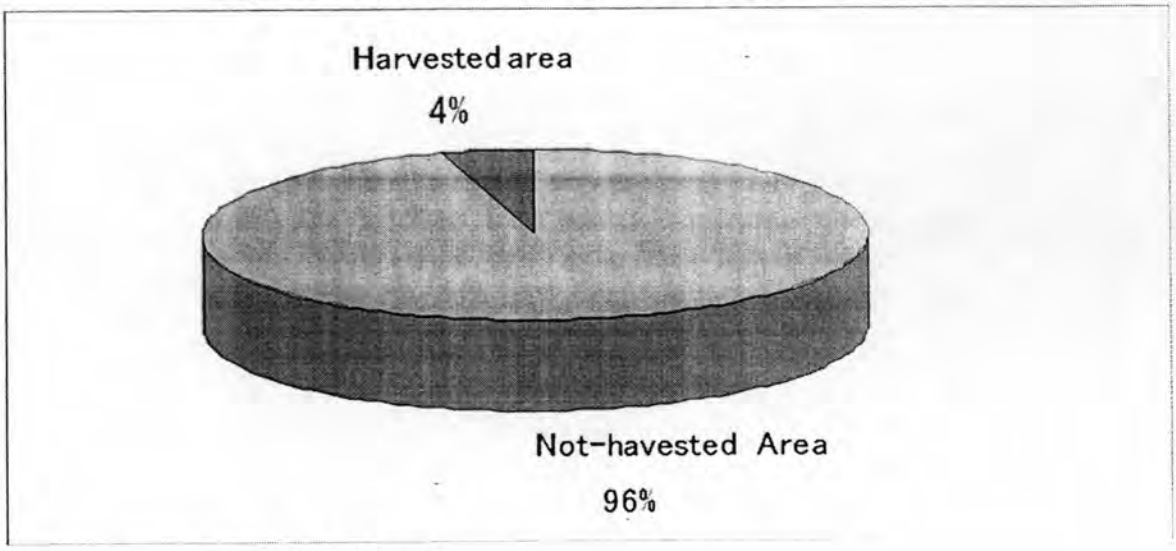
As illustrated in the figure below, Chumroen notes that the yield from Jatropha remains low. Current Jatropha yields are around 0.1 tonnes/ha compared with a potential yield of 1 tonne/ha. Elsewhere in the Mekong, Jatropha productivity is around 2-3 tonnes/ha. Moreover, in 2008, only 4% of the cultivated areas have been harvested (figure below).

Figure 24: Potential productivity of Jatropha (with present variety), 2009



Source: Chumroen 2009

Figure 25: Harvested Jatropha areas, 2008



Source: Chumroen 2009 (MPCE/MOAI)

The Thai Bioenergy Development company is currently developing model plantations with these new energy seeds in Thailand and Myanmar. It has plans to develop oil palm plantations in Tanintharyi Division, southern Myanmar, along the border with Thailand. This is an area with prime conditions for oil palm cultivation in the 'oil palm belt' (see the map above).

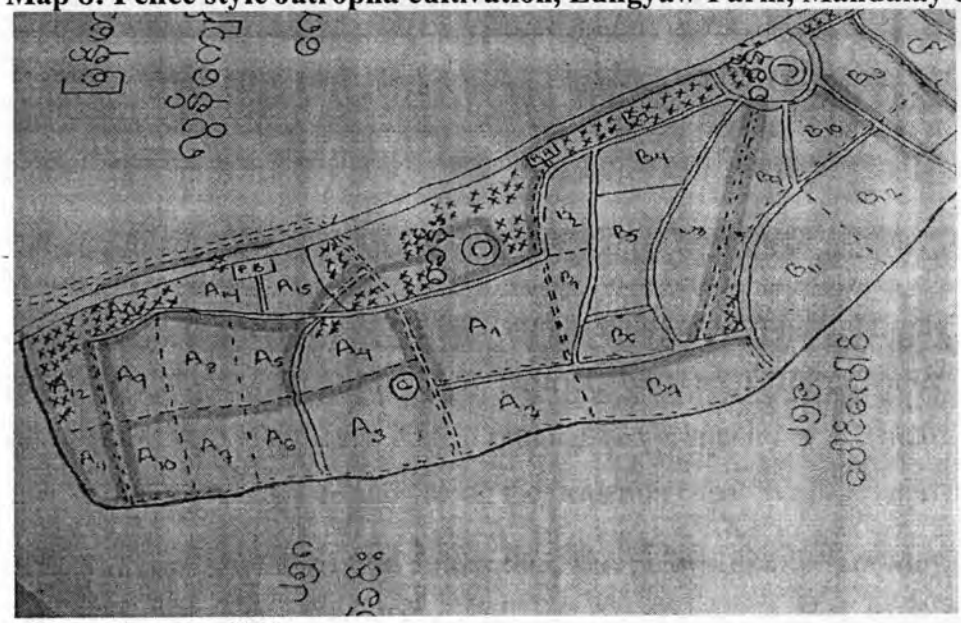
Photo 39: Jatropha plantation, Shan state, Myanmar (credit: Chumroen)

Photo 40: Hand sorting Jatropha seeds, Taunggi, Shan State, Western Myanmar (photo credit: Chumroen)

Chumroen explains that about 60% of the Jatropha trees in Myanmar are just 1-2 year old. Improved yields can only be expected after three years. As drawn in the map below,

Jatropha is cultivated as a fence bordering cotton fields (green highlight) and in small plots (red crosses) in Lungyaw farm, Mandalay District. With no fertiliser (other than from the water runoff from the cotton fields) and no pruning, the productivity is a mere 12 baskets per acre, which is half the yield of fencing along the irrigation canal in Magwe District.

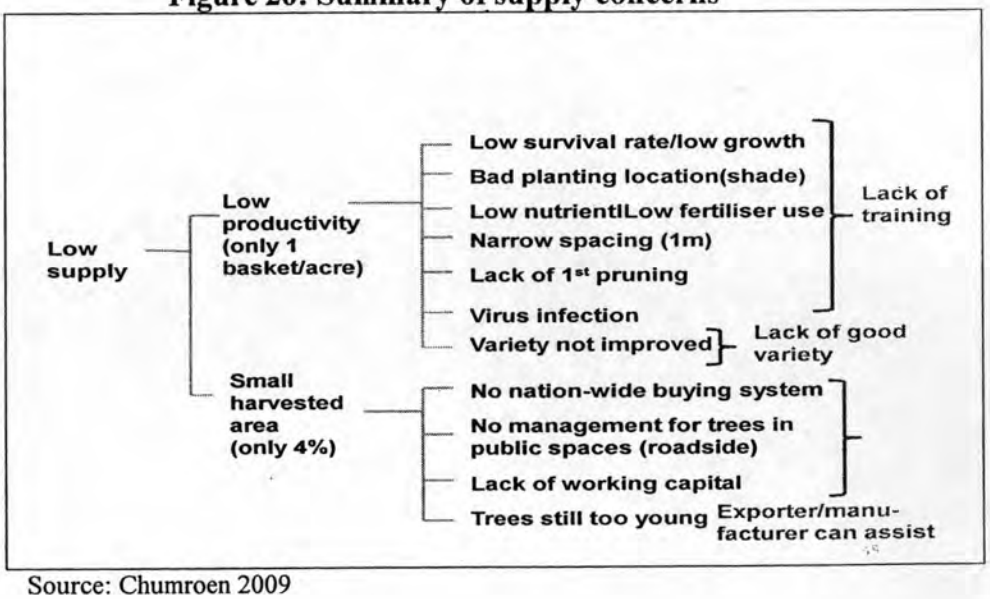
Map 8: Fence style Jatropha cultivation, Lungyaw Farm, Mandalay district



Source: Chumroen 2009

As in the case of Lao PDR (LIRE 2009) and other countries in the Mekong that have been experimenting with Jatropha, the reasons behind the low supply to date in Myanmar are illustrated in the figure below (Chumroen 2009).

Figure 26: Summary of supply concerns



Source: Chumroen 2009

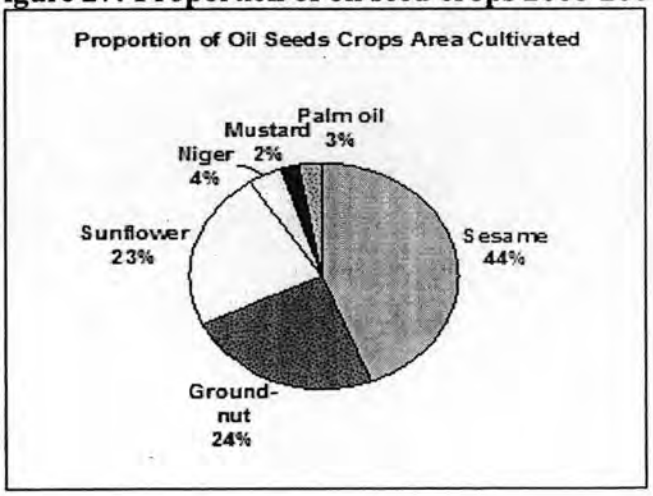
Chumroen's company, Bioenergy Development, is tackling two areas by which to accelerate improvements in Jatropha cultivation: (i) providing a national market for Jatropha seeds and establishing buying centers. Bioenergy Development has already started buying Jatropha seeds and exporting them to Thailand; and (ii) improving varieties and disseminating a new cultivation manual. Bioenergy Development is contributing a new manual based on its past experience in cooperation with Chiang Mai University and Kasetsart University (Chumroen correspondence January 2010).

Oil palm cultivation in southern Myanmar

There are 14 private oil palm mills in Tanintharyi Division in Southern Myanmar (see map below). The majority (11) have been build since 2002. Two plants are operated by the Ministry of Perennial Crop Development. Three plants were built by Malaysia, including the largest one. The Yuzana plant was built in 2005 with a capacity to process 480 tonnes of fresh fruit bunches per day. It has a refinery plant in Yangon with a total capacity of 120,000 tonnes per year. Domestic crude palm oil from Tanintharyi Division is used: (i) in an unprocessed form in the soap industry or domestic biofuels; (ii) or shipped to Yangon and refined at the Yuzana refinery.

U Thein Han (2009), the Chairman of the Myanmar Edible Oil Dealers' Association, makes the point that agriculture in Myanmar is characterised as low input/low output. If Myanmar is to become the "Oil Pot of Asia," U Thein Han suggests the use of cultivable waste lands (8.8%) and degraded lands (24.3%). Palm oil represents approximately 3% of the oil seed crops grown in Myanmar (figure below).

Figure 27: Proportion of oil seed crops 2006-2007



Source: Myanmar Perennial Crops Enterprise (MPCE 2009)

Myanmar imports palm oil from Malaysia and Thailand, of which around 20% enters informally from Thailand. Myanmar also exports informally palm oil and sterin to India (FAO 2009).

Plans to increase Jatropha cultivation in Thailand and the Mekong are raising significant concerns amongst the agronomists interviewed in this research. One reason is a purely scientific fear of the potential for the spread of disease in traditional crops. For example, cassava in Thailand has managed to remain relatively free of disease. Reinhardt Howeler, a cassava expert with the International Center for Tropical Agriculture (CIAT) in Bangkok, cautions that although Jatropha is a species native to the Mekong region, the potential effects on other crops from the wider cultivation of Jatropha need to be further studied (Interview 15 January 2009), particularly on cassava.

The threats from invasive pests and diseases accompanying commercialisation of Jatropha cultivation has also been emphasised by the Deputy Director General of the Lao Department of Agriculture, Bounoum Douangphachan (Vientiane Times 26 May 2009). Even armed with the legislative mandate of regulatory agencies, customs officials find it difficult to implement effective control measures. These measures have a major role to play in safeguarding a country's agriculture against the introduction of invasive pests and diseases by detecting them at the border. These are the type of cross border issues that countries in the Mekong are struggling to coordinate in order to increase their joint capacity to protect food supply and promote agroenergy crop expansion.

Map 9: Tanintharyi Division, Myanmar

Another key issue raised during the informant interviews is the migration of labour in the Mekong. The trend of labour out-migration in the region has been upward and increasing in the last decade (Muanpong &Winston 2009). The majority of this labour in Thailand is from Myanmar. At the macro level, one study for Lao PDR, Myanmar and Thailand estimates that out-migration is estimated to be 10% of the total labour force of Lao PDR (nearly 300,000 workers), 15-20% of Myanmar's total labour force (around 5 million workers) (Winston 2008), and nearly 200,000 workers from Thailand. A study prepared for the Sustainable Mekong Research Network (Sumernet) concludes that this trend in national labour outflows deserves careful considerations for development planning of rural areas (Muanpong & Winston 2009). This is particularly the case for areas in provinces in neighbouring countries that border Thailand, where migration has become the norm as an option to enhance often desperate rural livelihoods.

As illustrated in the map above, Tanintharyi Division in Southern Myanmar is adjacent to the palm oil and rubber plantations in Southern Thailand. Increasingly, the work force for these Thai plantations is coming from mostly illegal workers from Tanintharyi Division. The Lao migratory labour force in North and Northeastern Thailand is also rising. Muanpong and Winston (2009) observe that the proportion of out-migration in Lao PDR represents over 15% of the national labour force, primarily from the five central provinces that constitute the country's main agricultural area.

Summary from the Shan state case narrative

This case narrative illustrates the promise as well as the challenges of developing agroenergy in the Mekong region from a socio-ecological perspective. The political interface with Myanmar is complicated by a disconnect between by government plans, on the one hand, and the reality on the ground, on the other. Thus, while investment in agroenergy is considered to be increasing in Shan state, it is shrouded in mystery and burdensome access. Clearly, the promise of Jatropha remains a theory in most Mekong countries. There is thus a need to significantly improve Jatropha yields for biodiesel to be economically viable on a commercial scale. There is also an urgent need to deal proactively with migration, particularly for seasonal agricultural labour with neighbouring Mekong region countries.

5.3 Findings from the field research, interviews, focus groups and survey

This research is grounded in empirical analysis in six case narratives of agroenergy development in Thailand and the Mekong region elaborated in the previous chapter.

- **Case narrative 1:** Community palm oil biodiesel, Rangsit-Saraburi, Thailand
- **Case narrative 2:** Community biodiesel, Vanghinlad, northeastern Thailand
- **Case narrative 3:** Community palm oil biodiesel, Aoluk, Krabi, Thailand
- **Case narrative 4:** Commercial ethanol, Khon Kaen, northeastern Thailand
- **Case narrative 5:** Agroenergy investment, Champassak, southern Lao PDR
- **Case narrative 6:** Agroenergy investment, Mandalay & Shan State, Myanmar

The case narratives can be situated along a continuum, with sustainability defined to encompass the three pillars of economic, social and environmental as set out in the conceptual framework for this research in Chapter III. The new paradigm for modernity is about balancing these three pillars of sustainability within the local context. Modernity is also defined along a continuum. Modernity is an interpretation of development that incorporates socio-ecological sustainability. The right to develop is tempered by the recognition of the value of natural resources. For developing countries, this is reflected by voluntary measures to increase energy efficiency and decrease environmental degradation. This proactive response reflects the realisation of the need to manage natural resources more efficiently in order to: (i) improve quality of life (social aspect); (ii) increase efficiency of use (environmental and economic); and (iii) add value to the production process (environmental and economic).

In this way, the Rangsit (case 1) and Aoluk (case 3) narratives are examples of economically viable and socio-ecologically sustainable small-scale oil palm production. The Vanghinlad case (case 2) also has the potential to meet the three-pronged criteria for interpreting a high level of modernity to the extent that production and use of biofuels offers an alternative to fossil-fuel based inputs (to power small machinery and to fertilise the land). These projects are geared towards widening the usage of biodiesel in rural areas in equipment including transportation trucks, farm tractors and simple machines such as water pumps and simple industrial engines, all of which are major consumers of conventional diesel oil. These three cases from the basis of the *Smart is Small* scenario elaborated in the next section.

The potential for the final three case narratives is linked with the way in which agroenergy is commercialised in Thailand (case 4) and, certainly in neighbouring Mekong countries – Lao PDR (case 5) and Myanmar (case 6). On the one hand, if the arrangements for trade and investment in agroenergy highlight the benefits of integrating small-scale producers vertically in the commercial chain, if the policy framework continues to be supportive of bioenergy, facilitating options to move towards greater agricultural and energy sustainability, these bright spots in the agroenergy landscape in the Mekong can become fixtures in the evolving project of modernity. The linchpin in increasing the likelihood of favouring the first set of case studies lies in the extent of regional integration.

This research supports the finding that as countries in the region broaden their vista of development to include a regional conceptualisation of development, the greater the potential for linked ecosystems to feature in public policy priorities. To this end, the greater transparency of public policy in implementing regulations related to investment in people, land and water, the greater the possibility for socio-ecologically sustainable outcomes.

Therefore, the theory tested in this research indicates that it is through a regional definition of agroenergy development that sustainability can best be rooted in public policy in the Mekong. The model would be adopted from this first set of case studies undertaken for the research.

If the arrangements, on the other hand, have unforeseen effects which accentuate the negative aspects of the status quo, the possibility exists that the first set of local biofuel initiatives will not gain sufficient momentum to break-out of the current, unsustainable capitalist model for development. They will remain isolated projects with less chance of creating a bridge for change. In order to ensure the latter and avoid the former, Thailand needs to choose the path forward with great care and deliberation at this juncture. To this end, the next section is dedicated to an elaboration of Thailand's policy options for trade in bioenergy.

Policy implications for trade and sustainable development

In a recent article, ecological economist, Robert Costanza of the University of Vermont (2009) outlines the path forward to build a new sustainable economy. Costanza, as many others, puts the blame on under-regulated markets and free market capitalism along with unlimited economic growth. The contemporary conceptual basis for development is

inconsistent with the "real state" of the world. In other words, according to the lines of argument in this thesis, there is a fundamental disconnect between theory, policy and practice. This disconnect threatens to constrict the development of a regional modernity in the Mekong that is based on socio-ecological sustainability. The solution to the underlying dissonance between the set of markers for goods, services and risks in the real world, Costanza suggests, is to reconnect these markers with reality by re-evaluating our assets (Costanza 2009).

Such a re-evaluation in the agriculture sector requires taking on a challenging policy nexus. A steady-state economy (Daly 1996) recognises the way in which industrialisation and human activity depletes regional natural capital. This, in turn, threatens the foundation for socio-economic sustainability.

In recognition of environmental tipping points of sustainability and the finite nature of the planet, this re-evaluation involves more efficient use of existing natural resources and incorporation of technologies in the production process. Significant sustainability gains in Thailand are already resulting from more efficient use of agricultural waste residues from processing. This is evident from the installation of biogas facilities in the majority of rice, sugarcane, cassava and palm oil mills in Thailand over the past few years.

Nevertheless, evidence of the sustainability of biofuels in Thailand is mixed. A recent review of Thailand's biodiesel prospects concludes that it is arguable whether palm-based biodiesel is economically and environmentally feasible in the long term. This is due primarily to the potential local effects on food supply and prices, as well as changes in land use and agricultural practices related to fertiliser inputs with high embodied energy costs (Siriwardhana et. al. 2009). However, analysis of the net energy value of fuel produced from cassava and sugarcane ethanol conclude that there is high potential to improve the energy balance if by-products (e.g., stillage and residues) replace fossil fuels in the mills (Thu Lan et. al 2008).

Thailand's objective is to develop the biofuels sector to contribute to domestic demand stimulated by blending requirements for ethanol and biodiesel in the transport sector. While there is insufficient palm oil to meet the domestic demand, exports of ethanol began in 2007. This differs from the scenario in Malaysia and Indonesia's well established capacity for palm oil exports. Malaysia and Indonesia account for nearly 90% of global exports of palm oil, primarily to the EU.

Analysis of the results of the survey: drivers for bioenergy development

When asked about the main driver for biofuels policy in their country, the interviewees, in all but one category, overwhelmingly identified *energy security* (57.3%) as the primary objective (table below). *Domestic commercial opportunities* and *local rural livelihood development* tied as secondary drivers (15.4%), with *export growth potential* in third position (11.2%). Local informants selected rural livelihood development (50%) ahead of energy security (40.9%) indicating a more locally-centric perspective than would be expected. Interestingly even the private sector, which consisted of mainly Mekong region entrepreneur interviewees, chose energy security (48.3%) over either domestic commercial opportunities (27.6%) or *trade* (20.7%) as a major driver of biofuels. Economic considerations, thus, were considered to be less of a driver than energy security even for the private sector. It is also noteworthy that only one local level respondent indicated climate change as a driver for biofuels.

Table 34: Main drivers of biofuel policy

Question 1	**What is the main driving force behind your country's policies on biofuels?**					
Informant category	energy security	domestic commercial opportunities	trade	rural development	climate change	Total
National gov	**17**	6	3	3	0	29
Intergov	**16**	4	2	3	0	25
NGO	**26**	3	5	4	0	38
Private sector	**14**	8	6	1	0	29
Local	9	1	0	**11**	1	22
Total	**82**	22	16	22	1	143
%	**57.3**	15.4	11.2	15.4	.7	100

Source: Extracted from the survey data for this research contained in Appendix L

When asked about whether coordination could be improved between ministries on biofuels (question 3 of the survey), the vast majority (97.7%) of those surveyed responded in the affirmative.

National policy coordination

The development of agroenergy needs to be considered in the changing framework of policy planning and implementation at various levels of government (national, provincial and local). This is a general point made in the literature concerning agricultural diversification

policy in Thailand (Nipon, Ruhs & Sumana 1998; Siriluck & Kanmeier 2003; Mingsarn & Pornpen 2000).

All respondents in the survey questionnaire for this research placed particular emphasis on the need for greater policy coordination. A case in point often raised in the interviews and focus group discussions is the Thai National Committee on Biofuels Promotion and Development. As Burin Sukphisal, an expert advisor to Parliament, explains, this Committee was established in 2005 and met a couple of times (Interview 15 May 2009). It has yet to meet since the events of September 2006. In its place, the Standing Energy Committee of the House of Representatives has been discussing comprehensive legislation for renewable energy, including biofuels. A draft bill had been negotiated for presentation to Parliament in 2006 but was stymied by the coup d'état. This legislation fell by the wayside over the past two years, lost in the political turmoil. One member of the Standing Energy Committee confirms the importance of putting in place a comprehensive piece of legislation and understands that a draft piece of legislation is under consideration in Parliament (Samai Interview May 2009).

Questions 4 and 5 of the survey related to the main challenges to the development of the biodiesel and ethanol sectors respectively (table below).

Table 35: Main challenges to ethanol and biodiesel development

Informant category	Policy framework	implementation	Crop yields
National government	**41.4** *34.5*	34.5 ***37.9***	20.7 *27.6*
International and regional Intergovernmental organisations	**Biodiesel 68** ***Ethanol 64***	16 *20*	16 *16*
Non-governmental organisations	**52.6** *36.8*	42.1 ***44.7***	0 *5.3*
Private sector	**31** ***20.7***	24.1 ***44.8***	**37.9** *24.1*
Local community organisations	0 0	**36.4** *22.7*	**31.8** *50*
Total **72.1%** **67.9%**	**40.6** *32.3*	**31.5** *35.7*	19.6 *22.4*

There are three main implications flowing from the survey questionnaire data concerning the perceived lack of sufficient coordination.

First, the lack of *coordination* has implications for devising the policy framework and implementing policies and regulations. Hence, when asked about the main challenges to the development of the biodiesel sector, 72.1% of the respondents identified either the *policy framework* (40.6%) or *implementation of policies and regulations* (31.5%). When asked about the main challenges to ethanol development, 67.9% of the respondents identified either the *policy framework* (32.2%) or *implementation of policies and regulations* (35.7%). Therefore, there is a correlation between the responses received in questions 3, 4 and 5 for both ethanol and biodiesel. Interestingly, in the biodiesel sector, these "top down" policy responses were chosen over *scientific challenges*, such as improving *crop yields* (19.6%), or *technological improvements*, such as *harvesting techniques* (4.9%) or *processing technologies* (3.5%). For ethanol, the need to improve crop yields featured more prominently but was still identified as the third challenge (22.4%) to the development of the sector after *implementation of policies and regulations* (35.7%) and the *policy framework* (32.2%).

Another related point is the difficulty of coordinating with local levels is illustrated by diverging priorities that emerged from the survey. Local community informants were those which identified *crop yields* (31.8% for biodiesel and 22.7% for ethanol) and *harvesting techniques* (31.8% for biodiesel and 50% for ethanol) as the main challenges. These are the aspects of the development of the sector in which local community informants are more likely to be involved. Moreover, local level respondents were equally uninterested in both the policy framework and the processing challenges in the development of either the biodiesel or ethanol sectors, resulting in their voice being lost in the aggregate statistical results.

Second, with respect to who should *take the lead* to assume leadership in developing the biofuels sector at the national level (question 6) and in the Mekong region (question 7), the dichotomy of perspectives between the different informant levels again becomes clear and is consistent in the related questions. The following can be observed from the survey data (table below).

Table 36: Leadership at the national and regional level on bioenergy

Informant category	Regional organisation	Gov – national	Gov – local & provincial	Private sector	Community based orgs
National government	*44.8*	75.9 *44.8*			
International & regional intergov organisations	*Q 7: 80*	Q6: 72 *8*	*0*	*12*	*0*
NGOs	*63.2*	60.5		*18.4*	
Private sector	*27.6*	44.8 *13.8*	*13.8*	34.5 *41.3*	
Local community organisations	*0*	*59.1*	**59.1**	*18.1*	22.7 *9.1*
Total **44% lack of reg support** *54.5%*	**45.5**	**55.9** *25.9*	21 *6.3*	16.8 *19.6*	6.3 *2.8*

The majority of respondents (55.9%) felt that government at the national level should assume a leadership role in developing the biofuels sector in each country. However, in the case of both the private sector and certainly local level respondents, the tendency was to favour private sector leadership (34.5%) by private sector respondents, and local level government (59.1%) and community-based organisations (22.7%) by local level respondents.

The responses to question 7 offer insight in the difficulty of putting in place a more regional approach to the development of biofuels in the Mekong. Not surprisingly, the vast majority of intergovernmental and regional organisation respondents (80%) identified their preference for a regional organisation to take the lead on developing biofuels in the Mekong. National government respondents were surprisingly equally divided between regional organisational leadership (44.8%) and governments at the national level (44.8%). This was despite the fact that an effort was made to clarify that any regional organisation would function under the direction of member governments, such as is the case for ASEAN, ADB and ACMECS. Hence, one quarter of the respondents (25.9%) preferred leadership to be exercised by governments at the national level. Support for this response is found most

evidently at the local level (59.1%), and, as noted above, at the national government level (44.8%). At the local level, the voices of a few cannot be discounted as is discussed below.

In the other four categories of respondents, the survey results are mixed. While the first choice of NGOs (63.2%) and the private sector (27.6%) was for a regional organisation to show leadership in the biofuels sector, there was competition from the other choices. With respect to the national approach to biofuels development, an important share of NGO respondents chose alternative leadership through the private sector (21.1%) or, at the regional level, private sector and public-private partnerships (7.9% + 10.5% = 18.4%). The private sector response was also divided between private sector leadership (34.5%) at the national level, and private sector leadership (17.2%) and public-private partnerships (24.1%), which when combined represents 41.3%. Significantly, this combined total for alternatives to leadership (72.4%) on biofuels represents more than the first choice of regional intergovernmental leadership (27.6%). Strikingly, at the local level, not one of the 22 respondents preferred a regional organisation to take the lead, preferring national governments (59.1%), followed by a tie between local and provincial level government (13.6%) and public-private partnerships (13.6%), community based organisations (9.1%) and the private sector (4.5%).

Thus, the survey results reveal distinct preferences based on the informant category but several general trends. As illustrated above, many of the nuances in the data are as interesting as the general trends and majority percentages. There is a preference for national (as opposed to local or private sector) and regional guidance (as opposed to national or local level). However, there are important variations in the underlying data between categories of informants. Notably the preference amongst local level respondents can be masked by the majority response. These nuances are useful to acknowledge in a political economy assessment of development policies in the Mekong. They are also useful when devising strategies to achieve optimal coordinated outcomes for as many actors as possible. If enabling a transition to greater sustainability is largely a political endeavour, as many would argue, this can help shape an effective message to bring about change (Interview Goree May 2009).

Third, flowing from the analysis above, the survey illustrates the difficulty in coordinating policies at the regional level – which in theory many interviewees considered to be the optimal policy response to developing the agricultural sector in general and agroenergy

in particular. There was the following inconsistency in the survey responses. While the majority (44.5%) of respondents preferred a regional organisation to take the lead on developing biofuels in the Mekong region, 54.5% chose alternative responses, primarily governments at the national level (25.9%) and public-private partnerships (12.6%). Similarily, when asked which actor should take the lead in developing the biofuels sector at the national level, the majority (55.9%) chose government at the national level. However, a significant percentage (44%) chose alternative responses, primarily governments at the local and provincial levels (21%) and the private sector (16.8%). The figures are more striking when you look at the percentages in the individual categories for the private sector and local level respondents as noted in the second point above. This indicates first and foremost, an inconsistency between the interviews and the responses to the survey with respect to support for a coordinated regional approach to agroenergy development.

The results in this respect are most striking for local level interviewees who opted for local level leadership at the national level, and national leadership at the regional level; results which were not in accordance with the majority choices as to which actor should take the lead in developing biofuels at the national level (question 6) and in the Mekong region (question 7). To recall, the majority of respondents preferred central government leadership at the national level, but a regional authority to take the lead at the regional level.

With respect to question 8, the majority of informants (85.3%) were aware of government incentives to promote biofuels. Question 9 dealt with standards related to biofuels. The majority of informants (73.4%) were aware of or made use of standards in the sector.

In response to whether the biofuels sector was heading along the right path as of 2009 (question 10), the interviewees were mixed (table below).

Table 37: Is the biofuels sector heading along the right path as of 2009?

Informant category	YES	NO
National government	**58.6**	41.4
International & regional intergovernmental organisations	12	**88**
NGOs	36.8	**63.2**
Private sector	**58.6**	41.4
Local community organisations	45.5	**54.5**
Total	42.7	**57.3**

According to Surapong Charoenrath (2008), a researcher at the Field Crop Research Institute in Bangkok, Thailand's efforts to reduce dependence on oil imports through agroenergy development over the past quarter century has been "less than continuous" in response to the fluctuating price of oil. However, with the trend towards higher oil prices in combination with rising attention to energy security, agricultural development and climate change, Surapong emphasises, policymakers have finally realised that it is time to develop a more robust national strategy to diversify the country's energy sources. Moreover, diversification is also aimed at increasing the share of renewable energy sources in Thailand's fuel mix in an effort to make the transition to a low-carbon economy. Thailand's National Alternative Energy Development Plan, adopted in March 2009, is described in Chapter IV. Whilst renewable energy currently accounts for 5% of its energy mix, Thailand's ambitious objective is to increase this share to over 20% by 2020.

The thesis of this research explores whether Thailand has sufficient *policy space* in which to devise national strategies to deal with various domestic concerns, such as energy diversification and energy security alongside socio-economic and environmental challenges. As noted in Chapter II, to a large extent, the policy space of any individual country in the global economy is shaped by the forces of globalisation. The need for countries in the international community to forge a common approach, for example, to address climate change is another way in which policy priorities are established. Following the convergence of high food and fuel prices in 2008, international experts took a deeper look at the unintended consequences of national biofuel targets on the supply and price of food.

Reviewing the 2008 crisis, the US Department of Agriculture (USDA 2009) concludes that part of the problem stemmed from hoarding of basic commodities, such as rice, and emergency trade restrictions and bans imposed as safeguard measures by governments. These were among the main drivers for the increase in other food commodity prices, such as rice.

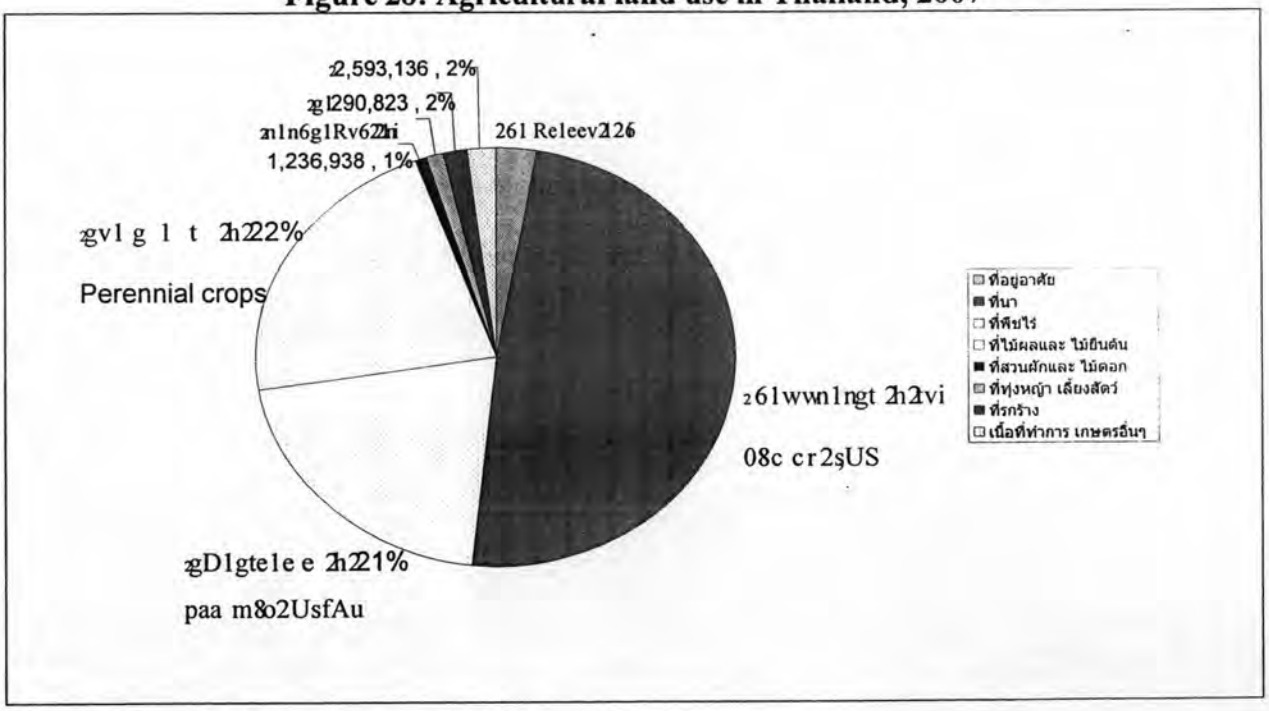
Findings from the informant interviews and focus groups

The following section summarises key issues raised by the interviewees and focus groups in addressing the implications for sustainable development of increasing agroenergy development in Thailand and the Mekong region.

Trends in agroenergy and adding value in the agricultural sector

Many interviewees emphasised the need to make better use of available land in Thailand and the Mekong. In this regard, interviewees considered that there is significant potential to add value to the agricultural sector. As illustrated in the figure below, paddy rice cultivation accounted for nearly 50% of arable land use in 2007 in Thailand.

Figure 28: Agricultural land use in Thailand, 2007



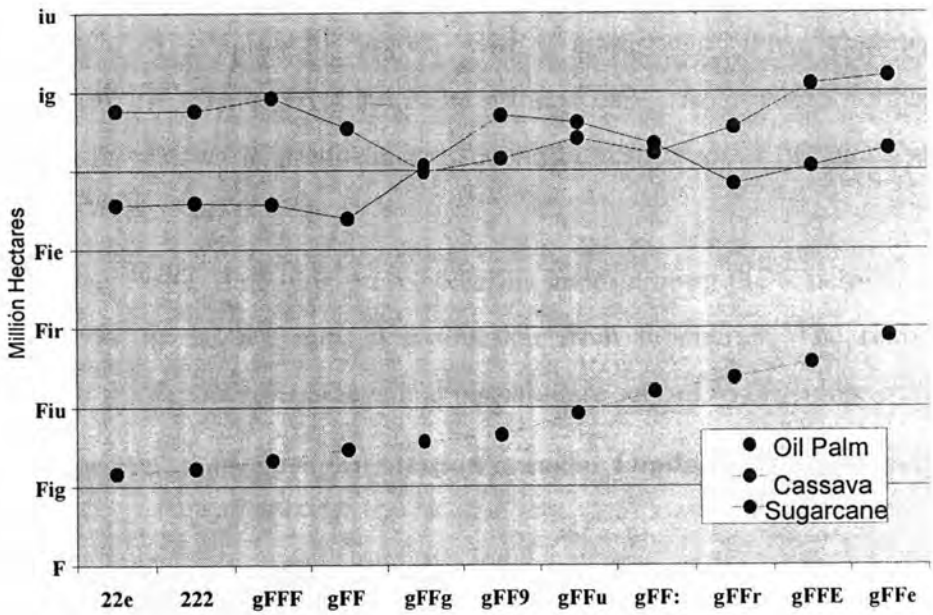
Source: Dept of Agricultural Economics, 2008

Second, consider that Thailand exports a large portion of its agricultural production. Thailand has been a key global rice exporter since 1981. In 2007, for example, Thailand exported 9.19 million tons of milled rice, capturing 29% of the market (www.oae.gov.th).

Thailand is the first exporter of tapioca, with a majority of those exports going to the European feedstock industry. Thailand is the primary exporter of natural rubber in the world. It is the fourth largest world producer and second largest exporter of sugar, with 75% of its sugar production for exports.

These facts were noted by interviewees as underpinning the feasibility for Thailand to shift to adding value to agricultural production from bioenergy. The rising energy crop plantation areas for cassava, sugarcane and oil palm are set out in the figure below.

Figure 29: Energy crop plantation areas in Thailand (Million hectares)



Source: Samai 2009 (data from OAE, MOAC 2008)

The next step for Thailand and Mekong countries, many interviewees noted, is to add value to agricultural production. Nils Gärdek, a socio-economist at a Swedish consulting company in Vientiane stresses that "to produce biofuels purely for export is not economically feasible and difficult to manage logistically, mainly because of limited and poor infrastructure" (correspondence 6 January 2010).

Looking to the future and the changing nature of the current predominantly small-scale household-based rice production in much of rural Mekong, Gärdek notes that "if agroenergy is introduced on a small-scale for community use, you will have to consider the

replacement food sources. If you look at larger-scale commercial production, you will still have to look at replacement of food sources. This may involve introducing to a greater extent a cash/salary-based rural economy." In either case, he predicts, "if introduced, there will be a change in the cultural practices among rural farmers, and, adding to this the cultural and ethnic diversity in those regions, will make the scenario complex and risky."

Interviewees noted that it is the task of the governments at the various levels within each country and between the Mekong countries to ensure sufficient infrastructure to facilitate agricultural diversification and reduce the risks. Efforts to coordinate transport to ports and even storage and processing logistics in the Greater Mekong Subregion is on course, according to ADB officials (ADB 2009).

Food security

Following the food crisis in mid-2008, ASEAN countries have agreed to coordinate regional food security to set up a regional emergency fund. Laos, Gärdek argues, "Laos is vulnerable to food insecurity in the sense that people are already living close to the edge," with "seasonally-based local agricultural production" for the domestic market. The exception, Gärdek cites, is the larger-scale agriculture "which is mainly going directly to export markets."

In a report prepared for the Swiss government, David Fullbrook (2009) characterises the situation as "a vast accidental experiment is taking place in Laos testing the resilience of the fragile environment and its food producing ecosystems by rapidly imposing dams, mines and plantations." The changing nature of the economy, Fullbrook argues, from self sufficiency towards commercialisation is reshaping Laotian society and its environment, expanding market demands, and "triggering responses that may serve to further depress food production, broaden vulnerability to food insecurity, and further erode resilience" of the food system and the ecology.

Lao PDR is experiencing a test of resilience. More to the point, however, this thesis argues that the development model being put in place in Laos is not an accident. It is the resource-intensive model of the 20th century paradigm focused on economic growth at all costs and with few limits imposed – by society or nature.

The interviewees in general agreed that change in the production system in the Mekong is a complex and risky endeavour. Not least of the concerns is the food security imperative, which, Fullbrook and others argue, is critical in a region where the vast majority of the population are rural and exist on under $2 a day (Fullbrook 2009).

The need for a paradigm of sustainability to be orchestrated by improved governance as manifest by coordination within and between the various ministries was a common point emanating from many of the informant interviews and focus groups. It is also a lesson to be learned from Brazil's 30 year experience with ethanol. The central institutions and entities are responsible for devising the appropriate strategies and policy directions. These plans are then implemented by local institutions and authorities, with feedback to the provincial and national level (Interview Oliviera 31 December 2009).

Thongchanh Sengsoulivong, head of the Development Office in the Provincial Agricultural and Forestry Office (PAFO) in Pakse, Champassak, throughout the field trip emphasised the centrality of coordination to provide a framework for land use in Lao PDR. In this regard, Somsack Chamdara of the Vientiane office of the Swiss Agency for Development Cooperation (SDC), in the case of rubber, notes that "in the reality, provincial authorities end up playing a critical role in terms of authorising land use planning without consultation with other provincial authorities. If interprovincial departments were as well coordinated, the unplanned rubber plantation, for example, would have not occurred as we have seen at the moment" (LaoFAB) discussion 24 November 2009). Respondents in the survey questionnaire for this research indicated a majority preference for governments at the national level to take the lead in developing biofuels (55.9%). Furthermore, it was precisely the policy framework and the implementation of policies that is currently viewed by the informants as the greatest challenge to developing ethanol (67.9%) and biodiesel (72.1%).

Somsack Chamdara shares the point of view of many other interviewees: "I hope that it is not too late to rethink this situation and try to look for other alternative cash crops, not only rubber or other large-scale plantations."

In an agriculturally-plentiful Mekong, it is the *management* of food as much as the amount of production, many experts note, that is vital to maintaining food security and enabling a balance in land use between food and fuel. For example, Mekong governments are beginning to recognise the importance of the agricultural sector and put in place safeguards to

ensure food and energy security alongside attention to raising farmer income. Vietnam announced in December 2009 that it planned to end hunger in remote areas of the country by 2012 and increase farmer income by 2.5 times by 2020.

It is ironic that as the second largest rice exporter after Thailand, Vietnam faces food shortages for nearly 10% of households. Nguyen Tri Ngoc, head of the Cultivation Department in Hanoi, announced that "Vietnam needs a strategic solution for its rice production to guarantee sustainable development" (VNS 25 December 2009). The Vietnamese Ministry of Agriculture and Development estimates that the country cultivates 4 million hectares of rice each year, producing over 24.5 million tonnes, of which 4.5 to 5 million tonnes is exported. Ngoc is quoted as commenting: "This isn't acceptable, that while Vietnam is exporting 18-20% of it rice production, a section of the population in the country lacks rice."

Sustainable resource management is another important element of the debate. It is a key lesson learnt from Brazil's experience with ethanol. The informant interviews undertaken for this research in Brazil emphasised Brazil's recent legislation governing agro-ecological zoning of sugarcane plantations (Itamaraty 2009). Brazil also committed to reducing deforestation by 80% by 2020 prior to the Copenhagen climate conference in November 2009.

Land use and restructuring of agricultural production need to be closely coordinated. The point being that biofuel development is more than the soil, to recall Jonathon Rigg – it is about land and how it is managed. Ngoc attributes changes in land use away from rice cultivation to the trend to divulge responsibility to the local level in Vietnam. That is why he considers "it was crucial to amend the land law by limiting the power of localities to change the usage of farm land for other purposes, without being responsible for their decisions" (VNS 25 December 2009).

Several interviewees pointed to three reasons for the underlying food shortages in the Mekong: (i) low quality of rice processing and storage systems; (ii) rice trading networks; and (iii) plant disease. In addition, mention was made to the rapidly rising population as a future driver for food demand.

Regional trade and investment integration

The importance of regional trade and investment integration was raised by interviewees as a vital component of the bioenergy discussion. Thailand is at the vanguard of development in the Mekong region. Based on over twenty years of export-led economic growth, Thailand has built a solid base for the process of industrialisation to take root. The basic conditions for development are well advanced. For example, roads, electricity lines and sanitation are firmly established nationwide. This stands in contrast to neighbouring countries in which these services are only now beginning to be put in place. However, the process of industrialisation in Thailand and its integration into the global economy, as noted in a vast body of academic literature, has largely marginalised the agricultural sector (Rigg 1997; Hewison 2001; Dearden 2002; Molle & Thippawal 2003; Pasuk & Baker 2004; Somchai 2006). The negligence of the agricultural sectors and, moreover, rural development was emphasised by all interviewees with respect to the potential of agroenergy development to stimulate local livelihoods.

The Mekong region is at long-last moving towards greater integration. After decades of involvement in the Cold War, regional strife and limited possibilities, the Mekong is beginning to take shape. Distinct from the other countries in the Mekong region, Thailand is clearly a leader in many respects – economic growth, social enhancement and environmental stability. Yet, according to statistics and interviewees, income inequality in Thailand persists and is rising.

To illustrate the extent of socio-economic inequality in Thailand, Professor Pasuk Phongpaichit of Chulalongkorn University gave the following statistics during her keynote address at the King Prachadhipok Institute conference "Towards a Fair Society" in December 2009:

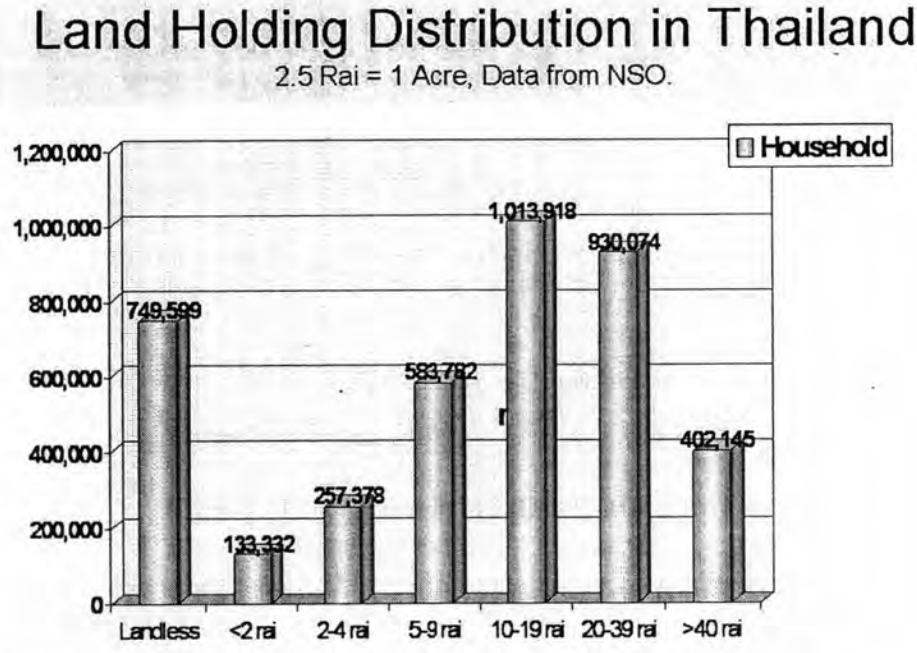
- te The top 20% own 69% of the country's assets and the bottom 20% own 1%.
- te Less than 1% of the population own nearly half of the country's savings.
- te Amongst farming families, nearly 20% are landless, or about 811,871 families, while 1-1.5 million farming families are tenants or struggling with insufficient land.
- te 10% of land owners own more than 100 rai each, while the majority of the rest own one rai or less.

te On income distribution, the top 20% enjoy more than 50% of the gross domestic product while the bottom 20% only 4%.

te The average income of the bottom 20% is the same as the poverty line at 1,443 Baht per month ($43.72).

te The gap between the richest and poorest families is 13 times higher than Thailand's neighbouring countries (Pasuk 2009).

Figure 30: Land holding distribution in Thailand



Source: Samai 2009

Many interviewees emphasised that land distribution in Thailand is an important element of the debate. The average farming plot in Thailand is 18 rais (2.88 ha), as shown in the figure above. Samai notes:

> The Northeast is an interesting area. In the past 40-50 years, there has been a large proportion of people moving out of agriculture into cities during the off-peak farm season on a part-time basis. During rice planting and harvesting, they return home and leave Bangkok empty (correspondence 2 November 2009).

Small-farm machinery has contributed to this trend in a major way, continues Samai:

> to facilitate the Isan people to have a second career. The crops they choose, rice, cassava or sugarcane do not need much labour during the growing and gestation periods so the working age adults can be away from home and only return during planting and cutting periods.

In this way, researchers consider that off-farming income has contributed to maintaining farmers on the land over the past decades (Molle & Thippawal 2003).

As discussed in Chapter IV, Thailand has an extensive network of institutional and legal frameworks and policies to deal with rural development, water management and agriculture. There are also a diversity of policies and laws to address the social and environmental implications of development. Beyond policies, practices in Thailand are leading the way forward for a shift to renewable energy. In theory, therefore, Thailand is well placed to lead the transformation to sustainability in the Mekong region. Most interviewees consider that Thailand has an interest in doing so for political, economic and social reasons. For example, concerning migration, several informants noted that Thailand is often the first destination for migrant workers from neighbouring countries seeking to improve their livelihoods.

Thailand's leadership in regional fora, such as ASEAN and ACMECS, has initiated a process of transformation in the Mekong. Yet, the majority of informants expressed concern about the planning processes underlying this transformation. The primary issue noted by informants related to the need for more information on complex issues, such as biofuels, and for this information to be better coordinated within different ministries in each country as well as between Mekong region countries. Lack of coordination, thus, between and within governments in the region emerged as a key area of concern.

In making and breaking the emerging bonds in the Mekong, local communities are coping with the implications of becoming more integrated into the global economy. The dynamics of integration on the social structure of these changes are well illustrated in bioenergy production and use. First and foremost, these developments are rooted in socio-ecological change at the local level in Thailand and the Mekong region.[46]

Opportunities and challenges for Thailand's agroenergy sector

Informant interviews and focus group discussions clearly indicated that finding the appropriate balance between energy security, energy efficiency and sustainable resource management to develop renewable energy from bioenergy in a sustainable manner presents

[46] There is a vigorous debate in the Mekong concerning the merits of "swidden" agriculture or "slash and burn" shifting cultivation techniques. For example, this debate was extensively highlighted in a LaoFAB exchange between November 2008 and January 2009 (See the archives at www. Laofab.org).

opportunities as well as challenges (table below). It will require technological and productivity innovation alongside sustainable resource management. Moreover, building a viable bioenergy sector requires sustained political will to ensure effective implementation and enforcement of policy mandates. These mandates, as emphasised by the interviewees, need to take into account the fiscal burden imposed on the government budget from subsidising bioenergy.

Interviewees point to a three-fold prerequisite deemed indispensible for sustainable bioenergy development: (i) governmental support, strategic vision and political will to stay the course; (ii) regional integration to coordinate the agricultural sector in general and agroenergy in particular; and (iii) vertical incorporation of small-scale farmers in a larger regional supply chain.

Table 38: Opportunities and challenges for agroenergy

Opportunities	Challenges
1.e To shift dependence from petroleum to enhance energy security	Need to balance competing claims for land between food, fuel and fibre; need for food security
2.e To diversity and add value to agricultural sector	Need to meet well-defined bioenergy policies and targets at the national and regional level; need to balance the government budget
3.e To efficiently manage waste agricultural residues contribution to cogeneration	Need to provide nutrients to the soil through no-till integrated systems; need to increase technological innovation
4.e To simulate investment and technological innovation for second generation biofuels	Need to increase funding for R&D and coordinate strategic policy (along the lines of spearheaded by the APEC Center for Technological Foresight, NSTDA)
5.e To create an integrated regional market for agroenergy gain for ethanol and biodiesel	Need to balance economic and government incentives for biofuel feedstocks; need for strategic regional cooperation for agroenergy framework; need to enhance awareness and information on the biofuels market
6.e To develop small-scale community bioenergy production and use to create energy sufficiency, stimulate rural development and reduce fossil fuel input costs	Need to balance large-scale commercialised agro-industrial develop of biofuels for the transport sector and for export (ethanol)
7.e To benefit from low costs of production (land, labour, water) to add value to the agricultural chain of production	Need to address land use changes and labour migration within the region resulting from biofuels development; need to ensure transparent, equitable investment and safeguard land rights
8.e To meet the rising demand as transportation infrastructure expands in a dynamic region	Need to enforce strategic impact assessments to address socio-environmental consequences of agroenergy investment

9.e To operationalise the Clean Development Mechanism, gain carbon credits and stimulate clean technologies	Need to guide private sector investment through enforcing socio-environmental regulations (labour, air, water & land laws); need for proactive, voluntary initiatives (RSB, RSPO)
10.e To add value to exports (agricultural and industrial)	Need to strategically promote investment along the supply chain (in the automotive sector); need to secure market access (to meet sustainability criteria and address tariff and non tariff barriers to biofuels trade)

Source: Compiled based on the interviews and focus group discussions

In 2008, Thailand exported 71 million litres of ethanol to a range of countries, including Australia, Japan, the Netherlands, the Philippines, Singapore and Taiwan, mainly for beverages, not fuel ethanol (Interview Natikorn 10 November 2009). Interviewees point out that exports are hampered by the need for case-by-case approval from the Ministry of Commerce. This is due to the fact that the Cane and Sugar Act (1984) does not differentiate sufficiently between alcohol production for beverage use and for fuel.[47] The Thai Ethanol Manufacturers Association argues that the regulatory framework should be revised to distinguish between the two to facilitate exports of surplus ethanol (Interview June 2009). Moreover, permitting ethanol to be produced directly from sugarcane juice (as opposed to molasses) and allowing market dynamics to drive the degree of substitution between sugar and ethanol production would increase the economic viability of the sector.

Samai Jai-In notes that to obtain permission to export ethanol takes 22.5 days and requires the authorisation of three ministries (Commerce, Customs and Excise) (Interview 10 October 2009). This is why the majority of respondents (68%) in the research survey considered that the main challenge to the development of the ethanol sector is a combination of a *consistent policy framework* and *policy implementation*, as opposed to improving crop yields, harvesting techniques or processing technologies.

In contrast to the ethanol scenario, interviewees noted that there is insufficient domestic supply of crude palm oil to meet the national target to increase biodiesel production capacity from 1.39 to 3.3 million litres per day by 2012. Since February 2008, all diesel sold in Thailand has been blended with 2% biodiesel (B2). To meet these blending requirements,

[47] The categorisation of ethanol as an agricultural product or an industrial good is an issue that also needs to be clarified in the World Trade Organisation.

the Government plans to increase the area of oil palm plantations by 5 million rai (800,000 hectares) by 2010.

Economic factors

If the objective is to reduce dependence on fossil fuel imports, two economic factors were highlighted by the interviewees and focus groups. First, biofuels (ethanol and biodiesel) are currently and are likely to continue to be more expensive than fossil fuels. Private sector interviewees stressed that biofuels cannot compete with fossil fuels without government support (i.e., subsidies) of production and consumption of biofuels. In Thailand, the primary focus of the national biofuels strategies have been on reducing soaring expenditures on imported fossil fuels. This is mainly due to the fact that the prevailing pricing structures reflect the externalisation of many of the costs of fossil fuels. With the government facing a growing budget deficit, there are signs that the Ministry of Energy may have to consider removing subsidies on gasohol and biodiesel (Bangkok Post 22 January 2010).

Phasing-out subsidies and forcing consumers to pay the real market prices is politically difficult. A case in point is the subsidies that were provided as an incentive to switch from diesel to natural gas in the transport sector in Thailand. These subsidies remain in place for natural gas for vehicles (NGV). In this case, the argument against removing the subsidies is that once drivers convert their vehicles to natural gas, it is not possible to switch back to petrol. Therefore, there is a now vocal opposition from the beneficiaries to attempts to phase-out the subsidies.

The second aspect relates to the management of the biofuels sector. As noted above, Thailand's current management system for biofuels has established policies that, in turn, have resulted in an excess capacity of ethanol (which regulations make it difficult to export) and insufficient supply of biodiesel (which regulations make it difficult to import).

If the objective is to develop biofuels as an export sector, there needs to be a clear policy in place and the regulatory framework should support biofuels trade. The current Thai laws and regulations act to discourage ethanol exports and discourage crude palm oil imports. These trade restrictions are negatively affecting the biofuels sector in Thailand. Moreover, if the objective is to increase exports and enhance the commercialisation of biofuels to that end,

the Ministry of Agriculture also needs to be involved to assess the most appropriate crop for ethanol, for example between tapioca from cassava or molasses from sugarcane.

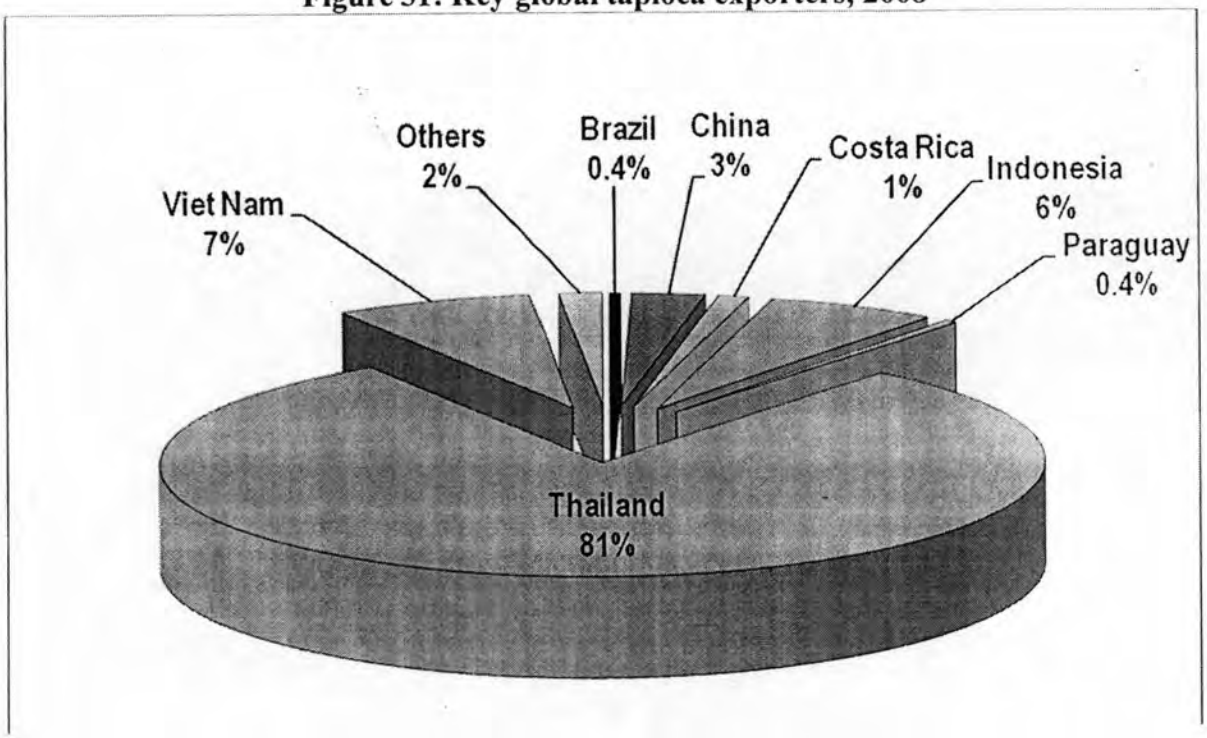
This assessment requires, first and foremost intra-ministerial cooperation. Responses to the survey questionnaire for this research indicate that the overwhelming majority (99%) of respondents consider that national coordination could be improved in Thailand. Phichai Tinsuntisook, chairman of the Renewable Energy Industry Club at the Federation of Thai Industries, notes the difficulty for the Ministries of Energy and Finance to cooperate to work out a balanced support policy for bioenergy development (i.e. an optimal package of taxes and subsidies) (Interview May 2009). This observation was echoed by the overwhelming majority of interviewees who pointed to the need for comprehensive renewable energy legislation and a single governmental agency to underpin coherent bioenergy policymaking. Moreover, this observation was made with respect to all levels of the policymaking process – the national, regional and international realms. There is a dearth of coordination despite best efforts. This is identified as a key impediment to Thailand's prospects for biofuels trade identified by most interviewees and highlighted in focus group discussions.

Choice of feedstock

One way to increase the economic viability of biofuels is to increase crop yields. Thailand is focusing its research and development on cassava the feedstock of choice. Many interviewees, particularly those directly involved in the agricultural sector, highlighted the importance of Thailand's development of cassava since the 1990s. Whilst Nigeria and Brazil are the primary global producers of cassava, over the past decade Thailand has risen to become the leading global exporter of tapioca.

Cassava grows in poor and sandy soils, such as those in Northeastern Thailand, which are not suitable for other crops. It has a long dry season and requires little maintenance during the growing period. Moreover, tapioca can be used towards a range of different products in the food, fuel and feed supply chain. This allows flexibility and choice of options for producing countries.

Figure 31: Key global tapioca exporters, 2008



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ource: FAO statistics, 2009

Currently, 90% of ethanol in Thailand is produced from sugarcane molasses. However, the focus of policy planners and agronomists, such as Klanarong Sriroth, Director of the Cassava and Starch Technology Unit at Kasetsart University and international cassava expert, is to improve cassava yields. The hope is that new strains of cassava will be disease resistant, require less water and yield more starch. This will bring down the costs of tapioca-based ethanol and make the cassava strains more resilient and resistant (Interview 24 February 2009).

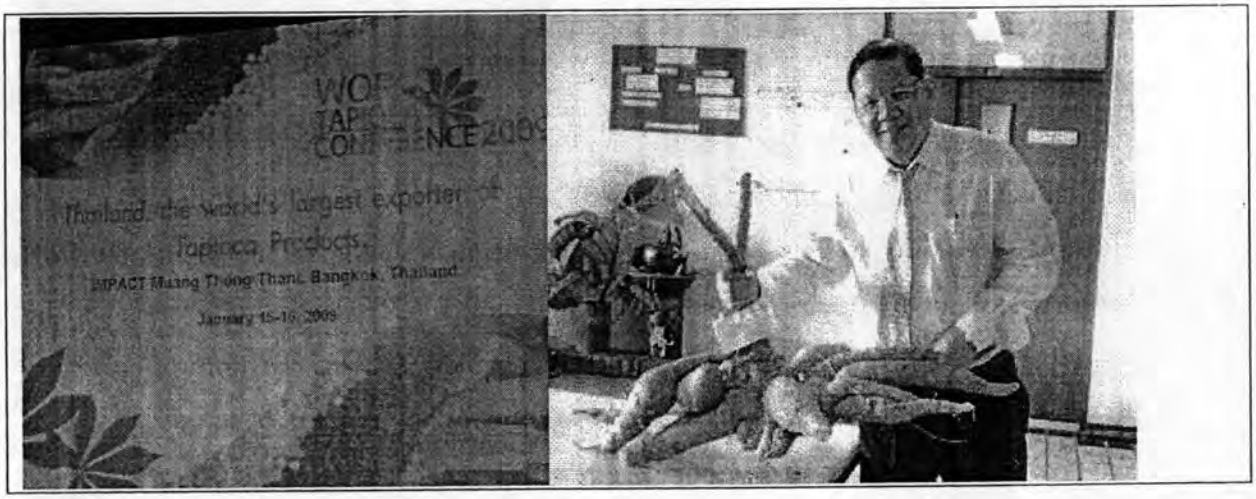


Photo 41: World Tapioca Conference, Bangkok, January 2009

Photo 42: International cassava expert, Klanarong Sriroth, Kasetsart University with first prize cassava root

A significant segment of the World Tapioca Conference in January 2009 was dedicated to crop genetics and how to continue improving yields. Geoffrey Hawtin, the head of the International Center for Tropical Agriculture (CIAT) based in Cali, Colombia, highlights why we should be concerned about plant genetic diversity. Genetic diversity is the basis of potential crop improvements (Interview 15 January 2009). However, cassava is under threat worldwide. According to the authoritative list of endangered plants maintained by the International Union for the Conservation of Nature (IUCN), 35% of wild manioc species are under threat of extinction, with 10% endangered. Hawtin's center was founded in 1973 as part of the CGIAR global network of agricultural research centers and germplasm collections. Conserving seeds is not a sufficient guarantee of genetic diversity, Hawtin emphasises, as it is expensive to conserve the manioc plant and leaves ex situ. The Global Crop Diversity Trust established in 2004, Hawtin notes, is supporting collections around the world with $260 million ($12 million per year).

Herman Caballos, an agronomist in charge of cassava breeding for CIAT, says the crossbreeding selection is expensive and slow, requiring around eight years for every generational improvement, for example to increase the starch content or decrease post-harvest root deterioration. Caballos predicts that the next decade will bring increases in specialty cassava.

Risk of disease, pests and viruses is another key element of the biofuel discussion for agronomists. Reinhardt Howeler, CIAT-Asia, notes that cassava has been virtually disease free in Southeast Asia, with the exception of India (Interview 15 January 2009). On this point, there was concern expressed amongst several of the agronomist interviewees in the Ministry of Agriculture about the risk of viruses being imported with Jatropha, which is a related species of cassava. The interviewees raised a point of technical tension between the Ministries of Agriculture and Energy on bioenergy development. As the leading global tapioca exporter, the cassava industry in Thailand is worth $1.5 billion per year. Thus agronomist interviewees are alert to the possible consequences of the Ministry of Energy's plan to import Jatropha stems for planting in the energy sufficiency projects throughout Thailand (Interview Ministry of Agriculture).

Risk of diseases and pests would threaten Thailand's cassava production and spread across the region, researchers warned in January 2010. Disease for example can dramatically reduce the starch content of cassava roots. "Cassava production in Southeast Asia has enjoyed an extended honeymoon period" Rod Lefroy, Regional Research Leader, CIAT-Asia commented (Laofab 22 January 2010).

Photo 43: Tapioca: the Magic Plant
Photo 44: Asia's No.1 leader in Renewable energy, Chitralada Biofuels Project poster

Steven Shepley and Erhard Floether, veteran agricultural Mekongologists, are among the interviewees emphasising that the choice of feedstock for ethanol is tied into a larger debate on diversifying the crop base in Thailand and the Mekong (Interview and correspondence February 2009). According to Professor Phrek Gypmantasin, Chiang Mai University, there are currently four crops competing with each other for land and government-supported development in the Mekong: sugarcane, cassava, rubber and eucalyptus (Interview 19 January 2009).

In order to bring evidence to bear on the discussion, the rest of this chapter charts developments in bioenergy through case studies in Thailand and the Mekong region.

Forging South-South cooperation and sharing experiences

One of the strategies to change the dynamics of the debate emphasised by interviewees is for developing countries to forge alliances and enhance cooperation. There is increasing priority being given to forging linkages between developing countries on issues of mutual interest. This is the case with bioenergy in general. For example, Brazil has taken a leadership role in strengthening the agricultural sector and tackling energy poverty with its extensive technical assistance programme in Latin America and Africa (Interview André Corrêa do Lago October 2009). With this objective in mind, memoranda of understanding have been signed to enhance scientific and technical exchanges between Brazil and China, Vietnam and Indonesia over the past few years (Interviews Claudia Santos and Pedro Henrique Machado; focus group Itamaraty October 2009).

There was a heightened interest to learn more about the Brazilian ethanol experience expressed throughout the informant interviews and focus groups in Thailand and the Mekong. Thailand organised one technical visit to Brazil in 2007 and three in 2008. There were also several private sector delegations to Thailand to participate in the World Tapioca Conference in January 2009 and the World Alternative Energy Sciences Expo in February 2009. After coordinating several official visits during her tenure of nearly four years as Thailand's Ambassador to Brazil, Ambassador Siree Bunnas suggests that Brazil's ethanol success is based on a long term policy of governance and strong determination to development the agroenergy sector over a sustained period of time. She has been impressed with the coordination to make the strategy work from the choice of raw material to agricultural research to equipment. Thailand can learn from Brazil's approach, Siree Bunnas suggests, by prioritising the need to share knowledge and adopt holistic and consistent policies (Interview 11 November 2009).

The Brazilian experience with bioenergy

The necessary villain of the agroenergy story is the market. The market price driver for biofuels is the key to how the story unfolds.

Miguel Domingos Oliveira, Araguari, Minas Gerais, Brazil, January 2010

In the 1970s, in response to the first oil crisis, the Brazilian government decided to develop sugarcane-based ethanol to stimulate agroenergy alternatives to costly oil imports. For Brazil, the development of ethanol had a two-fold objective: to reduce energy imports and to encourage energy independence (Itamaraty 2007). In addition to being a strategic policy choice, Brazil's ProAlcool national ethanol programme provided an economic opportunity for more efficient use of the agricultural sector (Simões 2007; Goldemberg 2009). Export-led development was not the driver (Kimble 2009).

After the second oil shock in 1979, a comprehensive programme of financial incentives was put in place to assist in developing new sugarcane plantations and ethanol-based vehicles. The subsidies were maintained due to the low international price of oil during the mid-1980s, which eroded the credibility of the ethanol programme. Consequently, the decision was taken in 1989 to dismantle the economic incentives as part of the country's broader move to deregulation. The reduction in subsidies resulted in a significant reduction in the use of hydrous ethanol. The private sector gradually took over the planning and management of the industry from the Sugar and Ethanol Institute, which had been the regulator of the industry for over six decades. In 1993, a blending requirement was introduced mandating that 22% of anhydrous ethanol be added to gasoline. This range of the current blending requirement is flexible between 20 to 25% (www.sugarcanebioethanol.org).

Brazil's national biofuel programme is estimated to have cost the Brazilian Government approximately US$4 billion accompanied by targeted subsidies to the emerging ethanol industry, sugarcane ethanol production in Brazil today is an independent, self-standing operation, which has resulted in the savings of over US$100 billion by some estimates. It has made Brazil the leading global ethanol exporter.

Subsidies for the production of ethanol were gradually dismantled by 1999. Today, ethanol in Brazil is not a subsidised sector. Investment by the automotive industry in flex-fuel vehicles, which can run on a blend of gasoline and ethanol, has been successful. Ethanol use has been integrated with the automotive sector to the extent that 90% of all cars are flex-fuel

(Coelho 2006). That means that consumers have the choice to fill the tank of their car with ethanol or petroleum. When the price of ethanol rises, consumers can switch to oil at the tank. Sugar mills also have the alternative whether to produce sugar or ethanol.

As explained in the Federal Government's *Agroenergy Plan 2006-2011*, Brazilian agroenergy policies are prepared by the Ministry of Agriculture, Livestock and Food Supply to ensure the competitiveness of Brazilian agribusiness. The public policy objectives are three-fold: social inclusion, regional development and environmental sustainability.

In explaining the relevance of the Brazilian ethanol experience for Thailand, a representative of the Brazilian Sugarcane Industry Association (UNICA) emphasises that stimulating local production and domestic demand in these times of financial difficulties makes a lot a sense, and is probably much better use of public spending in the long term than, for example, tax relief on consumption. Notwithstanding the fluctuations in oil prices, this interviewee's view of the Brazilian experience is that the lesson to be learned is not to give up on a renewable energy programmes if oil prices fall (as was the case in Brazil), as oil prices are not likely to remain in the lower range of US$40 to US$60 per barrel. Therefore, national strategies that shift dependence on imported oil towards bioenergy should be considered as an investment in the future, and a cleaner one, especially given that ethanol does not displace the core production of oil, but marginal oil that is more costly to extract and more polluting (e.g., tar sands).

While Brazil has in place a long standing ethanol programme, biodiesel is in the process of being developed. The Biodiesel Law (2005) establishes a minimum blending requirement of 2% by 2008 and 5% by 2013. Reflecting an innovative policy tool to stimulate social inclusion, a system of tax incentives was established for smallholder production in the north and northeastern regions of Brazil. The *Selo Combustível Social* (Social Fuel Seal) permits biodiesel producers who source their feedstock from smallholder cooperatives in poor regions to benefit from a reduction in federal income tax and access to financing from the Brazilian Development Bank.

Miguel Domingos Oliveira, who has devoted his life to the land and local political involvement, has spent a lifetime engaging in cattle ranching and soya, sugarcane and manioc (cassava) cultivation. Oliveira (81) believes the necessary villain of the agroenergy story is the market. The market price driver for biofuels is the key to how the story unfolds. There is scope, however, for government investment in its development as "a socially important element of the rural landscape in agriculturally plentiful developing countries" (Oliveira interview 4 January 2010).

to 45: Miguel Oliveiro, Brazilian agro-ıstrialist

Lessons learned: supporting energy transformation or subsidising inefficiency?

Interviewees from international organizations emphasized the need to consider the lessons learned from the bioenergy experience of developed country. Two scholars, Mario Giampietro and Kozo Mayumi emphasise governments are looking to biofuels as a panacea to solve the threats of peak oil and climate change. In *The Biofuel Delusion: the fallacy of large scale agro-biofuels production,* Giampietro and Mayumi (2009) demonstrate the multiple ways in which this solution is a mirage. Stimulating biofuels in an attempt to replace fossil fuels, the authors argue, will only create more problems than they purport to solve.

As is clearly evident from a review of the literature, large-scale biofuels production in the United States and European Union risks not delivering net energy gains (in relation to energy spent), nor contributing to the mitigation of climate change (in terms of net greenhouse gasses emitted), while concurrently imposing greater collateral costs on biodiversity, habitat and traditional-farming systems. It is important to emphasise that the case made by Giampietro and Mayumi is against large-scale agroenergy production, with examples from the US and the EU. Giampietro and Mayumi (2009), thus, argue that the "biofuel bandwagon rolls on relentlessly in Western governments" in part due to a lack of sound scientific analysis.

In this respect, this thesis puts forward two main lines of argumentation. First, this type of analysis constructed by Giampietro and Mayumi and others against biofuels is focused on the large-scale production experiences in the OECD. It does not take into account the experience with, and potential for, more efficient biomass use in developing countries from the perspective of available energy options. In the Mekong, the evidence in this research makes the case for smaller-scale integrated production to reduce local and regional dependence upon imported energy. Moreover, their analysis does not acknowledge energy poverty and the fact that, for example, burning fuelwood remains predominant in many developing countries. There is, therefore, an urgent need to separate the different realities underlying biofuel development in order to allow the policy space for developing countries, such as those in the Mekong, to legitimately construct development alternatives that are realistic and sustainable. Sustainable bioenergy, thus, is possible under certain conditions and bearing in mind various natural limits. Waiting for second and third generation technologies to be commercialised will be an important development – in 10 to 15 years time. However, as noted by several interviewees, the promise of these technologies does not help us today.

Nevertheless, there is a tendency in Thailand and the Mekong region to view biofuels as panacea to solve a host of development and energy concerns. This observation was confirmed by the interviewees. Biofuels are politically attractive based on their promise to stimulate national development in general and rural livelihoods in particular. Walden Bello, a researcher with the Centre for the Global South and vocal critic of neo-liberal policies in developing countries, considers biofuels to be a "technical fix" or a BandAid solution to the energy-climate crisis (Interview 21 February 2009). The root of the crisis, Bello argues lies in the unsustainable industrial model of agriculture that externalises the environmental and social costs of production in a quest to produce more with less at any expense. Walden Bello joins Henry Saragit (La Via Campesina), Wichita Chusakul (Northeast Thailand Network Foundation) and Sawad Uppahat (Assembly of the Poor) in their call for ASEAN Director General Surin Pitsuwan to address the roots of the problem. Their proposal to Surin Pitsuwan at the ASEAN Peoples' Forum focuses on agrarian land reform to prepare the ground for greater sustainability in the region (Interviews and conference participation 21 February 2009).

Reference in the interviews is often made to the role of agricultural multifunctionality in developing countries. In other words, the agricultural sector in the Mekong region has a role to play in economics and trade, but also, as the continuing basis for livelihood improvement amongst the region's majority of poor, rural smallholder farmers.

5.4 Global concerns, regional trends, local narratives

Being a tiger is not important. What is important is to have enough to eat and to live.

I used to say that this sufficiency doesn't mean that each household has to produce its own food, weave its own cloth. That is too much. But within a village or a district, there must be a certain amount of self-sufficiency. Anything which can be produced beyond local needs can be sold, but maybe not sold too far away. To minimise transport costs.

If we can change back to a self-sufficiency economy, not completely, even not as much as half, perhaps just a quarter, we can survive.

But people who live the modern economy may not agree. It's like walking backwards into a khlong.

His Majesty King Bhumipol Adulyadej, 4 December 1997

2010 will be seen as the point where the discourse shifts from only focusing on emission reductions in developed countries to also considering the shifts in growth pathways of developing countries.

Mukul Sanwal, climate change expert, 2010

Decentralised processes of globalisation have accompanied a significant theoretical shift. The multiple modernities thesis thus emphasises regional constructions of modernity. It argues that it is in the individual interest of each Mekong countries to interpret modernity on their own terms – collectively.

This thesis rests on a continuing analysis of empirical evidence in a particular region – the Mekong. It is a region in which all the players aside from Thailand have only recently entered the international trading system. It is a region of agricultural abundance in the context of great disparity in stages of development. These disparities make it imperative to approach the policy making nexus of agriculture, energy and trade from a regional perspective to capture the benefits and avoid the negative consequences of development.

Perspectives of globalisation that encompass these positive consequences are more nuanced than previously advanced by critics. The bioenergy discourse should be considered in the context of this wider vista of a paradigm shifts. These shifts encompass the forces of globalisation and the transformative local practices in the creation of a regional modernity.

This does not mean that the Mekong region can avoid greater integration in the wider economic system. Nor that this would be desirable. However, it maps the policy space that is opened up to address the specificities and particularities of a Mekong interpretation of modernity through greater regional integration. It is an open question if this transformation will manage to overcome the pitfalls inherent in the Western centric path towards modernisation.

The theory of multiple modernities advanced at the outset of the research has several contributions to make as an underlying guiding concept for the analysis. It emphasises the multifaceted implications of globalisation on the nation-state, resulting in a transformation of its functions and powers (Martinelli 2000). This transformation is re-embedding the nation-state in complex transnational, regional and local networks. Nowhere is this phenomenon more apparent than in agroenergy development. By way of illustration, the previous chapter outlined the regional implications of Thailand's agricultural support and investment practices. In order to allow for the full menu of policy options related to agroenergy to be discussed, this research has moved beyond an abstract discussion to examine specific and concrete aspects. This has led the research conclusions in the next chapter to be revised guided by a theoretical framework that reflects a regional focus for the interpretation of modernity.

Thailand's bioenergy narrative is not an entirely new story. The biofuel initiatives at Chitralada have enabled Thailand to start building a path towards renewable energy sources since the mid-1980s. Yet, the context for this development has evolved. As this research has illustrated, local narratives are adapting to socio-ecological changes in the Mekong based on local contexts and connections in each country.

Pasuk Phongpaichit uses the above quote to emphasise a fundamental shift in the conceptualisation of modernity in Thailand in the aftermath of the Asian economic crisis in 1997. She highlights the shift in mindset concerning "history's march to modernism" as opposed to the merits of "walking backwards into a khlong":

> Since the early 1980s, ideas about the importance of locality and community have been proposed in opposition to the emphasis on growth and urbanisation. This 'localism discourse' has largely been ignored by mainstream economists and social scientists. If it is addressed at all, [...] it is seen as futile attempts to obstruct history's march to modernism in the name of backward-looking rural utopianism. Yet this discourse, and in part some of its key words – locality (*thongthin*), community (*chumchon*), self reliance (*pheung ton eng*), self sufficiency (*pho yu pho kin*) have received considered prominence in the context of the crisis (Pasuk 2005).

Elements of the 'localism discourse' described by Pasuk are relevant to the current global economic and environmental crises. Local definitions to global climate change concerns are arguably the main concrete way in which to effectively tackle the need to reduce dramatically greenhouse gas emissions. Several interviewees considered that developing countries are effectively being asked to forfeit the path to economic growth as it has been defined in the past. That is to say sustained economic growth linked with rising energy consumption. If the task of governance is as demanding as it is complex, governments will not be alone in shaping the emerging transition to low-carbon economies in Thailand and the Mekong. Increasingly, non-governmental actors ranging from environmental organisations to private sector corporations are helping to define the parameters of governance and monitoring implementation of development strategies.

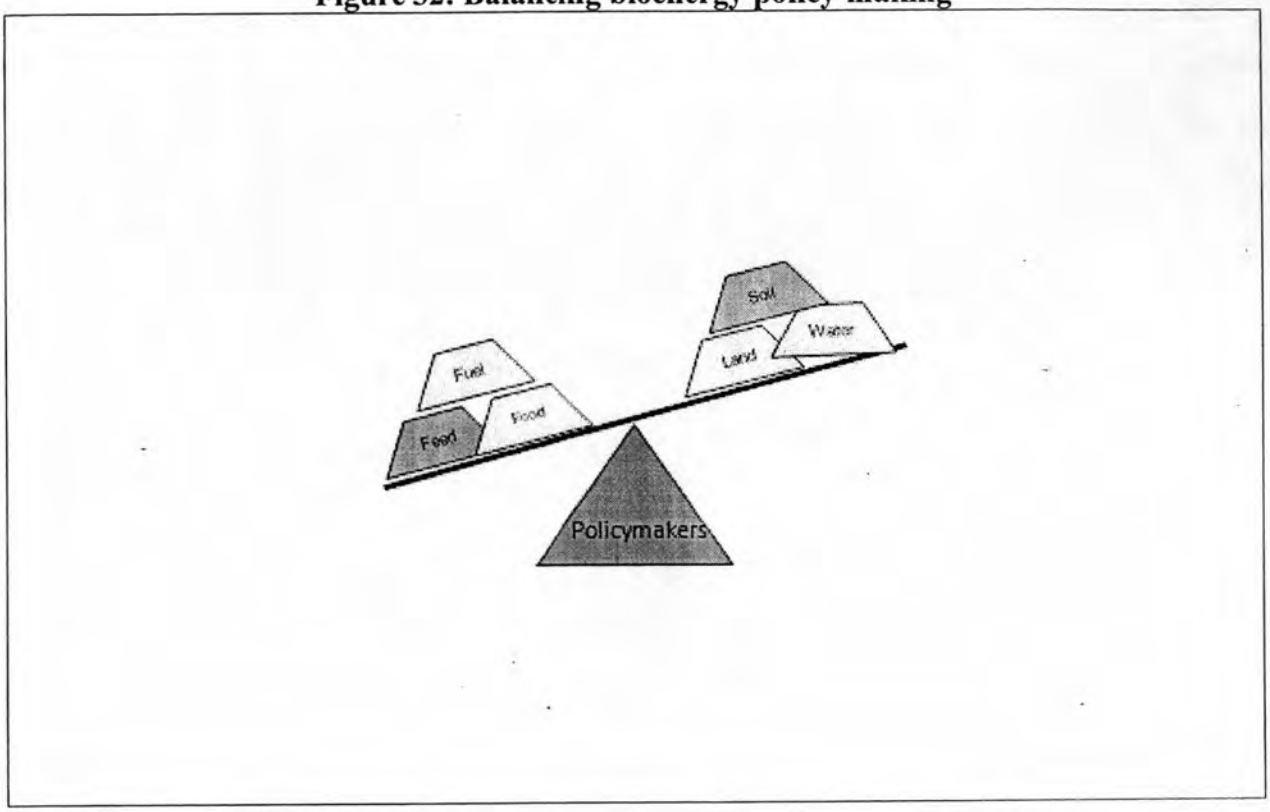
The theoretical underpinnings for this research set out in Chapter II posited that globalisation has made it possible for a host of other non-governmental actors to help shape the future. If past practices are deemed to be unsustainable, governments are being called upon to lead the way forward towards a more sustainable energy future. Nevertheless, although targeted government intervention is now seen as acceptable and, even necessary, there is no consensus on *how* best to intervene to stimulate energy security, whilst growing the economy in an ecologically sustainable way that does not bankrupt the public purse.

In the post-Washington Consensus era, strategic policy intervention is being positively reassessed. Jeremy Carew-Reid, a long standing sustainable development expert with the International Center for Environmental Management in Vietnam, stresses that the nexus between food and fuel is first and foremost with mitigation (the agriculture sector contributes 12-14% to global greenhouse gas emissions). If it is not dealt with at the outset, then the management of the agricultural system will also have consequences for climate adaptation (Interview 3 February 2009). As these narratives unfold, the theory of regional modernities suggests that there will be greater emphasis on collective action to protect public goods and shape regional policy space to construct a pathway for sustainable development.

As illustrated by the case narratives in this chapter, balancing the various aspects involved in the policy nexus of agroenergy is a challenge, particularly in the face of environmental constraints, such as land fertility and water availability (figure below). The

point is that synergies between food security, rural resilience and environmental sustainability are a public good that governments need to actively promote.

Figure 32: Balancing bioenergy policy making



The task ahead, however, is not so simple. The odds of making the transition to a low-energy economy in Thailand and the Mekong, some informants consider, are small. Ensuring the sustainability of biofuels development represents an extraordinary challenge, given the domestic political constraints in Bangkok and powerful vested agro-industry interests. The many government officials and activists seeking to emphasise community sufficiency solutions therefore need to fundamentally rethink their strategy and expectations for the region's energy future.

Local involvement in Thailand

> *The protests in defence of resources drew on powerful traditions in the peasant community. Over the century of the expanding land frontier, Thailand had developed a peasant society which was possibly unique.*
>
> *For villagers, these resources of land, water and forests are the basis of their livelihood. They fight to defend them.*
>
> Pasuk & Baker, *Thailand's Boom and Bust*, 1998

According to the Asian Farmers Association for Sustainable Development, smallholder farmers serve as the "stewards of the land," who are more likely to use sustainable farming methods and practice integrated, diversified crop rotation to satisfy their nutritional needs, reduce their risks and maintain soil fertility (AFA 2009). For example, Thai farmers traditionally have intercropped rice and soybeans.

Emphasis on the vital role of small-scale farmers is reinforced by the UN International Assessment of Agricultural Knowledge, Science and Technology for Development, compiled by over 400 independent experts during four years (IAASTD 2009). Representing a sobering account of the failure of industrial farming, this 2,500-page report entitled *Agriculture at a Crossroads* highlights that small-scale farmers and agro-ecological methods are the way to meet the needs of local communities while building resilience and sustainability.

Thailand's history of the countryside and its farmers is important to this discussion for at least two reasons. First, it is relevant to understand how the current situation evolved and the roots of the strong community culture in Thailand. In this respect, there is a wealth of literature from which to draw. Second, this is the model that in part is being utilised to expand the rural frontier in the rest of the Mekong – with potential for positive and negative implications for sustainable development.

Hayami (2001) describes the processes of different ecological conditions and historical trajectories interacting to create different social and cultural systems and resulting in major differences in economic performance and agrarian structures. Indonesia developed based mainly on exploiting tropical rain forests under Dutch colonialism, which divided the rural sector between rice-farming peasant owners and large export oriented plantations for tropical crops with hired labour. In the Philippines, the Spanish exploitation of the same resource base led to landlessness among the rural population. Hayami describes how

"relatively homogeneous landowning peasants continued to dominate in Thailand, where delta plains that were suitable only for rice production formed the resource base for development." These different agrarian structures associated with different social value systems have accounted for differential development performance across the three economies in the recent three decades (Hayami 2001).

Several case narratives in this chapter illustrate the contribution of involving local communities to socio-ecological sustainability. Whilst development models promoted during the era of the Washington consensus were based on 'top-down' approaches, there is wide spread acknowledgement amongst development experts of the vitality of 'bottom-up' models. These models have captured the headlines emanating from the international policy community. The World Development Report in 2008 focused on enhancing smallholder farming models of sustainability. Small-scale approaches to dealing with the development agenda are proliferating. Sverre Tvinnereim, a bioenergy expert with the FAO's regional office in Bangkok, cites success stories from a recent FAO report (2009) on small-scale agroenergy initiatives in countries as diverse as Mali, India, Brazil and Vietnam (Interview May 2009). For example, Tvinnereim refers to the project in Northern Thailand to develop community-based biodiesel production for local use from Jatropha involving agricultural cooperatives in Viengsa District, Nan province, Northern Thailand and initiated by Kasetsart University and the Viengsa Agricultural Cooperative.[48]

In this respect, Seri Phongphit, the director of the grassroots Community Enterprise Institute, the Thai community model is well enshrined in its pathway for development as "a reality not just a concept" (Interview 11 July 2009). It has persisted alongside industrial export-led growth for several decades. Pasuk Phongpaichit and Chris Baker (1998), in their seminal work on Thailand's boom and bust economy, expand on the legacy of Thailand's land frontier, whereby forests were cleared at an accelerating rate from around the 1950s. The authors note that over the course of 150 years, peasants cleared twenty million hectares to expand crop exports (Feeny 1982; Hirsch 1990; Mingsarn 2005). Crop productivity was low and there was little investment in improving techniques. The government built roads and drove the pace of agricultural expansion to contribute to export revenues to finance urban

[48] The Viengsa Agricultural Cooperative was established in 1970 to assist farmers in reducing the cost of production. The bioenergy project involves 500 farmers of the 5,000 members of the Cooperative (FAO 2009).

growth through promoting agribusiness (Pasuk & Baker 1998). Already by the 1990s, however, agriculture as a contributor to national wealth had been reduced to a minor role. Nevertheless, Pasuk and Baker, emphasise that "over the century of the expanding land frontier, Thailand had developed a peasant society which was possibly unique."

As highlighted by Pasuk above, the "peasant century" spawned a "countryside of small-scale independent cultivators" and gave rise to the community culture movement (Seri 1986; Chatthip 1988, 1991). Along these lines, the UN International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD 2009) gives a new sense of measure to the way in which people manage agriculture. Their task to assess agricultural systems and knowledge required this expert panel to address:

> the multifunctionality of agriculture, not just as a site for food production, but also as a foundation for communities, economies and a host of ecological relationships. There are vital links in agricultural systems with internalisation of environmental costs, availability of and access to public goods, such as biodiversity, and ecosystem services. These are vital to achieving development and sustainability.

The term *multifunctionality* has been interpreted as having trade and protectionist implications and has been controversial in global trade negotiations. This is not the definition of the IAASTD report. The IAASTD expert report uses multifunctionality "solely to express the inescapable interconnectedness of agriculture's different roles and functions. The concept of multifunctionality recognises agriculture as a multi-output activity producing not only commodities (food, feed, fibres, agrofuels, medicinal products and ornamentals), but also non-commodity outputs such as environmental services, landscape amenities and cultural heritages.[49]

There are several important factors working against the worst elements of past models being replicated, namely increasing awareness of rights and connectivity to a global community of activists. This is evident, for example, in headlines such as "Land rights links in the spotlight" concerning the decision of the Lao National Land Management Authority to recognise land claims (Vientiane Times 14 January 2010) and the growth and diversity of farmers cooperatives and socio-environmental non-governmental organisations operating in the Mekong region.

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[49] The working definition proposed by OECD, which is used by the IAASTD, associates multifunctionality with the particular characteristics of the agricultural production process and its outputs; (i) multiple commodity and non-commodity outputs are jointly produced by agriculture; and (ii) some of the non-commodity outputs may exhibit the characteristics of externalities or public goods, such that markets for these goods function poorly or are non-existent.

Recalling Habermas that modernity is an incomplete project, the argument is put forward that *regional modernities* are constructed based on *creative local practices*. These practices are not found in the halls of the World Bank in Washington, or in the FAO in Rome or the OECD in Paris. Rather, the way forward in the post-Washington consensus era is to recognise diversity in bringing about change and provide a supporting international framework with this flexibility in mind.

The worth of the empirical case narratives of bioenergy development in Thailand and the Mekong is to map out how this change looks like in the field. There are alternatives to the failed model of highly subsidised agroenergy in the US and the EU, on the one hand, and, on the other hand, the Brazilian success story, which many analysts consider is not entirely transferrable to other developing countries for the reasons outlined in Chapter V. The alternatives are illustrated by small-scale oil palm production that is vertically linked into a national supply chain (cases 1 and 2).

By exploring the multifaceted linkages between modernity (in theory) and development (in practice), it is possible to increase the knowledge of how to achieve sustainable development with policies that work. Localities can adapt to changing circumstances and act to shift the paradigm of modernity. In this way, it is possible to go beyond Rostow's *Five Stages of Economic Growth* as a necessary precondition for all societies to modernise. Until the early 1980s, the theoretical model for understanding modernity and the process of modernisation was based on a linear, predefined path to industrialisation. To a great extent, the assumption was that modernity and modernisation were inevitable, predictable and uniform. The standard model was a Western-centric experience emanating since the Enlightenment onwards as set out in Chapter II.

The theory of multiple modernities, however, allows for the conceptualisation of modernity based on a diversity of empirical reality. Basically, the theory of multiple modernities argues that features of modernity can be expressed in different ways in different places and localities (Martinelli 2005), as well as different regions (Agrawal & Sivaramakrishnan 2003). The contribution of this research to this discussion is that it needs to be expressed in terms of natural resource frontiers or agro-ecological regions.

The uniform, standard path to modernity has been rejected – or at least suspended, because of the financial crisis and ecological breakdown. That is to say that just as the Easter

Islanders, according to the powerful analysis by Jared Diamond in *Collapse: How Societies Choose to Fail or Succeed* (2005), were not modern, they nevertheless still managed to destroy their civilisation by neglecting the environmental foundations. In contrast, the Western-centric model of development has damaged the planet by modernising. The point is that in terms of socio-ecological sustainability, the post-Brundtland construction of modernity, different societies can be *modern* without replicating the West. More to the point, from a socio-ecological perspective, it is imperative to do so.

This change in the fundamental premise of development is not merely interesting as a theoretical construct. The relationship between humankind and nature has a direct impact on our quality of life. Development is underwritten by how we define this relationship. The implications for development of bringing about a new paradigm of sustainability can: (i) change the relationship between modernisation and development to allow for greater equity and ecological sustainability; and (ii) change the role of the nation state that has been so pivotal to the project of modernity. In these two respects, we need more integration of different policies and more intervention to manage markets (Martinelli 2005; Rodik 2007).

5.5 Conclusion: an emerging regional modernity

Thailand can't run away from its neighbours;
It is a tenuous position to be rich amongst the poor.

Samai Jai-In, Energy Expert, Royal Thai Navy, 10 November 2009

After centuries of an increasingly centralised energy economy, could energy once again become a local matter? This is the aspiration in theory of Thailand's Ministry of Energy. Since 2003, energy self sufficiency has moved one step closer to becoming a reality in practice for over 500 local communities in Thailand. This is exemplified by local farmers in Vanghinlad, Northeastern Thailand (case narrative 2).

The model put forward in Thailand to integrate small-scale community biodiesel production and use is an attractive alternative to empower rural energy sufficiency. The field work in Rangsit (case 1) and Aoluk, Krabi (case 3) illustrates the success in implementing this model in two regions of Thailand. As outlined in this chapter, the purpose of the models employed in the case narratives is to lower energy input costs and increase farmer income. The possibility exists to integrate small-scale community-based production into the national commercial biodiesel system, as in the former Rangsit tangerine orchids (case 1). There is

also potential to remodel local energy systems while simultaneously increasing the sustainability of agricultural practices and efficiency of natural resource use, as in Vanghinlad Tambon (case 2).

The fact that the Thai agricultural transformation has its roots in the concept of Sufficiency Economy, many Thai interviewees emphasised, has a role to play in invigorating the conceptual framework for a sustainable energy transformation. In other words, in the words of a local informant for this research, "farmers are key front-line environmental stewards with the local knowledge and resilience to guide sustainable resource management." In this way, this research provides evidence that Thailand's community biodiesel programmes have the potential to put into practice local energy sufficiency, whilst simultaneously adding value to agricultural activities and decreasing input expenditures on petroleum and chemical fertilisers and pesticides. This is the objective of Pra Tawee, Sawaeng Ruaysoongnern and Thong Mo in promoting sustainable and integrated agricultural practices for the Thai farmers in Suphanburi.

Chatthip Nartsupha has been criticised for romanticising the Thai village through the idealisation of a community culture (*watthanatham chumchon*), arguably in defiance of the drive towards modernisation in the 1980s (Thongchan 2008). The purpose of this thesis is not to further challenge the myth of a static subsistence economy paradigm, which has been addressed by scholars elsewhere (Bowie 1992; Rigg 2001; Rigg 2008; Thongchan 2008). Certainly, Thailand has long engaged in regional and international trade networks. The purpose of this research, however, is to accentuate the elements in Chatthip's narrative that have a role to play in crafting a dynamic and sustainable path forward. As noted above, Chatthip's emphasis on the resilience of the rural economy holds relevance for current discussion of the agricultural sector in the Mekong. Many of the informants during this research commented on the negative consequences of the neglect of this pivotal sector in the Thai economy. To the point, Pasuk Phongpaichit and Chris Baker (1999:129), scholars of the Thai economy and the English translators of Chatthip's *The Thai Village Economy in the Past*, posit that the economic crisis in 1997 "revealed Thailand's underlying reliance on the village economy for food."

Similarly, soaring petroleum prices in 2008 revealed both the reliance of the village economy on costly energy inputs and the possibility to use Thailand's rural economy and

abundant agricultural potential for energy (Ammar Interview November 2008). The scope to cogenerate energy in the agricultural sector was reiterated by the interviewees. This thinking explains efforts to build energy self sufficiency by strengthening biodiesel production and use in over 500 communities across the country. Building energy self sufficiency at the local level, proponents argue, would entail a rebalancing of the rural economy with other sectors of the national economy. This is an important aspect of the Thailand's biofuels narrative that emerged from the informant interviews at all levels. Moreover, this small-scale, local livelihoods approach is highlighted in several recent reports (ADB 2009; FAO 2009; USAID 2009; World Bank 2008). As will be discussed in the next chapter, this approach is not without its critics.

There is a high likelihood that this model of community energy sufficiency and agricultural sustainability will continue to be further entrenched in Thailand. The question is whether it will be the model that is advanced in neighbouring countries in the Mekong, where Thailand's investment in bioenergy is flourishing. To date, this has not been the case. Herein lies the cause for concern for trade in bioenergy in the Mekong annunciated in the next chapter.

Interviewees point to the fact that Thailand has initiated technical assistance cooperation in the Mekong region to transfer knowledge on the sufficiency economy. Nevertheless, lack of regional leadership to transfer best practices and sustainable farming practices in agroenergy is the main reason why the evidence flowing from the cases outlined in the second group of the narratives is mixed. There is potential for sustainability and prosperity, at the same time, the risk exists that socio-ecologically destructive investment patterns will be perpetuated. The outcome depends on the nature of contracts established and contribution to local value addition to the agricultural sector. The eventual outcome, in large part, will be based on the way in which the scenarios constructed in the next chapter unfold.

As Thailand rethinks the operational assumptions surrounding agriculture, land and water use, thus, there are "bright spots." These bright spots are centered on existing small-scale innovative practices and strategies to reverse natural resource degradation and build resilience at the local level (Interview with Ratner 2 February 2009). These bright spots emanate from increasing awareness of the value of biodiversity conservation and sustainable

agricultural practices on improving quality of life and local livelihoods (Interview with Blate, WWF 2009).

The contribution of this chapter is to provide on-the-ground case narratives that can start to construct a bridge to a future picture of sustainability in the Mekong region. This necessitates local narratives reaching through the policymaking complexities to reach national and international decision makers. Contrary to much of the literature to date, the overall picture emerging from the case narratives covered in this chapter portrays a reinvigorated countryside and complex agrarian mosaic in the Mekong. This counterbalances the common viewpoint concerning the 'fading away of a peasant world' and ushers in the possibility of defining the landscape for a post-agrarian society. On the basis of the evidence in this research, we can see clues as to the future of agriculture in the Mekong.