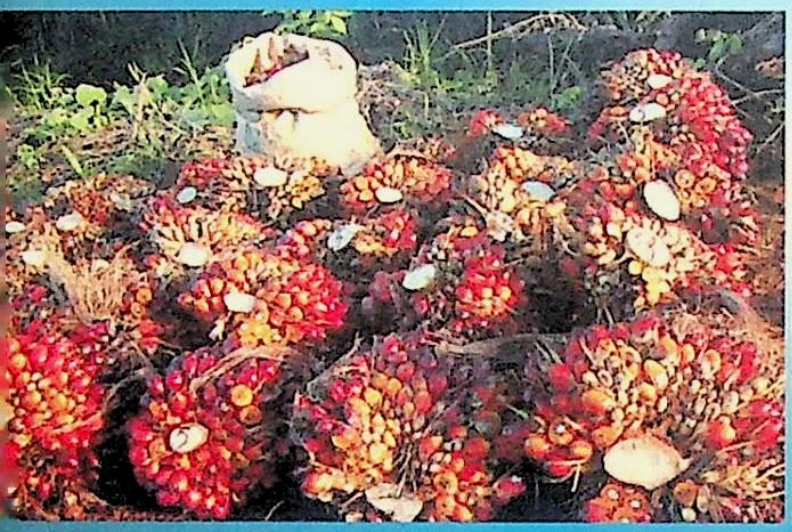
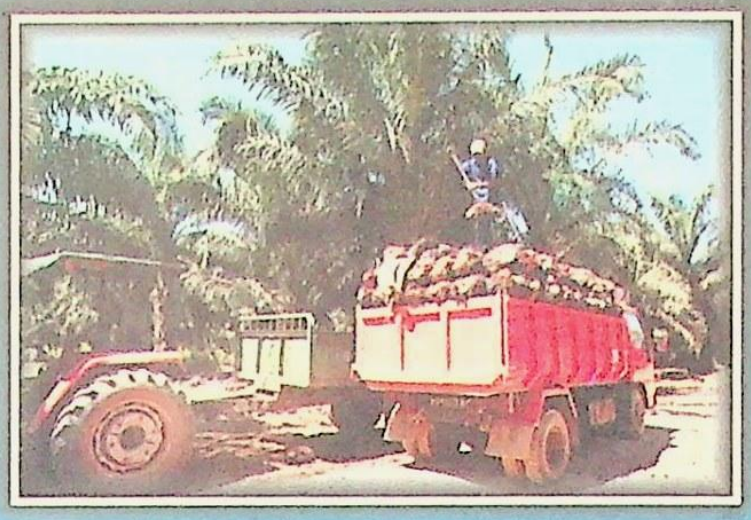
Socio-economic dynamics of biofuel development in Asia Pacific





Christina Schott

FRIEDRICH EBERT STIFTUNG



The significant developments of biofuel production in recent times have been discussed predominantly in terms of their environmental costs and benefits as well as their general economic potential. Yet, what has been partly neglected was the biofuel balance with regard to the social impacts from the production of biofuel feedstock by plantations and smallholders throughout Asia. While there is of course local awareness concerning the rights of indigenous peoples and local land rights disputes, the production of biofuels also severely influences the lives of plantation workers and small holders working on a contract basis for big agribusiness enterprises.

While the corresponding social impacts may not necessarily be restricted to the production of biofuels – they also occur in the corresponding large-scale production of other agricultural staples – the development of biofuels has the potential to lift these problems into new, hitherto unknown dimensions. In addition, the demand for agricultural staples like palm oil for biofuel production also threatens to crowd out the demand for agricultural staples for nutritional purposes. The associated critical agricultural dynamics also led to the adoption of the term agrofuels by the more critical scholars and activists, in order to highlight these problematic aspects.

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EXECUTIVE SUMMARY/ FOCAL POINTS

- While initially promoted as a solution for energy self-sufficiency and reducing greenhouse gas emissions, the production of many biofuels has turned out to be far from sustainable. The carbon balance often proves to be negative when natural areas are converted into plantations and forests destroyed. In many feedstock producing countries, the use of farmland for energy crops endangers food security.

- Newly introduced certification mechanisms in Europe and the USA do not take into consideration the social impacts of biofuel feedstock production on communities living and working in feedstock producing areas. Certifications will only be effective, if they include all large biofuel consumers. China and India introduced biofuel mandates and producers in developing countries no longer depend on Western demand.

- While China, Japan and South Korea are heavily investing in the biofuels industry, most of the feedstock will be produced in Southeast Asia and Pacific countries. Feedstock producing countries show a certain regional pattern:

  - Equatorial countries Indonesia and Malaysia, with Singapore as their logistics centre, take the lead in biodiesel production from palm oil. They are followed by Thailand, the Philippines and their Pacific neighbour Papua New Guinea.
  - The Mekong countries focus instead mainly on biodiesel from Jatropha curcas with Myanmar currently trying to push the world's largest Jatropha cultivation project.
  - The Philippines concentrate on biodiesel production from coconut oil.
  - Bioethanol is mainly produced from cassava and sugarcane. Thailand and the Philippines are the largest producers in the region.

- Second-generation biofuels derived from non-food biomass such as algae or cellulose-containing plant residues are the best alternative for slowing down the current worrisome dynamics. However, since these technologies are not commercially viable yet, immediate hope now seems to lie with biodiesel produced from Jatropha curcas. In 2010 about 5 million hectares of it will be planted worldwide and more than 85 percent will be located in Asia. Yet, with no long-term experience in the production of Jatropha-based biodiesel, the Jatropha boom bears significant risks.

FOREWORD

Recently, significant developments in biofuel production have been discussed predominantly in terms of their environmental costs and benefits and their general economic potential. However, ***the biofuel balance with regard to the social impacts of the production of biofuel feedstock on plantations and by smallholders throughout Asia*** has been more or less neglected. There is of course local awareness concerning the rights of indigenous peoples and disputes about local land rights, but the production of biofuels also severely influences the lives of plantation workers and smallholders working on a contract basis for big agribusiness enterprises. While the corresponding social impacts may not necessarily be restricted to the production of biofuels – they also occur in the large-scale production of other agricultural staples – the development of biofuels has the potential to lift these problems into new dimensions. In addition, the demand for agricultural staples such as palm oil for the production of biofuel also threatens to crowd out their use for nutritional purposes. There is criticism on the agricultural dynamics caused by this development and some critical scholars and activists have adopted the term ***agrofuels***, in order to highlight these problematic aspects.

The dynamics of biofuel production will accelerate significantly in the mid- to long-term perspective in view of increasing energy demand worldwide for economic growth, continuously decreasing

fossil energy resources and the climate balance of fossil fuels. Working in the country with the highest palm oil output in the world, FES Indonesia has therefore initiated a project of mapping biofuel developments and dynamics in Southeast and East Asia. The project focuses especially on the social consequences. The analysis and the corresponding country profiles shall provide a more comprehensive picture concerning this topic. The project is meant to be a starting point for a more broadly informed debate about biofuels development at regional and global level. The report focuses on the major players in the Asia-Pacific region and refers to dynamics in other regions when necessary. This geographic limitation is predominantly a result of pragmatic considerations and does not imply any conception of geographic regions as such. It merely puts emphasis on a set of countries which are especially affected by the biofuel development dynamics.

Yet, it has to be acknowledged that – due to the topical nature of the developments – the statistical basis for in-depth quantitative cross-country comparisons is far from sufficient. Definitions and volumes of available data vary from country to country. Their measuring units are not the same either which is shown in the level of data aggregation of the data referred to in this analysis. The analysis presents broadly identifiable trends and dynamics and quotes specific data where available. These limitations notwithstanding, it provides a clear-cut picture of some crucial dynamics emerging in the field of biofuels in Asia Pacific, which are alarming in many regards. But it also indicates the potentials of these developments and shows how to reroute these developments in a more sustainable and socially just direction.

We would like to thank Christina Schott for her tremendous efforts in compiling this innovative and comprehensive analysis from a huge

variety of publicly available sources. With this analysis we hope to contribute to a critical and comprehensive reflection of the dynamics in the development of biofuels in Asia and the Pacific. It should help decision-makers to identify the risks and problems associated with this development more clearly and to make better and more responsible use of the potential that lies in the development of biofuels.

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Christina Schott, born 1971, graduated in German literature, journalism and psychology from Hamburg University before completing her professional training at the Henri-Nannen School of Journalism. Yearning for the Far East and having travelled there several times, she left Hamburg and her job as an editor at the weekly magazines Stern and Hoerzu in 2002. As a fellow of Germany's International Journalists' Programmes she worked with the Jakarta Post for several months and later stayed on in Indonesia as a freelance correspondent for German print media. In 2004, she co-founded the German correspondents' network "weltreporter.net" which today comprises 40 freelance correspondents all over the world. Christina regularly contributes to Stern Magazine, Die Zeit, Asia Pacific Times & other German media, and also to the Jakarta Post. She reports from Malaysia, Singapore, Thailand , and other ASEAN countries. Her priorities are socio-cultural and environmental topics. Her interest in biofuels production and its social and environmental consequences arose in 2007 when she first saw the living conditions on and around oil palm plantations in Kalimantan, Indonesia

TABLE OF CONTENT

Executive Summary/Focal Points.....*iii*

Foreword.....*v*

About The Author.....*viii*

Introduction.....*1*

What are Biofuels?.....*9*

Life in Southeast Asian Plantation Areas.....*14*

Kingdom of Cambodia.....*20*

People's Republic of China.....*29*

Republic of Indonesia.....*43*

Japan.....*59*

Republic of Korea.....*69*

Lao People's Democratic Republic.....*77*

Republic of Malaysia.....*83*

Union of Myanmar.....93

Papua New Guinea.....99

Republic of The Philippines.....106

Republic of Singapore.....117

Kingdom of Thailand.....124

Democratic Republic of Timor Leste.....133

Socialist Republic of Vietnam.....140

Analysis.....147

Outlook and Conclusion.....160

Sources.....165

INTRODUCTION

Only a decade ago, Western politicians started presenting biofuels[1] as a major achievement for the global environment: Fuels derived from biomass were celebrated as a relatively simple way to decrease the dependency on fossil fuels and to reduce harmful greenhouse gas emissions. At the beginning of the 21st century, governments in Europe and North America introduced subsidies and tax breaks for biofuels production and implemented gradually rising mandates for the use of biofuels.[2]

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[1] There are controversial perceptions of the term biofuel versus agrofuel: While government and industry sources use biofuel, many NGOs – especially if opposing the development – prefer agrofuels. They argue that people might be misled by the syllable "bio" and imagine a clean, environmentally sound product. Without intending to evaluate it, this analysis will use the term biofuel in the sense of the very root of the word: fuel derived from a biological mass.

[2] The US Energy Policy Act of 2005 requested the introduction of a Renewable Fuel Standard Programme starting with a 2.78 percent share of bioethanol in the national gasoline consumption by 2006 (US Environmental Protection Agency). For 2010, the USA have set a 100-million-gallon bioethanol mandate, which most probably will be reduced, because there is not enough feedstock available. The European Biofuels Directive of 2003 set a first target of a 2-percent-share of biofuels in the energy consumption of the European Union by 2005, which then was not met. The target for 2010 is 5.75 percent biofuels.

The challenge of sustainability

In recent years, however, it has become clear that the production of many biofuels will turn out to be far from sustainable or even beneficial for the fight against climate change. Palm oil for example – once considered the most economical feedstock for biodiesel – is the main reason for staggering deforestation in Indonesia and Malaysia. Even its carbon balance, currently the main argument in favour of the use of biofuels, is not at all positive when natural areas are converted into plantations and forests destroyed. Especially the burning of peat swamps causes an immense output of carbon dioxide.

Apart from their negative environmental effects, biofuels also affect the world's food supply. Even before utilizing food crops such as corn, soy or sugar cane as energy resources, many countries were already suffering from food shortages. The rapid increase of global food prices in 2008 led to social unrest in several developing countries.

In the meantime, some governments and organisations have started reacting to the food-versus-energy discussion as well as to the strong protests against the destruction of rainforests: European countries for example downsized their initial targets for the mandatory use of biofuels and enacted by-laws for a certified sustainability of feedstocks. China has stopped all subsidies for grain-based biofuels and is currently switching to the production of non-edible crops. Critics, however, see the downsizing of production rather in the context of the global financial crisis: Low petrol oil prices in combination with high feedstock costs have made the production of biofuel far less profitable than the outlook promised only a few years ago. Especially biodiesel from

palm oil led to a series of bankruptcies of biodiesel producers in Australia, Germany and the USA due to high feedstock prices in 2008.[3]
Bioethanol from sugarcane is by far the cheapest option at the moment, but it has recently become rather infamous due to reports about horrible working conditions on Brazilian plantations, the world's largest producers of this feedstock.

New dynamics in biofuel development

Nevertheless, the prospects for biofuels production are improving again: Driven by the mandatory use of biofuels in more and more countries and due to massive over-capacities in production facilities, the market is expected to explode in years to come – especially for biodiesel from so-called second-generation feedstocks such as Jatropha curcas and algae.[4]
2010 will see increasing mandates in the European Union, the USA and Brazil, currently still the world's largest biofuels consumers.[5] Asia's biofuels markets are expected to grow even faster. China, South Korea, Indonesia, the Philippines and Thailand are currently increasing their already implemented mandates. India, Malaysia and Vietnam

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[3] Adnan, Hanim: High CPO price hurting biodiesel industry, The Star Online, 14 October 2009

[4] See chapter "What are biofuels?"

[5] In 2008, Europe still dominated the biodiesel market with 80 percent (Biodiesel 2020: Global Market Survey, Feedstock Trends and Forecasts, Multi- Client Study 2nd Edition, Emerging Markets Online, 2008). The biofuel consumption in Europe will increase by mandates to an average of 6 percent in 2010. The biggest producers and consumers of bioethanol are the USA and Brazil.

announced the introduction of biofuel mandates by 2010. Japan will follow in 2012.
To provide the world's most populated nations with biofuels requires vast resources: While China, Japan and South Korea are heavily investing in their own biofuels industry, most of the feedstock will be produced in Southeast Asia and the Pacific countries. Due to the available landmass and favourable climate conditions, the region has a huge potential for crops such as oil palm, coconut, cassava and Jatropha curcas.

Land conversion and its consequences

This development in biofuel markets implicates the conversion of giant areas of agricultural or natural land to energy crops. Conservative estimations go up to 166 million hectares worldwide being converted to biofuels plantations by 2020.[6] A study by the Cornell University even states that up to a third of all available cropland on earth could be required, in order to produce 10 percent of all transport fuels from energy crops in 2030.[7]
While government officials and industrial players in developing countries expect huge revenues from leasing out land to their industrial neighbours, the communities

[6] UNEP: Towards sustainable production and use of resources: Assessing Biofuels. A summary presentation from a report conducted by the International Panel for Sustainable Resource Management, September 2009.

[7] Ravindranath, N.H. et al.: Greenhouse Gas Implications of Land Use and Land Conversion to Biofuel Crops. In: R. W. Howarth and S. Bringezu: Biofuels: Environmental Consequences and Interactions with Changing Land Use. Report of the International SCOPE Biofuels Project, 2009 (http://cip.cornell.edu/biofuels/)

originally inhabiting these areas often become homeless and jobless and fall victim to the global market mechanisms. The United Nations warned that around 60 million people are in danger of being displaced because of biofuel plantations. Most of the local communities and workers affected by the biofuels development are promised good jobs and huge profits, but they never receive what they expected. Protests are often oppressed by violence. Most of these people either migrate to bigger cities and end up in slums or work under very poor conditions as day labourers on the very same land they formerly owned.

The social destruction and human rights violations caused by converting land to the production of energy crops are widely neglected by the consumers. They are also not adequately taken into consideration in the new bylaws for sustainability in Europe. Currently practiced certification methods concentrate on energy efficiency, carbon balance and environmental impacts. The pressure on local residents and indigenous people to sell or even leave their homeland without any compensation is not taken into account.

Harsh working conditions on the plantations are insufficiently reflected and so is the impact of environmental destruction on social life: Polluted water, acidified and ozone-depleted soil lead to food scarcity, cause health problems and can result in poverty and social unrest. Often entire communities are destroyed, because their members migrate to big cities in search of a better life.

Outline of the study

The following analysis provides an overlook of biofuel production and consumption in Southeast and East Asia[8] and looks at the social impacts including land conflicts as well as living and working conditions in and around the plantation areas. Although India and other South Asian countries are also important players in the global biofuels business, they are not included in this study, since they are not influencing the plantation development in Southeast Asia as much as East Asian countries. They are therefore less responsible for its social consequences. India indeed is a huge buyer of palm oil for example (mainly for its food and cosmetics industry), but it is not yet visibly investing in land use projects or production facilities for biofuels in Southeast Asia.

The study is a compilation of facts and data on the subject and each country profile starts with implemented and planned state policies. This is followed by an overview of production facilities and feedstock as well as an outline of local and international markets for the respective products including a table of related investor projects. These lists, however, are not intended to be exhaustive. The country

[8] The analysis covers all Southeast Asian countries with the exception of Brunei, since the sultanate on the island of Borneo is currently involved in only one small biofuels project outside its borders. Instead, Papua New Guinea is included, as it is closely connected to the palm oil and biodiesel producing conglomerates of Indonesia, Malaysia and Singapore and will receive new biofuel investment from East Asian countries. As main investors from East Asia, the analysis covers China, Japan and South Korea.

profiles close with insights into land use practices and living and working conditions at and around the plantation areas. A final conclusion gives an outlook on the possible development of biofuels production in the region and the impacts it will have on the social development of Southeast Asian countries.

WHAT ARE BIOFUELS?

Biofuels are clean-burning, natural fuels derived from renewable, biological resources. They can be blended with petroleum fuels in variable concentrations. Up to date, biofuels were mainly used for power generation or as transportation fuels in industrial countries. With more and more developing countries following the trend, biofuels are increasingly used for rural electrification and cooking, too. Recently, there have been tests on the use of biofuels for trains and airlines (see Japan chapter).

Biodiesel and bioethanol

There are two different types of biofuel: biodiesel and bioethanol. ETBE (ethyl tertiary butyl ether) is a special modification of bioethanol extracted from ethanol and isobutene. It is primarily used in Japan. Since it has lower water solubility, ETBE can be blended more easily with gasoline than common bioethanol without affecting the quality of the mix.
Biodiesel is usually made of vegetable oils, such as palm oil, rapeseed, soy bean, sunflower or coconut oil. Animal fats and fish oil can also be used for biodiesel production. Biodiesel results from transesterification, a chemical process

using alcohol. Glycerin is separated from the vegetable oil or fat. While glycerin is a by-product that can be processed in soaps for example, the remaining methyl esters can be used as fuel in diesel engines. Most modern diesel engines can run on biodiesel in high concentration (not to be confused with waste oils for specially converted diesel engines).

Bioethanol is normally produced by fermenting crops containing sugar or starch such as sugarcane, cassava or corn. Other methods include destillation or dehydration. Bioethanol consists of the same ethyl alcohol to be found in alcoholic beverages and is usually used for blending gasoline. Many modern engines can run on a 10-percent-blend of bioethanol.The engines have to be converted if higher concentrations are to be used.

The USA and Brazil are the world's largest bioethanol producers and are responsible for 89 percent of the global production in 2008. Their main feedstocks are sugarcane and corn.[9]

The world's largest biodiesel producer was – at least until 2008 – Germany, followed by neighbouring European countries using rapeseed as their primary feedstock.[10] But Brazil is expected to take over this position soon due to a new mandate for biodiesel (based mainly on soy as feedstock). Malaysia is still struggling to approach its self-set target of becoming the largest biodiesel producer by using palm oil.

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[9] Industry statistics by the Renewable Fuel Association, USA, 30 May 2009

[10] Evans, John: Taxing Time for European Biodiesel, Biodiesel Magazine, June 2008

Food crops versus second-generation biofuel crops

Since all of the above mentioned feedstocks are food crops, there is a growing global controversy about food security which is increasingly threatened by agricultural energy crops. More and more countries therefore are researching and developing so-called second-generation biofuels on the basis of non-food energy crops (for example Jatropha curcas or algae), recycled waste oils or cellulose-containing plant residues such as rice husk, wheat straw or wood chips.
China has changed its biofuels policy due to fears concerning food security and is transforming its current biofuel production from using mainly wheat and corn to cassava and Jatropha curcas.
Recent bioethanol research focuses on sweet sorghum (mainly in China) and on the development of cellulosic ethanol derived from cellulose fibres in grass or wood or plant residues. This technology is still very cost-intensive, but seems promising, because it can survive on agricultural or industrial waste such as straw or wood chips. Japan and South Korea are forerunners in the research on cellulose-based ethanol and are motivated by their own lack of agricultural resources. Algae are another feedstock intensively researched by these two countries.
Southeast Asian countries with fewer financial resources have so far focused on feedstock for less expensive biofuel production processes.

Feedstock patterns in Southeast Asia

It is not surprising that Indonesia and Malaysia, the world's biggest palm oil producers, run their biofuel production

almost entirely on palm oil – so does Singapore, the quasi business control centre of its palm oil producing neighbours. Thailand focuses on a mix of palm oil, cassava and sugarcane. The Philippines are leading in the biodiesel production from coconut oil, but are also developing sugarcane and Jatropha curcas as important feedstocks.
The Mekong countries Cambodia, Lao, Myanmar and Vietnam are new to the biofuels business and they all put their hopes on Jatropha curcas as their main feedstock. The same goes for small player East Timor. This inedible plant is said to be growing everywhere, also on marginal lands. It can easily be processed even in small amounts.
Yet, there are practically no long-term-experiences with growing techniques and yield results, so that many organisations regard the investment in Jatropha curcas to be a very risky one. Although few projects run longer than three years, an estimated 900,000 hectares worldwide were planted with the crop by 2008 with more than 85 percent located in Asia. In 2010, there will probably be 5 million hectares of Jatropha plantations.[11]
Recent market studies[12] see the second-generation biodiesel crops Jatropha curcas and algae as the upcoming feedstocks of the near future along with animal fat and waste vegetable oil. The latter are already commonly used in several countries (e.g.Vietnam). But the focus is predicted to shift away from these as soon as new technologies will allow the commercialized production of cellulose-based bioethanol.

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[11] GEXSI: Global Market Study on Jatropha, prepared for the World Wide Fund for Nature, London/ Berlin, 8 May 2008
[12] Emerging Markets: Biodiesel 2020 – Global Market Survey, February 2008

Currently leading feedstocks for bioethanol in Southeast Asia are sugarcane and cassava with Thailand and the Philippines being the biggest producers in the region.

Life in Southeast Asian plantation areas

Most of Southeast Asia's natural resources have been exploited for centuries, mainly under the colonial rule of European countries. Life and work on plantations in the tropical region have always been tough. But the problem has reached a new dimension due to the unlimited expansion of plantation areas all over Southeast Asia in the last decade, not least because of the exploding biofuels production. It is directly linked to other issues such as hunger, poverty, natural disasters and climate change. International organisations and local communities have repeatedly criticised the harsh conditions that do not comply at all with global social standards of the 21st century.

Working conditions on plantations

Generally speaking, the living and working conditions on plantations in Southeast Asia can be labelled as very tough – be it for plantation workers, landless farmers or smallholders whereever they depend on larger distribution systems. Very low pay for endless working hours, job hazards to health and life without insurance nor safety measures, intimidation by violence and loss of livelihoods are only some of the usual consequences arising when big plantation companies enter a rural area.
"On those plantations, working time is not counted in hours. What counts, is the amount of the delivered yield", says Rulita of the Wood and Forestry Workers Union in Indonesia (DPP FSP Kahutindo). „If a worker doesn't bring in the required result, his wife and kids have to help no matter how so that he doesn't lose his job."[13] Almost the same goes

[13] Schott, Christina: Knochenjobs für Biodiesel, NordSüd news II/2008

for smallholders who are independent only on paper: In most cases they totally depend on the supply and distribution systems of big companies or government agencies, to whom they become the more indebted the less they can fulfil the requested yields.

Specialized unions for plantation workers are almost non-existent in Southeast Asia with the exception of maybe Malaysia. They are usually subsumed under a superior umbrella organisation not dealing in detail with problems arising on plantations. In few countries though, e.g. Thailand or East Timor, at least smallholders have succeeded in setting up some fairly strong farmer associations – usually with the help of foreign non-governmental organisations (NGOs).

"Working conditions on plantations are among the worst in our region, even compared to those in textile factories that receive much more international attention", Rulita says. "Plantations are mostly located in remote areas far away from any state control and it's almost impossible to inform all workers about their legal rights." [14]

The working conditions are especially hard for women who are not only paid less and sometimes even sexually exploited, but who have to care for their households and children after work. They are given the "easier" jobs such as applying pesticides and fertilizers – which means splashing highly poisonous substances onto the soil without appropriate protection. These often cause long-term health problems.[15]

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[14] Ibd.

[15] See for example Tan, Lee: The Impact of Oil Palm on Women and Families, Australian Conservation Foundation, 2007 and Rengam, Sarojeni V.: Malaysia: Severe health effects of pesticides on workers in oil palm plantations, WRM's bulletin N° 129, April 2008

The story is not much different in Indonesia or Cambodia, on the Philippines or Papua New Guinea. The pressure on the work force has even increased in recent years: practically all countries in Southeast Asia reacted to the global biofuel boom by earmarking huge areas for new plantations to produce energy crops. Governments and business players wanted to be ready when biofuel mandates in huge markets such as Europe and the USA, China, India, Japan and South Korea become effective.
Their first step is to acquire the necessary land.

Smallholders and agribusiness

Most of the Southeast Asian countries still have large rural societies usually living a low, but often self-sufficient standard. In many regions, land was used communally for centuries – implicating that there are no legal documents proving the users' right of ownership according to modern land laws.
There are several options for the investors to deal with this problem. One option is to persuade local farmers to co-operate. These farmers can be smallholders already owning their land or people given land from the state or the company under the condition to grow a certain crop. The investing company usually helps to clear the land, provides the seeds and later collects and distributes the harvest. All these services have to be paid for, of course, so that most smallholders become indebted to the companies and are totally dependent on them. And to make matters worse, they now have to buy all their daily needs, whereas before they were often self-sufficient from farming food crops. Sometimes, they end up as slave-like workers on their own

land.[16]
The other option for companies to acquire land is to lease or buy concessions from the respective government. Due to the unclear legal situation, this option very often leads to conflicts and even social unrest: Thanks to very low living standards and some of the highest corruption rates in the world, local governments all over Southeast Asia tend to give land concessions to the highest bidder instead of seeking the welfare of their local communities. Any protests are usually silenced by force, if not by the police then by the companies' own militia-like guards.[17]
Residents who can sell their land – though it might be well below its price – are rather lucky compared to those who are evicted from what used to be their home. However, they also give up their former livelihood, usually for the promise to get a job on the plantation. Most probably they first get that job and help the investor to clear their farm land and plant the new crop, but as soon as the plantations get fully operational after a few years, migrant workers usually flock in and are employed instead.

Migrant plantation workers

To farm the newly developed plantation areas effectively, investing companies need a lot of cheap labourers with a minimum of experience. They also need workers who are

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[16] See for example Friends of Earth, LifeMosaic and Sawit Watch: Losing Ground: The human cost of palm oil expansion. Executive Summary, February 2008 and Butler, Rhett A.: The social impact of oil palm in Borneo, www.mongabay.com
[17] See for example CHRAC: Losing Ground – Forced Evictions and Intimidations in Cambodia, a study by the Cambodian Human Rights Action Committee, September 2009

not attached to the area and therefore not interested in resisting certain decisions as local communities might easily do once they gain too much insight. Migrant contract workers are ideal. These are usually landless farmers from impoverished rural areas or jobless people from overpopulated regions who are desperate enough to take any jobs regardless of physical burden or unsatisfying contract conditions. They never had any insurance or social security services in their life anyway.
"Workers in private plantation companies hardly ever dare to organize themselves out of fear to lose their jobs", Rulita of the Indonesian Wood and Forestry Workers Union explains. „At least in Indonesia, unions only exist on state plantations – but there, too, only on paper: The leaders of those unions are practically always the company managers and never workers." Government plantations often provide social security services like health care or pensions, but most workers would always prefer a job in a private company, since the pay is better. [18]

Landless farmers and local communities

Landless local farmers might envy plantation workers for their "good" jobs, because they themselves often end up as occasional day labourers, hardly able to pay their living costs which are rising due to the increased demand coming with the migrants. The loss of farm land is frequently accompanied by the destruction of other food resources such as fish due to pesticide-polluted rivers.
The social structures in affected rural communities are

[18] Schott, Christina: Knochenjobs für Biodiesel, NordSüd news II/2008

turned upside down because they lose their traditional base of communal farming and decision-making. Community heads frequently try to profit from the new development and leave the lower community members behind. The ensuing disputes over natural resources between plantation companies, migrant workers and local communities often leads to social unrest. In the long run, many rural residents will leave for the cities where they hope to find a better life. More often than not they might end up in slums.

While politicians from developed countries such as Japan, South Korea or Singapore might label this an internal problem of the affected nations, it has in fact become a global one. As the world's biggest overseas land leasers, China and South Korea are jointly responsible for the social disaster resulting from "land grabbing" in their business partner's countries. Japan and Singapore do the same. Alongside Europe und the USA they are the economic and technological powers pushing the vast plantation expansions for biofuels production in Southeast Asia.

KINGDOM OF CAMBODIA

Area: 181,035 km²
Population: 14,494,293 [19]

Biofuels in Cambodia [20]	Possible Production Capacity	Consumption
Biodiesel	193.2 million litres/ 2013	No data available
Bioethanol	93.9 million litres/ 2011	No data available

State Policies

The production of biofuels in Cambodia is in its infancy, but many studies confirm a significant potential for the development of bioenergy crops.[21] Nevertheless, there is no policy yet for the development, production or use of biofuels. A plan for biofuels development for the transportation sector is currently being drafted. Meanwhile, the government promotes its "Rural Electrification by Renewable Energy Policy" as part of its long-term energy agenda.
Many officials highlight the government's interest in the domestic use of biofuel. They mention the following reasons: cutting the cost of petrol fuel imports, increasing energy security, creating job opportunities and reducing pollution. Another interest, of course, is to develop a potential export market. The government has also announced incentives such as waiving import and export duties and offering significant tax breaks for investors in biofuels production. It is not transparent, though, which government institution will take specific responsibility for the development of biofuels. Currently the Ministry of Agriculture, Forestry and

[19] Newest data according to the CIA World Factbook
[20] Source: Markandya/Setboonsarng, ADB Institute, March 2008
[21] See for example: Markandya/Setboonsarng, ADB Institute, March 2008

Fisheries and the Ministry of Industry Mines and Energy are involved.

Feedstock and production

Up to date, there are almost no biofuel production facilities in operation in Cambodia. Planned large-scale plantations of energy crops have only just begun to be set up. Priority feedstocks are Jatropha curcas and cassava. Alternative options are corn, soy, sugarcane, oil palm, rice husk and other agricultural residues.

In recent years, the business sector has shown major interest in ethanol production. Many factories have started to produce starch, alcohol, and ethanol – mainly from cassava: The crop has become one of the most important agricultural export commodities in just one year (2007), with over 300,000 hectares already planted. A study by the Asian Development Bank Institute mentions a possible production capacity of 93,9 million litres of bioethanol from cassava per year by 2011.[22]

The government promotion focuses on large-scale foreign investment in Jatropha curcas. Biodiesel Cambodia and Canadia Bank are running pilot projects for training and research. The target is to develop 40,000 hectares of Jatropha curcas plantations by 2010. About 56 percent of the land will belong to private farmers, and 44 percent to concession operations. The Asian Development Bank Institute envisions the production of 193 million litres of biodiesel at the end of 2013 from around 80,000 hectares of Jatropha curcas

[22] ibid. If not mentioned explicitly otherwise, the numbers on biofuels always mean pure biofuels. If a blend of conventional and biofuels is meant, it is stated explicitly.

plantations. According to the World Rainforest Movement, there are even plans for up to 800,000 hectares of plantations in Cambodia to be established by private international companies in the near future.
Most of the planned plantations and production facilities, however, are not operational yet. The country's first 9,600 tonnes of biofuel were produced by South-Korean M-H Bio-Energy and exported to Europe straight away.[23]

Local and international markets

Many farmers, especially in the north western regions, have been encouraged by traders from Thailand to start growing biofuel crops (mainly Jatropha curcas) for the export market which offers promising high prices. In Battambang, close to the Thai border, many biofuel plantations and projects are emerging. Since most Thai gas stations already sell biodiesel and bioethanol for environmentally conscious consumers, producers in Battambang know that they will find a market for their products in their neighbouring country.[24] Cambodian farmers associations and NGOs working with them regard this development as a good opportunity, although they neither have sufficient information nor long-time experience with the crops. In other regions, the market is not very stable and farmers take a big risk by planting Jatropha curcas or cassava there.
Another big problem lies in the lack of infrastructure for distribution or transportation. The Cambodian NGO Forum

[23] Kunmakara, May: First ethanol export marks start of lucrative industry, Phnom Penh Post, 6 January 2009
[24] Information by Groupe Energies Renouvelables, Environnement et Solidarités (GERES)

thus believes that the government needs a more balanced focus and should include better-organised smallholder production for local processing and use. This would comply with the targets in the Rural Electrification Programme, but so far the biofuel production has been mostly intended for export markets.
The danger of the current development is that Cambodia only produces biofuel crops for export and thereby misses the chance to improve its own energy supply through local production.

Location and land issues

Most of the areas suitable for the cultivation of biofuel crops are located in the northern parts of Cambodia. While in the northwest many farmers are persuaded to plant Jatropha curcas for the Thai biodiesel market, Chinese and Vietnamese investors focus on land in the north and northeast of the country. Some assessments also indicate a big potential in the central Kampong Cham province.
There are two common alternatives for procuring land. The companies either set up contracts with smallholders and help them with clearing land and provide the seeds. The other option is that the company buys or leases land from the government and hires rural workers, often migrants.
The second option has already caused many problems[25], particularly because it is not clear how the concessions are awarded. Local people are hardly ever consulted and in many cases residents are violently evicted from their land.

[25] See: Losing Ground – Forced Evictions and Intimidations in Cambodia, a study by the Cambodian Human Rights Action Committee, September 2009

Even the Asia Development Bank (ADB) Institute points out in its assessment that "the system of concessions is unsatisfactory and reforms are urgently needed".[26]

The unclear division of responsibilities between national and provincial authorities and disregard for land-use planning are another source of conflicts. Villagers have for example accused South Korean M-H Bio-Energy Group, Cambodia's first biofuels exporter, of discharging toxins into a lake in Ponhea Loeu, Kandal province, where the company set up its production plant for bioethanol that started operation in January 2009.[27]

Consequently, one of the greatest concerns of international NGOs is the increasing demand for land concessions which are used to quasi legalise land grabbing from the poorest rural areas. This causes more and more land conflicts and struggle for natural resources between companies and local communities. According to the existing law, land concessions for economic use must not be larger than 10,000 hectares. The government, though, does not show any motivation to reclaim land from companies occupying areas of more than 10,000 hectares.

Serious investors are seeking concessions to develop ethanol production from cassava, partly by leasing land from the state to grow the plant, and partly by buying land from farmers. More dubious investors, however, apply for a permit from the government to develop a biofuel plantation,

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[26] Markandya/Setboonsarng, ADB Institute, March 2008

[27] Kunmakara, May: First ethanol export marks start of lucrative industry, Phnom Penh Post, 6 January 2009

take over the land, cut down all the trees, and never come back to produce any biofuel.[28]

Living and working conditions

Official information is hardly available about the working condition of plantation workers, but reports from NGOs show that work and life on Cambodian rubber or fast-wood plantations for example is not humane: constant pressure for high yields, low payment, bad hygienic conditions, child labour. As plantation camps are isolated entities in remote areas, there is often no other authority than the militia-like guards of the companies taking over total control of the workers' lives, often by violence.[29]
A study by the NGO Forum Cambodia in 2005 showed that the majority of local residents were unhappy with the arrival of big plantation companies in their regions. Most of them lost their traditional livelihood and only few found permanent employment. Usually migrants from other regions were fully employed instead. Prices increase with the newcomers due to rising demand and there is usually also a rise in crime and prostitution. Food resources like forests and rivers deteriorate on the other hand, because of

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[28] Megan MacInnes, Land and Livelihoods Programme Advisor of the NGO Forum on Cambodia, describes the brutal land grabbing practices very vividly in her report " Attempts at regulating agro-industrial plantations in Cambodia", The NGO Forum on Cambodia, 2009. The study "Losing Ground – Forced Evictions and Intimidations in Cambodia" by the Cambodian Human Rights Action Committee dated September 2009 was not published due to political pressure.

[29] See for example: Environment Forum Core Team: Fast-wood Plantations, Economic Concessions and Local Livelihoods in Cambodia, NGO Forum on Cambodia, August 2005

monocultures and pesticides used on the plantations. More often than not planting starts before issues such as environmental assessments and concessions have been clarified.

In contrast to other plantation developments, local NGOs view the development of Jatropha curcas rather positively. From a societal perspective, Jatropha curcas indeed would be a better choice for developping energy crops, since it can be grown in small clusters and can be easily processed. It is a drought resistant, non-edible perennial plant which grows on marginal soil and lives for up to 50 years and is therefore a more realistic choice for smallholders than for example sugarcane. It can be a guarantee for a more independent life. Many local people therefore expect more income and job opportunities.

According to the study by the ADB Institute mentioned above, the development of 80,000 hectares of Jatropha curcas plantations in Cambodia will create more than 30,000 job opportunities and take 67,000 members of rural families out of poverty.

The problem is that most local farmers do not know much about the international context of biofuels development and the only information they get is promotion material by local traders. International NGOs see the biofuels development in Cambodia overly negative and overlook the potential for improving livelihoods, local fuel use and agricultural efficiency - also with respect to Jatropha curcas which investors are currently most interested in.

Investors

Alongside Lao, Cambodia seems to emerge as a main producer of natural resources for its neighbours. Interested investors come from Malaysia, Singapore, Thailand, Vietnam and China, but also from South Korea, Canada and the USA.
The ADB Institute considers a development programme of biofuels in Cambodia focussing on Jatropha curcas predominantly and secondarily on cassava, but "with respect to consultations, environmental and social assessment" and only if the rice production is secured.[30]

- Biofuels producers in Cambodia [31]

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Angkor Biofuels Co. Ltd.	Jatropha curcas		1 million hectares		project by the Cambodian Ministry of Industry Mines and Energy
Biodiesel Cambodia	Jatropha curcas, waste vegetable oil	Siem Reap	40 hectares test farm	200 litres/ day	pilot projects at the Maharishi Vedic University and the Angkor Hospital for Children
Canadia Bank	Jatropha curcas	Kompong Speu province	production facility for feedstock from 3,000 hectares (by 2010)		
M-H Bio-Energy Group (South Korea)	cassava	Ponhea Leu, Kandal province	production plant	40 million litres/year (currently 10 million litres/ year for export to Europe)	30 million US-Dollar
Mong Reththy Investment Co.	oil palm	Koh Kong province	11,00 hectares, production plant planned		Charoen Group subsidiary, Thailand
MRT-TCC Sugar Investment Co.	sugarcane		8,400 hectares		Charoen Group subsidiary, Thailand
Pan Asia Biofuels (Canada)	Jatropha curcas	Prey Vihear province	65,000 hectares, (fully planted in 2015) production plant (construction start 2011)		100,000 US dollars, strategic partnership with Acqua International, future customers: GM, BP, Shell, US Navy

[30] Markandya/Setboonsarng, ADB Institute, March 2008

[31] Sources: Markandya/Setboonsarng, ADB Institute, March 2008; Bhandhubanyong, Paritud et al., 2008; Biodiesel Cambodia, 2009; Fernquest, Jon, 5 February 2008; Kunmakara, May, 1 October 2009; Pan Asia Biofuels Corporation, 2008.
This chart – as all following lists of biofuels producers – is not intended to be exhaustive.

PEOPLE'S REPUBLIC OF CHINA

Area: 9,596,961 km²
Population: 1,338,612,968 [32]

Biofuels in China [33]	Installed Production Capacity (target)	Actual Production	Consumption
Biodiesel	3 million tonnes/ 2009 6-12 million tonnes/ 2020	250,000 tonnes/ 2008	17.1 million tonnes/ 2020
Bioethanol	2 million tonnes/ 2010 10 million tonnes/ 2020	1.58 million tonnes/ 2008 1.7 million tonnes/ 2009	

State Policies

China is facing an exploding energy demand as a result of its rapid economic development: The nation's energy consumption almost doubled from 143 billion tonnes in 2001 to 265 billion tonnes in 2007.[34]
Consequently, the Chinese government had to react and introduced several measures to reduce fossil fuel consumption. In addition to hybrid fuel vehicles, fees for road use and improved public transport, the promotion of biofuels (since 2000) led to a significant increase in the production of biofuels. Following the examples of Brazil and the USA, four pilot projects were officially authorized to produce E10 gasohol (gasoline mixed with 10 percent bioethanol) until 2004, mainly from corn and wheat. The producers were exempted from income tax and also received other fiscal subsidies. Furthermore, Beijing invested 143

[32] Newest data according to the CIA World Factbook
[33] Source: Junyang/ Beckman, USDA GAIN Report, 17 July 2009 and GTZ, February 2006
[34] Zhiyu, Tian: Energy Situation and Energy Saving Activities in China, Energy Research Institute NDRC, P.R. China, 7 April 2009

million US dollars in the development of cars running on bioethanol.

In 2007, however, the government banned the use of grain-based feedstock for biofuel production because of growing concerns about food security and thus also cancelled the tax incentives for bioethanol producers using grains as feedstock. A fifth ethanol plant was approved and built in Guangxi, using cassava as feedstock.

The government started promoting perennial crops that can grow on marginal land, e.g. Jatropha curcas. Between 35 and 75 million hectares of suitable marginal land are going to be developed for biofuel production.[35]

A revised Energy Conservation Law was implemented in April 2008, requesting that the share of renewable energies rises to 10 percent of the nation's total energy consumption by 2010 and to 20 percent in 2020. The Chinese government intends to replace 15 percent of the current fossil fuel consumption in the country with biofuels until 2020.

A mandate for a 10-percent ethanol blend in gasoline has meanwhile become effective in the ten provinces of Anhui, Guangxi, Hebei, Heilongjiang, Henan, Hubei, Jiantsu, Jilin, Liaoning, and Shandong. A national mandate for a 20-percent ethanol blend is scheduled for 2020. However, there is no national mandate yet on the use of biodiesel as a transportation fuel. There are discussions on a B5 or B10 mandate by 2020.[36]

The Chinese government paid around 115 million US dollars in subsidies for biofuels in 2006. The amount is estimated to reach 1.2 billion US dollars in 2020. According to experts,

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[35] GSI/IISD: Biofuels–at what cost? November 2008, page 1

[36] APEC Biofuels: China Biofuels Activities, July 2008

this will not be enough, because feedstock development is not included in the calculations.[37]
In December 2008, the Ministry of Finance and the State Administration of Taxation issued a policy that offers a VAT refund to biodiesel producers using more than 70 percent of waste animal fat or vegetable oil for their production.
The departments responsible for the planning and implementation of the biofuel policies under the National Development and Reform Committee (NDRC) are the National Economic and Trade Committee, the Ministry of Science and Technology, the Ministry of Water Resources, the Ministry of Agriculture and the Ministry of Commerce. The difficult task to balance the often contradictory targets of the ministries involved lies with the National Energy Administration which does not have full ministry status, but is headed by the NDRC's deputy minister.

Feedstock and production

In the course of the last decade China became the third largest biofuel producer after Brazil and the USA. Up to date, the country produces mainly bioethanol, mostly from corn (80 percent) and wheat growing in the northeastern regions of the country. In 2007, the government banned biofuel production from grain-based feedstock due to rising concerns about food security and turned its support to other crops. But non-grain feedstock supply remains limited, since competition for land use with grain crops is tight.
Up to date, the government has authorized five ethanol production plants. Four of them use mainly grain-based

[37] GSI/IISD: Biofuels–at what cost? November 2008, page 1

feedstock: around 80 percent from corn and 20 percent from rice and wheat. Their combined production in 2008 was 1.46 million tonnes. The fifth plant started production with an annual capacity of 200,000 tonnes in 2007 and uses cassava.

An earlier national production target of 5.22 million tonnes of bioethanol by 2010 was cancelled and transformed into a proposed production of 3 to 4 million tonnes per year. The bioethanol production in 2009 is estimated to reach 1.7 million tonnes (compared to 1.58 million tonnes in 2008). The main problems for faster development apart from the lack of arable land are unstable prices and a lack of technological know-how. [38]

State and private investors are now researching and developing new feedstock: Cassava, sweet sorghum and sweet potatoes are considered to hold the highest potential. There are an estimated 116 million hectares of marginal land in China unsuitable for grains which could be used.[39]One major research project on sweet sorghum has been established in Dongying City, Inner Mongolia, supported by Italian, Belgian and German institutions. At the moment, there are about 700,000 hectares planted with sweet sorghum mainly in Northwest China (for comparison: China has 27.6 million hectares of corn plantations).[40]

Due to a zero tariff on cassava from Southeast Asian countries, many ethanol producers have started using cheap cassava imported from Indonesia, Thailand and Vietnam. To further reduce imports, the Chinese government supports

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[38] Junyang/ Beckman, USDA GAIN Report, 17 July 2009
[39] APEC Biofuels: China Biofuels Activities, July 2008
[40] GTZ, February 2006

the development of bioethanol from crop residues by intensifying the research on cellulosic material for ethanol production.

Although still trailing behind bioethanol, the production of biodiesel becomes an increasingly important factor in China's energy plan. The main problem is the lack of feedstock resources: As a net importer of vegetable oil such as palm and soy oils for food consumption, China's main feedstock for biodiesel production plants until now has been waste vegetable oil.

In 2007, there were only a few small biodiesel processing plants operating with a combined capacity of around 300,000 tonnes per year, almost all from waste vegetable oil or animal fat from restaurants and oil crushing plants. To change the status quo, the State Forest Administration started to develop 13 million hectares of plantations with various crops for a production of up to 2 million tonnes of biodiesel by 2010. Until 2020, the production is scheduled to increase to 6 million tonnes.[41]

The government primarily promotes biodiesel production from Jatropha curcas due to its potential to grow on marginal lands in almost all climate zones. Southwest China is the main target area for an ambitious national plan to plant 1 million hectares with the inedible crop in the near future, mostly on wild land. Seven provinces have been designated to set up demonstration forests for other biodiesel crops: Until 2010, there will be 400,000 hectares planted with Chinese pistachio, cornus wisoniana and xanthoceras sorbifolia in Anhui, Hebe, Hunan, Shanxi, Sichuan, Yunnan

[41] Lee, Sunny, Asia Times, 23 May 2007 and Liang, Yan, China View, 16 January 2008

and Inner Mongolia.[42]

As part of a five-year-programme, the China National Petroleum Corporation invested in four pilot projects in Yunnan for the improvement of planting and management techniques of Jatropha curcas. With the new plans, provincial governments became ambitious: In 2007, Yunnan province alone proposed 14 new biodiesel processing plants with a total output capacity of 3.2 million tonnes per year. The provincial government in Hebei decided to set up 870,000 hectares of various biodiesel feedstock crops until 2050.[43]

With this massive investment, the installed production capacity of biodiesel plants has already increased to an estimated 3 million tonnes per year by 2009. Due to the scarcity of feedstock resources, however, the actual production will probably not exceed the 250,000 tonnes produced in 2008.[44]

Due to little experience with Jatropha curcas and a lack of facilities in many regions, the development and yield results are still uncertain.

Local and international markets

Biofuels producers in China clearly focus on the domestic market. Starting from 2002, the government introduced the mandatory use of E10 gasohol in 10 provinces. Five official bioethanol producers are authorized by the Chinese government to supply more than 27 cities in 10 provinces. By 2005, the consumption of gasohol had already increased

[42] Liang, Yan, China View, 16 January 2008
[43] ibid.
[44] Junyang/ Beckman, USDA GAIN Report, 17 July 2009

to 20 percent of the national gasoline consumption. In 2008, there were about 20,000 gas stations in the country offering E10.

A national E20 mandate is scheduled for 2020, a B5 or B10 mandate is in the pipeline. The expected demand by then is estimated at 17.1 million tonnes of biodiesel and 8.5 million tonnes of bioethanol.[45]

To cover the demand resulting from these mandates, China has to rapidly increase its biofuels production. According to official plans, the country will be almost self-sufficient in its bioethanol production by 2020, but will still need to import at least 7 million tonnes of biodiesel from other countries.

Ethanol exports from China have significantly dropped after the government abolished a rebate of 13 percents VAT on exports in 2007. The year before, China exported more than 1 billion litres of ethanol to Japan, South Korea, Singapore and Taiwan. In 2008, the ethanol exports amounted to little more than 100 million litres.

With more ethanol remaining in the country, imports also dropped clearly: In 2006, China imported almost 8 million litres of ethanol from Brazil, Japan, Thailand, South Africa, Australia, the USA and other countries. Five million tonnes of cassava were imported from Indonesia, Thailand and Vietnam. In 2008, the country imported only 400,00 litres of ethanol and less than 2 million tonnes of cassava.[46]

Nevertheless, many Chinese companies are investing a lot in overseas facilities, especially for biodiesel production. In view of several giant projects planned by Chinese companies

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[45] GTZ, February 2006, page 16

[46] Export and import data according to Junyang/Beckman, USDA GAIN Report, 17 July 2009

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[45] GTZ, February 2006, page 16

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in Indonesia and Malaysia, a huge amount of palm oil-based biodiesel will soon be produced for China's domestic consumption in other countries.
Biodiesel from Jatropha curcas, however, will probably not supply more than 5 percent of China's diesel demand for transportation in the foreseeable future. According to the US Department of Agriculture, the quality of Chinese biodiesel is still too low to be used in cars. Therefore it is more appropriate for energy supply in rural communities. Non-grain-based ethanol production in the country is already subsidized. A decision on the subsidies for biodiesel production is expected by 2010.

Land issues and working conditions

In China, 20 percent of the global population live with only 10 percent of cultivable land. The rapid development of biofuel plantations in the country has caused fear of declining food security in and outside the country. As a response against an expected rise in food prices, the Chinese government banned grain-based ethanol production from corn and wheat in 2007. The use of other energy crops growing on marginal land such as sweet sorghum and Jatropha curcas was promoted instead.
Jatropha curcas is suitable for cultivation in the diverse landscapes of Southwest China and 1 million hectares will soon be planted according to a national action plan. But large-scale plantations, although they might provide economic and social benefits, also cause concern, since they might affect ecologically sensitive areas. The definition of what constitutes abandoned or degraded land is not always easy, for example in mountainous areas where people live

in very traditional ways (see chapter "Outlook and conclusion").

In 1999, for example, only 24 percent of the forests in the Yunnan province were state-owned, while 76 percent were owned by local collectives. Since collectively owned land is usually more degraded than state-owned land, a big part of the planned Jatropha curcas plantations will most probably be established on collectively owned land and contracted to individual households.[47]

Despite dominating state investment, provincial governments try to attract national and international private investors for cultivating and processing Jatropha curcas. Major private investments, especially from abroad, are usually set up on state-owned land. The management of a cooperation with hundreds of thousands of farmers on community-owned land is simply too complicated without intermediaries (usually local forestry bureaus). Only a few projects involve individual households, for example a four-year-programme by the Ministry of Science and Technology together with the United Nations Development Programme, expiring in 2010.

The Chinese government responded to protests concerning domestic food security by banning grain-based biofuels feedstock, and now state and privately owned companies from China are investing in biofuel facilities all over the world: The international NGO Grain listed China as the second biggest land grabber after South Korea. They say that China leases 2.1 million hectares in Asia, Africa and

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[47] GSI/IISD: Biofuels – at what cost? November 2008

Latin America to develop food and energy crops for its domestic market.[48]
The companies usually do not look for certified standards overseas. As a consequence, the local farmers and residents in those countries are often not treated well. Unfair practices of land grabbing impoverish local communities when they lose their traditional livelihoods and receive no or very little compensation (compare Cambodia, Indonesia, Myanmar chapters).
Ensuing land and working conflicts often lead to social decline and unrest, usually because partner countries fail to implement the respective government policies.

Investors

All biofuel producers in China have to sell their ethanol to the state-owned China Petroleum and Chemical Corporation (Sinopec) or the China National Petroleum Corporation (CNPC) who control the gas stations in China. They are also the main stakeholders in the Jatropha curcas-based biodiesel business, even if smaller companies in the provinces will provide most of the domestic production. As part of a five-year-programme, the China National Petroleum Corporation invested 658,000 US dollars in four pilot projects in Yunnan for improving the planting and management techniques of Jatropha curcas. There was almost no commercial biofuel production facility in Southwest China before this new programme.[49]

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[48] Rees, Eifion; The Ecologist, 22 June 2009
[49] Weyerhaeuser, Horst et al., ICRAF China 2007

- Bioethanol producers in China[50] -

Company	Feedstock	Location	Area/ Facility	Production Capacity	Investment
Operating Facilities					
Anhui BBCA Biochemical Co.	corn, cassava	Anhui, Bengbu	production plant	440,000 tonnes/ year	COFCO subsidiary
Henan Tian Guan Fuel-Ehanol Co.	wheat, corn	Henan, Nanyang	production plant	450,000 tonnes/ year	joint-venture of PetroChina, Sinopec and Henan Investment Group
Huarun Alcohol Co.	corn, rice	Heilongjiang, Zhaodong	production plant	180,000 tonnes/ year	owned by China Resources Alcohol Co.
Jilin Fuel Ethanol Co.	corn	Jilin, Jilin	production plant	500,000 tonnes/ year	joint-venture of PetroChina, Jilin Grain Group and COFCO
Guangxi COFCO Bio-Energy Co.	cassava	Guangxi	production plant	200,000 tonnes/ year	New Tiande Co.
Planned Facilities					
Beihai Gofar Marine Biological Industry	cassava	Guangxi	production plant	10,000 tonnes/ year	cooperation of China Agri and Sinopec?
ChinaAgri	cassava, potato	Hengshui, Hebei / Wuzhou, Guangxi / Jingmen, Hubei	production plants	300,000 tonnes/ year 300,000 tonnes/ year 200,000 tonnes/ year	all in cooperation with COFCO and the respective provincial governments, in Guangxi also with Sinopec
China Grain Group and CNPC	cassava		production plant	300,000 tonnes/ year	
China National Cereals, Oils and Foodstuffs Corp. (COFCO)	cellulose	Zhaodong, Heilongjiang	pilot production plant	5,000 tonnes/year	6.5 million US dollars, joint-venture of ChinaAgri and Novozymes (?)
China Resources Alchol Co.	sweet potato, rice	Hebei	production plant	23,000 tonnes/ year	
Chongquing Huangqiu Petrochemical Co.	cassava	Chongquing	production plant	100,000 tonnes/ year	awaiting authorization by the government
Hainan Yedao	cassava		production plant using feedstock from 4,500 hectares in Lao	125 million litres/ year	51 million US dollars
Huazhuan Siyi Ethanol Co. Ltd.	sweet sorghum		trial plant	50,000 tonnes/ year	
PetroChina	potato, sweet potato, sweet sorghum	Nanchon, Sichuan / Kunming / Yancheng, Jiangsu / Binzhou, Shandong	production plants	100,000 tonnes/ year 200,000 tonnes/ year 200,000 tonnes/ year 100,000 tonnes/ year	agreements signed with respective provincial governments, feasibility studies completed
Sinopec	potato, sweet potato, cassava	Jing'gangshan, Hubei / Zhijiang, Hubei / Chengde, Hebei	production plants	100,000 tonnes/ year 300,000 tonnes/ year n.n.	agreements with respective city governments
TianGuan Ethanol Co.Ltd.	Rice	Hubei	production plant	100,000 tonnes/ year	

According to the Asia Times, the state-owned China National Offshore Oil Corporation (CNOOC) also plans to establish 100 biodiesel plants all over the country using various feedstocks.[51] CNOOC is investing in the biodiesel production from Jatropha curcas in Myanmar and in facilities for palm oil-based biodiesel in Malaysia (100,000 tonnes per year). In Indonesia, they are currently building a biodiesel plant that will be the biggest in the world when it starts operation, with a planned annual production capacity of 5 million tonnes by 2015.

Sinopec announced in 2008 that it plans to invest 5 billion US dollars in the development of oil palm and Jatropha curcas plantations in Indonesia.

With the help of their government Chinese private companies invest in biofuel production facilities in other countries too. Large investments are made in palm oil plantations and refineries in Indonesia and Malaysia, as well as in cassava, sugarcane and corn crops in Lao and Cambodia. One company has started a 90-million US dollars plant in Nigeria for the production of 150,000 tonnes of bioethanol from cassava.

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[50] Lee, Sunny, Asia Times, 23 May 2007

[51] Sources: GSI and IISD, November 2008, S.1; GTZ, February 2006 and Junyang/ Beckman, USDA GAIN Report, 17 July 2009

- Biodiesel producers in China[52] -

Company	Feedstock	Location	Area/ Facility	Production Capacity	Investment
Biolux Austria	rapeseed	Weihei, Shandong	production plant	300,000 tonnes/ year	120 million US dollars, cooperative with Shandong province
China Clean Energy	waste oil	Fujian	production plant	100,000 tonnes/ year	
China Biodiesel Holding Co. Ltd.	Jatropha curcas	Xianmen, Fujian	production plant	100,000 tonnes/ year	
China National Offshore Oil Corporation (CNOOC)	Jatropha curcas	Sichuan Hainan	production plant demonstration plant	100,000 tonnes/ year 60,000 tonnes/ year	290 million US dollars, cooperation with Panzhihua City
Daimler Chrysler Germany	Jatropha curcas	Guizhou	production plant		Cooperation with Guizhou province
Fujian Zhuoyue New Energy Co.	grease waste	Longyan, Fujian	production plant	20,000 tonnes/ year	
Gansu Huacheng Biofuel	waste oil	Gansu	production plant	200,000 tonnes/ year	
Gushan Environmental Energy Ltd.	waste oil	Beijing Hunan Chongqing Shanghai		100,000 tonnes/ year 30,000 tonnes/ year 50,000 tonnes/ year 30,000 tonnes/ year	
Hainan Zhenghe Biofuel Energy Co.		Hebei	production plant	300,000 tonnes/ year	
Handan Gushan Oleo Chemical Ltd.	grease waste, rapeseed	Hebei	production plant	25,000 tonnes/ year	
Huawu Group	waste cottonseed	Shandong	production plant	100,000 tonnes/ year	
Hunan Tianguan Clean BioEnergy Ltd.		Hunan	production plant	200,000 tonnes/ year	42 million US dollars, joint-venture with Leo Ltd. England
Luoyang	Jatropha curcas	Guizhou	demonstration plant	50,000 tonnes/ year	
Petro China	Jatropha curcas	Sichuan	demonstration plant	60,000 tonnes/ year	
Shandong Provincial Government	Jatropha curcas	Shandong	production plant	100,000 tonnes/ year	cooperation with German company Lurgi providing know-how and technology
Sichuan Gushan Oil & Fat Chemical Ltd.	Grease waste, rapeseed	Gushan, Sichuan	production plant	30,000 tonnes/ year	

[52] Sources: GSI and IISD, November 2008, S.1; GTZ, February 2006 and Junyang/Beckman, USDA GAIN Report, 17 July 2009

Sichuan Provincial Government	Jatropha curcas	Sichuan	1.5 to 2 million hectares, production plant	500,000 tonnes/ year	cooperation with British company D1Energy PLC providing seeds from India and technical expertise
SinoPec	Jatropha curcas	Guizhou	demonstration plant	50,000 tonnes/ year	
Tianhong Bio-energy Scientific Development Co.		Inner Mongolia	demonstration plant	25,000 tonnes/ year	
Wuxi Huahong Biofuel Co.	grease waste	Jiangsu	production plant	100,000 tonnes/ year	
Xinhuo Bio-engineering Co.	waste oil	Henan	production plant	50,000 tonnes/ year	
Xinyang Hongchang Group	local wood plant, grease waste	Henan	production plant	30,000 tonnes/ year	
Yuanhua Energy Science Co.	grease waste	Fujian	production plant	300,000 tonnes/ year	
Zhenghe Bio-Energy Ltd.	acidified oil, fatty acid, Pistacia Chinensis	Wuan, Hebei		20,000 tonnes/ year	
Zhenghe Energy		Hunan		500,000 tonnes/ year	

Many more biodiesel projects that are currently in their planning stages are not listed here.

REPUBLIC OF INDONESIA

Area: 1,904,569 km²
Population: 240,271,522 [53]

Biofuels in Indonesia [54]	Installed Production Capacity	Actual Production	Domestic Consumption
Biodiesel	1.5 million tonnes/ 2007 5.5 million kilolitres/2010 (planned)	90,000 tonnes/ 2008	10,000 tonnes/ 2008
Bioethanol	220,000 tonnes/ 2007 3.8 million kilolitres/2010 (planned)	8,000 tonnes/ 2008	8,000 tonnes/ 2008

State policies

In 2006, the Indonesian government adopted its National Energy Policy which regulates the development of biofuels, including quality standards and licensing of exports and imports. The policy has set the goal to reach 2 percent of biofuel use in the national energy consumption by 2010 (5.29 million kilolitres) and at least 5 percent by 2025 (22.26 million kilolitres). At the moment, the biofuel consumption accounts for less than 1 percent. Indonesia aims to replace 20 percent of the national diesel consumption with biodiesel and 15 percent of all gasoline consumption with bioethanol by 2025.

In 2006, the government announced an investment plan worth 22 billion US dollars for promoting biofuels over the next five years. One year later 5.25 million hectares of allegedly unused land were identified for the development of biofuel plantations. In 2008, the government wanted to

[53] Newest data according to the CIA World Factbook

[54] Data sources: Indonesian Association of Biofuels Producers (APROBI); Silvati, Anasia, U.S. Commercial Service, August 2008 and Bromokusumo, Aji K., USDA GAIN Report, 1 June 2009

allocate 1.3 billion US dollars and 500,000 hectares of land for research and development in the field of biofuels.[55]
To push consumption, the Ministry of Energy and Mineral Resources took a decision about the mandatory use of biofuels in industrial sectors in October 2008. From the beginning of 2009, the following biofuel-blends have been obligatory[56]:

Obligatory blend of petrodiesel with biodiesel (B100) in percent:

Sector	2009	2010	2015	2020	2025
Public Transport	1	2.5	5	10	20
Private Transport	1	3	7	10	20
Industries	2.5	5	10	15	20
Power Plants	0.25	1	10	15	20

Obligatory blend of gasoline with bioethanol (E100) in percent:

Sector	2009	2010	2015	2020	2025
Public Transport	1	3	5	10	15
Private Transport	5	7	10	12	15
Industries	5	7	10	12	15

At the beginning of 2009, the House of Representatives agreed on a subsidy of 125 million US dollars to make the sales of biofuels more attractive. Nevertheless, competition is hard, since the state also provides heavy subsidies for fossil fuels. Even if the subsidies for biofuel sales rise to 125 million US dollars in 2010, as recently proposed, they will amount to only 1 percent of the fossil fuel subsidies allocated for

[55] Biopact, Mongabay News, 13 July 2006 and Krismantari, Ika, The Jakarta Post, 24 July 2007
[56] According to Regulation No. 32/2008 of the Ministry of Energy and Mineral Resources

2010.[57]

Since the subsidy payments for biofuels depend on rising or falling oil prices, most biofuel producers either stopped or reduced their production to 20 percent of their capacity in 2008, because they did not want to take the risk of having to pay the price differences. At the beginning of 2009, there was reportedly only one biodiesel production plant still in operation.

If the mandatory use of biofuels is implemented, the production will probably rise again to an estimated 2.41 million kilolitres of biodiesel and 1.48 million kilolitres of bioethanol by 2010.

To attract foreign investors, the Ministry of Finance wants to offer incentives such as reductions in value-added tax and subsidies for loan interests. In 2007, the government announced that it would provide an overall amount of 100 million US dollars for interest rate subsidies to farmers who grow biofuel crops such as oil palms, Jatropha curcas, cassava or sugarcane. Fuel producers will be given tax rebates in the first year of operation.

At the beginning of the same year, the government signed agreements with 59 foreign and local companies willing to invest 12.4 billion US dollars to boost the production of biodiesel from palm oil. By that time, the production target for 2010 was set at 32.7 million litres (200,000 barrels) a day.[58]

The Indonesian government sees the development of biofuels as a key to economic growth, poverty alleviation and new employment opportunities. By means of reducing fossil fuel

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[57] The Jakarta Post, Opinion, 3 June 2009

[58] Krismantari, Ika, The Jakarta Post, 24 July 2007

consumption by 10 percent and developing new energy sources, Indonesia hopes for more energy security. The government's plan includes the development of 1,000 energy self-sufficient villages and 12 special biofuel zones. At the same time, they want to reduce the country's green house gas emissions, which rank third in the world due to extensive forest fires. The irony is that those often occur during the clearing of land for palm oil plantations which are in fact the main feedstock for biofuels in the country.
Despite its keen interest, the Indonesian government has been slow in implementing the policies mentioned above. The National Team for Biofuel Development for example was installed in 2006, but since it did not have the authority to enforce policies, it ran out of work and was closed in July 2008. The responsibility for biofuel development now rests with Indonesia's Coordinating Ministry for Economy.

Feedstock and production

As the world's biggest producer of crude palm oil, Indonesia uses palm oil as its feedstock number one for biodiesel production. There were approximately 7 million hectares of oil palm plantations in the country by the beginning of 2009.[59] The plantations in Kalimantan and Papua, in particular, are constantly growing.
In 2007, Indonesia overtook Malaysia as the world's biggest palm oil producer with an output of 17.18 million tonnes of crude palm oil (CPO). 3.8 million tonnes were used in the national market, mainly for food products. Only 19,500

[59] The Jakarta Post, Opinion, 3 June 2009

tonnes were converted into biodiesel.[60] According to the Indonesian Palm Oil Board the palm oil production of 2009 might even rise to 21 million tonnes.

The installed production capacity for palm-oil-based biodiesel in Indonesia was 1.5 million kilolitres per year by 2007. There were 8 palm oil biodiesel plants (combined capacity: 520,000 tonnes per year) and three sugarcane ethanol plants (combined capacity: 70,800 tonnes per year) operating in 2007.[61] But the plants were only running at 20 percent of their capacity until 2008 – according to the Indonesian Association of Biofuel Producers because of inconsistent policy enforcement by the government. At the beginning of 2009, there was only one biodiesel plant in operation with a capacity of 7,000 tonnes/ month.[62] Downsizing production and consumption targets was primarily caused by the global financial crisis of 2008: dropping fossil oil prices made the rising palm oil prices incompetitive and led to a further drop in the production of palm-oil-based biodiesel from 100,000 tonnes in 2007 to 80,000 tonnes in 2008. By means of subsequently implementing a mandatory use of biofuels, as it was announced by the government, the capacity could grow again to more than 5.5 million kilolitres a year by 2010.[63]

Other possible feedstocks for biodiesel in Indonesia are coconut and Jatropha curcas. While the national production of coconut oil reached 880,000 tonnes in 2006, the planting

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[60] PalmOilHQ: Indonesia's 2008 palm oil biodiesel use seen, 9 October 2008 and Bromokusumo, Aji K.: USDA GAIN Report, 1 June 2009

[61] Legowo, Evita H. et al., Ministry of Energy and Mineral Resources Republic of Indonesia, August 2007

[62] Bromokusumo, Aji K.: USDA GAIN Report, 1 June 2009

[63] Silvati, Anasia, U.S. Commercial Service, August 2008

of Jatropha curcas just started a few years ago and many investors still have doubts about the final output. Nevertheless, the government regards the crop as a major biodiesel feedstock and therefore tries to encourage local communities to plant Jatropha curcas for their own energy self-sufficiency. Plantations are expected to expand more than ten times from 121,200 hectares in 2007 to 1,540,000 hectares in 2010.

In Indonesia, bioethanol is mainly produced from molasses of sugarcane and cassava. The national ethanol production is estimated to reach almost 3.8 million kilolitres by 2010. In 2008, Indonesia produced around 30 million tonnes of sugarcane on about 2.3 million hectares of sugarcane plantations. And many companies have further expansion plans: Sugarcane plantations will be expanded to 698,000 hectares by 2010 (from 400,400 hectares in 2007).

Cassava plantations are expected to reach 782,000 hectares in 2010 (from 52,000 hectares in 2007). However, only 25,000 tonnes molasses were used for bioethanol production in 2008. The production of bioethanol in Indonesia dropped from 10,000 tonnes in 2007 to 8,000 tonnes in 2008 due to the low fossil oil prices caused by the global financial crisis.[64]

If further developed, the following plants have potential to become raw material for biofuels in Indonesia: algae, sweet sorghum, sugar palm, sago, corn, palm fruit shells, rice husk and other crop residues. Indonesia also actively supports the research and development of ethanol production from cellulose.

Production is encouraged by new policies and there are already plans for a number of new biofuel production

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[64] ibid.

plants. 17 plants (in Java, Kalimantan, Sulawesi, Sumatra and a new one in Papua) are scheduled to produce between 2 and 5.57 million kilolitres per year by 2011. The feedstock will be mainly palm oil and Jatropha curcas grown on 3,6 million hectares of land. Another 17 plants (in Java, Kalimantan, Papua, Sulawesi and Sumatra) are supposed to produce 3.8 million kilolitres bioethanol from cassava and sugarcane by 2010 – among them 3 plants processing 600,000 kilolitres per year produced by various smallholder plantations in West-Java, North-Sulawesi and East-Kalimantan.[65]

Local and international markets

After the Ministry of Energy issued a decree on the mandatory use of biofuel in 2008, the government predicted that the national consumption of palm-oil-based biodiesel would reach 580,025 kilolitres in 2009, subsidized by 58 million US dollars. Bioethanol consumption was estimated to reach 194,444 kilolitres with subsidies of about 19.4 million US dollars (about 14 percent of the production capacity predicted for 2010). The actual demand will probably stay far below these numbers, because the financial crisis caused a reduction in the production.[66]
Since 2006, the state-owned oil company Pertamina has sold B5 ("Biosolar", a 5-percent biodiesel blend) at 228 gas stations in Jakarta, Surabaya and Bali and E5 ("Biopertamax", a 5-percent bioethanol blend) at 36 gas

[65] Legowo, Evita H. et al., Ministry of Energy and Mineral Resources Republic of Indonesia, August 2007
[66] Liem, Mita Valina, The Jakarta Globe, 30 January 2009

stations in Jakarta, Surabaya, Malang and Bali. A 10-percent-blend is available at a few stations in Jakarta and Semarang. Bio-Premium (an E5 mix with premium gasoline) was available at only one station in Malang.[67]

Currently, the number of gas stations selling biofuel has declined due to supply difficulties. As a reaction, state-owned oil company Pertamina decided to reduce their blend to a 2.5 percent biofuel share in January 2008 and by 2009 even to 1 percent in many places. This is the absolute minimum Pertamina is required to offer since the new mandate for the use of biofuel took effect.[68]

PLN, the state-owned electricity company, must now use 0.25 percent of biofuels and increase the share of biofuels to 1 percent by 2010.

Indonesia has so far exported only small amounts of biodiesel, mainly to China, the European Union, Australia and the USA. The main export commodity remains crude palm oil to be processed elsewhere. According to the Indonesian Palm Oil Producers Association, the country exported 13.2 million tonnes of crude palm oil in 2007. A growing national biodiesel industry might slow down exports.

The export of bioethanol is rather unpredictable and depends on the development of the domestic market. The main market for Indonesian ethanol exports is Japan.

Locations and land issues

Although biofuel is still a small-scale industry in Indonesia, the palm oil sector has vast expansion plans. They are mainly

[67] Dillon et al., GSI/IISD, December 2008

[68] Biofuels Digest, 30 April 2008

induced by the hope of exploding markets for the biodiesel crop. Apart from China, the European Union and the US, more and more countries have issued decrees on a mandatory use of biofuels in the coming years, increasing the demand. This fact serves the Indonesian palm oil industry as justification for further developing plantations, even if this means the destruction of huge areas of rain forest and thus the livelihood of indigenous people and small-scale farmers. The extension of oil palm plantations in Indonesia reached 6.8 million hectare in 2008, exploding from only 1.1 million hectares in 1990. Officially, the government plans a further expansion to 8.2 million hectares.[69] NGOs go even further and forecast the development of 20 million hectares by 2025. Almost half of this area will be planted in Kalimantan. The fastest conversion of forests into oil palm plantations is currently happening in Central Kalimantan with conversion plans for 4.5 million hectares of forests. Other conversion "hot spots" are Riau and Jambi in Sumatra as well as Papua. In the provinces of Papua and West-Papua, studies of NGOs unveiled plans for more than 7 million hectares of palm oil plantations only in the most Eastern province of the country. Official licenses for plantations in Papua have been issued for only 800,000 hectares by 2008."[70]

Since 2007 the licensing of plantations up to 10,000 hectares has been the responsibility of the province and regional governments which often pursue the interests of investors. It is thus usually not difficult for companies to get permits for plantations even in ecologically rich or socially critical areas. A combination of promises and bribes helps to get

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[69] Statistics by the General Directorate for Plantations Indonesia

[70] Information by Watch Indonesia

the local community heads's support for the company, while the rest of the residents often do not know anything about their rights or how to fight the privatisation of their community's land.

The vast and quick conversion from communal agro-forestry to private, commercial plantation industry turns the local Indonesian society upside down and makes local farmers totally dependent on large companies, even if they plant their own lot of land as smallholders. Frequently, this process leads to violent conflicts between companies and residents, migrant workers and local farmers, bribed leaders and their communities.

Until January 2009, Indonesian NGO Sawit Watch observed 576 open conflicts in the palm oil sector. The socio-environmental organisation assumes that the real number of conflicts was above 1,000. In a recent incident the elected mayor of Karang Mendapo, a village in Jambi Province on Sumatra, was arrested by the police, because he protested against the land grabbing practice of palm oil giant Sinar Mas. His arrest was meant to intimidate the other protesting smallholders in the area, but environmental groups made the arrest public and it hit the headlines. Sawit Watch warns about potential social unrest, if industry and government do not co-operate better in the interests of local and indigenous people.[71]

In a statement in March 2009, the United Nations Committee on the Elimination of Racial Discrimination strongly criticises Indonesia for not respecting the rights of indigenous peoples in its developing plans for oil palm plantations.[72]

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[71] Additional information by Watch Indonesia

[72] AMAN, Forest Peoples and Sawit Watch, Press Statement, 23 March 2009

Living and working conditions

One of the pros that the Indonesian government uses for the development of new palm oil plantations and biodiesel production is the creation of 3.5 million new jobs in the biofuels business. Many NGOs, however, deny the argument of job creation: according to their assessments traditional agro-forestry would provide livelihoods to more people than palm oil plantations.[73] Most residents who were easily able to live on the communal production forest before, might lose their livelihood and often find work only as day-labourers, if they are lucky. To add insult to injury, many plantations occupy ancestral land of indigenous people, taking away not only the traditional sources of water, food and medicine, but also destroying cultural and spiritual sites. In 2008, about 1.5 million people were working in the palm oil sector, many of them migrant workers from Java and Sumatra who follow the companies across the archipelago without being officially employed.[74]

The working conditions on the plantations are also causing conflicts, because wages are very low, working hours endless and most companies do not allow worker unions. The power lies often with militia-like security guards handling complaints with violence. State-owned plantations usually admit unions – whose leaders are mostly identical with the managers of the company. The Ministry of Energy "hopes" to increase the income for on-farm and off-farm workers up to the regional minimum wage.[75]

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[73] For example Save Our Borneo, Walhi, Watch Indonesia etc.

[74] Estimation by the Indonesian Union for Wood, Forest and Plantation Workers (DPP FSP KAHUTINDO)

[75] Information by DPP FSP KAHUTINDO

Working conditions are especially hard for women, who are usually paid even less and on top of their work have to care for their households and children. They are often given the "easier" jobs such as fertilizing and applying pesticides – which means spreading highly poisonous substances without appropriate protection which often causes long-term health problems (compare Malaysia chapter).
Almost a third of the palm oil plantations in Indonesia is in the hands of smallholders. That amounts to more than 2 million hectares. However, they are usually dependent on big companies for transportation and processing mills. They need to pay fees for using their facilities.
The report "Losing Ground" by the three organisations LifeMosaic, Friends of the Earth United Kingdom and Sawit Watch disclosed the impact of plantation development on the social, economic and environmental living conditions of traditional communities, particularly in the case of smallholders. Following the publication of this report, Sawit Watch and other NGOs demanded the establishment of a Smallholders Task Force, which also became part of the Roundtable for Sustainable Palm Oil in 2007.[76]

Investors

59 international companies have signed agreements with the Indonesian government to invest 12.4 billion US dollars in the biodiesel production, mainly on the basis of palm oil. The biggest single investment is planned in West-Kalimantan: For 5.5 billion US dollars, Chinese oil giant CNOOC wants to build the world's biggest biofuel plant

[76] See WRM's bulletin N° 127, February 2008

using palm oil, sugarcane and cassava as feedstocks.[77]
Most of the more recent investment interests focus on plantation development in Kalimantan and Papua. Conflict and disaster-shaken province Aceh developed a new green policy ("Aceh Green" in 2008) and wants to produce more biofuel crops: In addition to palm oil the focus is on Jatropha curcas, sago and sugarcane – based on strict sustainability guidelines. US investors have already expressed their strong interest.
The biofuel producing industry in Indonesia is represented by the influential Indonesian Biofuel Producers Association APROBI. Indonesia's largest palm oil producer is Asian Agri, a subsidiary of the Raja Garuda Mas Group. The Indonesian state owned 687,000 hectares of palm oil plantations in 2008. More than 2 million hectares are in the hands of smallholders (with a downward trend), represented by the Smallholders Task Force and farmers' associations.

– Biodiesel producers in Indonesia[78] –

Company	Feedstock	Location	Area/ Facility	Production Capacity	Investment
Existing facilities					
Asianagro Agungjaya (Raja Garuda Mas Group)	oil palm	Dumai, Riau	production plant	100,000 tonnes/ year	38 million US dollars
Bakrie Rekin Bioenergy	oil palm	Batam, Lampung	production plant	100,000 tonnes/ year	
BPPT Serpong	oil palm	Serpong, Banten	research facilities, refinery	300 tonnes/ year	in cooperation with the Department of Energy
Dharma	oil palm	West Java	production plant	4,000 tonnes/ year	

[77] Krismantari, Ika, The Jakarta Post, 24 July 2007
[78] Sources: Silvati, Anasia, U.S. Commercial Service, August 2008 and Legowo, Evita H. et al., Ministry of Energy and Mineral Resources Republic of Indonesia, August 2007 with additional information by Watch Indonesia and from various articles listed under "Sources"

EAI Jakarta	oil palm	Jakarta	production plant	500 tonnes/ year	
Energi Alternatif Indonesia		Jakarta	production plant	1,000 tonnes/ year	
Eterindo Group	oil palm	Tangerang, West Java and Gresik, East Java	2 production plants	240,000 tonnes/ year	
Ganesha Energi Medan	oil palm	Medan, North Sumatra	production plant	4,000 tonnes/ year	in cooperation with PTPN 4 state plantation
Indobiofuels Energy	oil palm	Merak, West Java	production plant	160,000 tonnes/ year	British-owned company
Musimas Group	oil palm	Medan, North Sumatra	production plant	350,000 tonnes/ year	
Permata Hijau Sawit		Medan, Sumatra	production plant	200,000 tonnes/ year	
Platinum	oil palm	Serang, Banten	production Plant	22,000 kilolitres/ year	
Puri Usaha Kencana	oil palm, Jatropha curcas	Kalimantan, Papua	production plant in West Java, plant in Lampung under construction	3,000 tonnes per month	8 million US dollars (W-Java) plus 28 million US dollars (Lampung), cooperation with Sinopec
RAP Bintaro	oil palm	West Java	production plant	1,650 tonnes/ year	
Sumiasih	oil palm	Bekasi, West Java; Lampung	2 production plants	200,000 tonnes/ year by 2010	
Wilmar Bioenergy	oil palm	Dumai, Riau	180,000 hectares, production plant	350,000 tonnes/ year (planned extension to 1 million tonnes/ year	Subsidiary of Singaporean Wilmar Group and US company Archer Daniel Midlands
Planned facilities					
APROBI Group	oil palm	Kalimantan	100,000 hectares		Indonesian Association of Biofuel Producers wants to develop own plantations
Asiatic Development	oil palm	West Kalimantan	80,000 hectares		subsidiary of Genting Group
BP	Jatropha curcas	Nusa Tenggara Timur, Papua, Kalimantan	100,000 hectares		128 million US dollar, joint-venture with D1 Oil, part of a worldwide project
BUMN Agro Industri	oil palm, Jatropha curcas	Riau, Jambi, South Sumatra, Kalimantan, Papua	220,000 hectares (Inti) + 880,000 hectares (plasma), production plants	400,000 tonnes/ year	35.5 million US dollars by the state-owned company
Clean Biofuel PTE Ltd.	oil palm, Jatropha curcas	Gorontalo, Sulawesi	50,000 hectares production plant (start of operation scheduled for 2009)	200,000 kilolitres/ year	190 million US dollars, Singaporean company
Darmex Agro	oil palm	Bekasi, West	production plant	85,000	subsidiary of US

		Java		tonnes/ year	company Fuchs Lubricant
Genting Biofuel Asia	oil palm	Merauke, Papua	400,000 hectares		3 billion US dollars, cooperation with Sinopec
Golden Agri Resources	oil palm	Batam	production plant	under construction	
IOI Corporation	oil palm	Kalimantan	150,000 hectares		
INDOMAL	oil palm	Medan, North Sumatra; Pekanbaru, Riau; Banten, West Java; Sula, North Maluku; Merauke, Papua	300,000 hectares (Sula / Merauke), 3 production plants (Sumatra and Java)	1.5 million kilolitres/ year	1 billon US dollars, joint-venture of Indonesian and Malaysian investors cooperating with the Indonesian state plantation company PTPN
Muting Mekar Hijau Group			290,000 hectares (with expansion plans to 540,000 hectares)		
Pertamina	oil palm	Dumai, Riau; Balongan, Westjava; Balikpapan, East Kalimantan	several production facilities	500,000 kilolitres/ year	state-owned gas and oil company
Sinar Mas Agro Resources and Technology (SMART)	oil palm	Dumai, Riau (plant), West Kalimantan and Merauke Papua	130,000 hectares with expansion plans to 440,000 hectares, production plant in Dumai, Riau; world biggest biofuel plant planned in West Kalimantan	400,000 kilolitres/ year (Dumai), 5 million tonnes/ year (West Kalimantan) starting in 2015	100 million US dollars for plantation expansions, 5.5 billion US-Dollar by Chinese oil company CNOOC for production plant
Sweden Bioenergy	Jatropha curcas	Nusa Tenggara	100,000 hectares, production plant	350,000 tonnes/ year	143 million US-Dollar
TOLARAM Kalbar	Jatropha curcas	West Kalimantan	110,000 hectares		

– Bioethanol producers in Indonesia[79] –

Company	Feedstock	Location	Area/ Facility	Production Capacity	Investment
Existing facilities					
BPPT Lampung	cassava	Lampung	production plant	2,500 kilolitres/ year	cooperating with Anugrah Kunia Abadi
Medco Energy (Bakrie Group)	cassava	Lampung, West Java, Kalimantan	50,000 hectares, production plant (planned)	270,000 kilolitres/ year by 2010	
Molindo Raya Industrial	sugarcane molasses	Malang/Kediri, East Java, Lampung	25,000 hectares, one plant in East Java operating, second in Lampung planned	50,000 kilolitres/ year (Java) + 100,000 kilolitres/ year (Lampung)	25 million US dollars, cooperating with state-owned plantation company PTPN X

Sugar Group Lampung	sugarcane molasses	Lampung, Central Kalimantan		70,000 kilolitres/ 2007, planned for 2010: 500,000 kilolitres/ year	
Planned facilities					
Angel Product	sugarcane	Sulawesi	8,000 hectares, production plant	10,000 kilolitres/ year	
Berlian Energy	sugarcane	Cianjur, Bondowoso, Java	8,000 hectares, production plant	1,800 kilolitres/ year	
EN3 (South Korea)	cassava	South Sulawesi	45,000 hectares, production plant	180,000 kilolitres/ year	
Indo Lampung	molasses	Lampung		150,000 kilolitres/ year by 2010	
Mitsui Petrobras	sugarcane	Kalimantan, Papua	200,000 hectares, production plant (planned)	500,000 kilolitres/year	Japanese-Brazilian joint-venture
PTPN 2,8,9,10,12,14 (states plantations)	sugarcane	North Sumatra, South Sumatra, Java, Nusa Tenggara Timur	100,000 hectares, production plant	200,000 kilolitres/ year	
Salim Group	sugarcane	South Sumatra	70,000 hectares, production plant	70,000 kilolitres/ year	
Sinar Mas Agro Resources and Technology (SMART)	cassava, sugarcane	West Kalimantan	World biggest biofuel plant	Production starting in 2015	5.5 billion US Dollars by Chinese oil company CNOOC
Sampoerna Group	cassava, sugarcane	Madiun, Pawonsari, Ponorogo, East Java	100,000 hectares, production plant	1 million tonnes/ year by 2010	
Sorini Tbk	cassava	Sulawesi	150,000 hectares, production plant	200,000 kilolitres/ year	
Sungai Budi	cassava	Lampung	25,000 hectares, production plant	120,000 kilolitres/ year	
Wilmar Bioenergy	sugarcane	Lampung, South Sumatra	70,000 hectares, production plant	70,000 kilolitres/ year	

[79] Sources: Silvati, Anasia: Indonesia Biofuel Development, U.S. Commercial Service, August 2008 and Legowo, Evita H. et al., Ministry of Energy and Mineral Resources Republic of Indonesia, August 2007

JAPAN

Area: 377,915 km²
Population: 127,078,679 [80]

Biofuels in Japan [81]	Installed Production Capacity	Actual Production 2008	Consumption in 2008
Biodiesel		10 million litres	5 million litres
Bioethanol	500 million litres/ 2011 6 billion litres/ 2030	200,000 litres	200,000 litres + 6.5 million litres ETBE [82]

State Policies

Japan's fossil fuel supply currently depends on imports for almost 100 percent. But increasing fossil oil prices and the global climate change discussion made the government turn their attention to biofuels and promote them. Biofuels are generally seen as a growing business and thus an opportunity for development in rural areas.
In 2002, the government of Japan launched its „Biomass Nippon Strategy". The objectives of this policy are: to anticipate global warming, to facilitate the development of relevant industries, to promote recycling and to revive rural communities. The strategy implicates the replacement of 500 million litres of fossil fuel in the transportation sector with biofuels by 2010. According to the petroleum industry, however, only 360 million litres of biofuel will be provided this year.[83]

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[80] Newest data according to the CIA World Factbook
[81] Data Sources: Ministry of Economy, Trade and Industry; Ministry of Agriculture, Forestry and Fisheries
[82] ETBE (ethyl tertiary butyl ether) is extracted from ethanol and isobutene and can be blended with gasoline. Since it has a low vapour pressure and low water solubility, ETBE will not affect the quality of the gasoline as much as ethanol does. As long as the raw material derived from biomass is regarded as a kind of biofuel.
[83] Masaki, Hisane, Asia Times, 13 December 2007

The Ministry of Environment announced the mandatory use of E10 (ten percent bioethanol mixed with 90 percent gasoline) by 2012. In the meantime, even the E3 mandate has not been fully implemented yet, partly because of the resistance of Japan's powerful petrol oil processing industry. As a consequence of signing the Kyoto Protocol in 2005, Japan has to reduce its greenhouse gas emissions level of 1990 by 6 percent by 2010 (25 percent by 2020).[84] Additionally, the National Energy Strategy of 2007 aims to reduce Japan's dependency on fossil fuels to 80 percent by 2030.

The government report "Boosting the Production of Biofuels in Japan" of the same year predicts that Japan will be able to produce 6 billion litres of biofuels inside the country by 2030. This target can, however, only be reached if technology will have advanced and enable full utilization of all the crop and forestry residues which are currently not usable. It also requires the development of about 386,000 hectares of abandoned land.[85]

To really boost the production of biofuels, the government strongly supports research in new technologies for low-cost ethanol. The development of so-called second-generation biofuels derived from cellulose and algae is a priority as an attempt not to further increase Japan's import dependency. The Japanese government currently relies on bioethanol imports from Brazil, but promotes the regional production of biofuels. Japan wants to work together with other countries in Asia in the development of raw materials.

Although there is no total tax break for biofuels, the taxes for ethanol-blended gasoline have been reduced since 2008.

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[84] Müller, Hilja, neue energie, November 2009

[85] Iijima, Midori, Japan Biofuels Annual, USDA GAIN Report, 1 June 2009

Imports of ETBE, a favourite of the industry, are free of tariffs. The blending of gasoline with bioethanol is limited by law to 3 percent due to concerns about safety and gas emissions. The limit for biodiesel blends lies at 5 percent.
The government agencies involved in biofuels policies are: the Ministry of Agriculture Forestry and Fisheries (MAFF), the Ministry of Economy, Trade and Industry (METI), the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Environment (MOE), the Ministry of Internal Affairs and Communications (MIC), and the Ministry of Land, Infrastructure and Transport (MLIT).

Feedstock and production

Although the current domestic production of biodiesel (10 million litres in 2008) by far exceeds the production of bioethanol (200,000 litres in 2008) in Japan[86], the government and investors focus on bioethanol, which attracts higher demand.
Being heavily dependent on ethanol imports, the government tries to push the domestic industry for ethanol production. Until 2007, there were only some pilot projects and few small-scale ethanol plants in the country. Planning to boost this industry, several new government-supported demonstration projects started exploring bioethanol production on the basis of different feedstocks. Japan's first two commercial ethanol production plants were scheduled to go online in 2009 in Hokkaido, targeting an annual

[86] Data according to Ministry of Agriculture Forestry and Fisheries. The ethanol production for industrial use (alcohol or chemical production) for 2008 was 540 million litres

production capacity of 15 million litres each from rice, wheat and sugar beets. The ethanol produced is planned to be processed into ETBE.[87]
It will still be hard to reach the self-set goal of 50 million litres domestic bioethanol production by 2011 – not to mention the target of 6 billion litres of bioethanol by 2030.

The price for biofuels is a very important factor for biofuels production in Japan: Domestically produced biofuels have to compete with cheap imports from Brazil and other countries. At the moment, the only feedstocks that would be cheap enough are waste products such as sugarcane molasses, non-standard wheat or waste cooking oil. Due to the limits of agricultural resources inside the country, the government strongly supports the development and research of ethanol derived from cellulose, for example wood chips, rice husk or wheat straw. Those waste products do not compete with food crops and the Ministry of Agriculture, Forestry and Fisheries allocated 34 million US dollars needed for research projects of cellulosic materials. Another possible feedstock considered for bioethanol production is Japanese silver grass. According to the plan, ethanol production from cellulosic materials is to be fully developed by 2030, in order to avoid more imports and long distance transportation costs.
The government and investors do not view biodiesel with the same priority as bioethanol, since only logistics companies use diesel fuel in Japan's transportation sector. Yet, 12 biodiesel feasibility projects were carried out in 2007 in which municipalities co-operated in partnerships with

[87] Iijima, Midori, Japan Biofuels Annual, USDA GAIN Report, 1 June 2009

private companies. Some restaurant chains helped by collecting their used cooking oil for biodiesel production.[88] Other companies invest overseas to develop biodiesel crops, for example palm oil in Indonesia and Malaysia or Jatropha curcas in Myanmar.
In 2006, the Nippon Oil Corporation together with the Toyota Motor Corporation stated that they were able to remove the oxygen from palm oil that usually causes diesel to degrade in non-tropical countries. They announced to be ready for commercial production of palm oil-based biodiesel by 2010.

Local and international markets

Japan has the world's second largest automobile fleet and thus will be a huge domestic market for biofuels once mandates become effective. Currently Japan consumes 840 million litres of ethanol per year, primarily imported from Brazil, but also from China, Thailand and other countries.[89] Most of this is, however, not used for biofuel blending but in the beverage, chemical and pharmaceutical industries. Only 200,000 litres of ethanol and 6.5 million litres of ETBE were consumed by the transportation industry in 2008. Brazilian companies were disappointed by Japan's slow implementation of mandates, since they expected larger amounts of ethanol to be shipped from Brazil to Japan by then.
Despite the government's ambitious plans for the future, the distribution of bioethanol blends to the public is still limited. In Japan's domestic market, E3 (3 percent ethanol

[88] ibid.
[89] Pratruangkrai, Petchanet, The Nation, 19 March 2009

blended with 97 percent gasoline) is competing with "Biogasoline" (a blend of 7 percent ETBE with 93 percent gasoline), which is favoured by the powerful oil processing industry, because it requires less modifications at the industry's distribution facilities. Even the government agencies cannot come to an agreement on the blends: While the Ministry of Environment supports E3 with subsidies, the Ministry of Economy, Trade and Industry promotes ETBE.

In 2007, two gas stations in Sakai city and Daito City started selling E3 and planned to gradually increase the number of stations for the distribution to a wider public until 2008. But according to the US Department of Agriculture, not more than 6 gas stations in Osaka and Hyogo were selling E3 to only 576 registered cars by mid-2009.

The Petroleum Association of Japan (PAJ), on the other hand, started selling ETBE-blended gasoline at 50 gas stations in Tokyo by 2007 and is steadily increasing the distribution to finally establish a nationwide network.

Competition will become tougher when the Brazilian state oil company Petrobras starts selling E3 in Tokyo's metropolitan area as scheduled in 2009. Thanks to subsidies from the Ministry of Environment, E3 gasoline blend is sold at the same price as normal gasoline.

In anticipation, the ETBE-blending distributors have planned to raise the sales of biogasoline to 840 million litres of in 2010.[90] Aviation seems to provide a new market opportunity: In January 2009, Japan Airlines successfully conducted a flight using a 50-percent-bioethanol blend derived from three different feedstocks, camelina, Jatropha curcas and algae.

[90] Tsukimori, Osamu, Reuters, 11 June 2009

Investors

In addition to public-private partnerships developing bioethanol-producing facilities inside the country, Japanese companies are involved in numerous development and investment projects overseas. The ethanol-producing and processing industry focuses on Brazil: In 2008 Itochu, Mitsui, Sumitomo and Toyota announced to invest a total sum of 485 million US dollars in plantations and production facilities in the Latin-American country. Mitsui for example plans to develop 15 to 20 ethanol plants in cooperation with the Brazilian state-owned company Petrobras.
Other companies are eying markets in Southeast Asia, mainly for biodiesel production from palm oil (Indonesia and Malaysia), coconut oil (Philippines) and Jatropha curcas (Myanmar). There are also projects on their agendas for cassava and sugarcane plantations in several Asia-Pacific countries (Papua New Guinea, Philippines, Vietnam). The Japanese government has agreements with Thailand and Vietnam to provide technical assistance in the development of biofuels from 2010.

Land issues and working conditions

Labour rights in Japan comply with international standards. There is a minimal wage for a 40 hour-working week and overtime requires premium pay. Forced and child labour are illegal and will be prosecuted. The constitution grants the right of free association in unions without being controlled or influenced by the government.
Nevertheless, there are only very few energy crop plantations or processing facilities inside the country. Japanese private

and public investors in the biofuels business rely on large overseas plantations at the moment, where working and living conditions hardly correspond to Japanese labour laws (see chapters Indonesia, Lao, Myanmar, Papua New Guinea etc.).

In 2009 Japanese companies were leasing 325,000 hectares in other countries around the globe to develop food and energy crop plantations, mainly for their domestic market.[91] The investment is usually done with the help of government agencies or local companies without consulting the residents at the locations. The yield is lost for the local people in the respective countries and that can lead to food shortage and social unrest.

In a rare protest, the Philippine NGO Pamalakaya in 2009 sent a letter to the Japanese Prime Minister asking him to stop the planned biodiesel project by the Filipino-Japanese joint-venture Pacific Bio-Diesel Corporation in Ilocos Norte. Pamalakaya highlighted the extremely destructive and exploitative character of the planned 600,000-hectare coconut plantation: All the yield would be processed for the Japanese biodiesel market, while landless Filipino farmers lose the basis of their livelihoods.[92]

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[91] Rees, Eifion, The Ecologist, 22 June 2009

[92] Mayuga, Jonathan L., Business Mirror, 5 July 2009

[93] Sources: Ministry of Economy, Trade and Industry, 1 February 2007, with additional data compiled from various articles listed under "Sources"

Investors

- Bioethanol Producers Japan [93]-

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Asahi Breweries, Ltd.	sugarcane molasses	Iejima Island, Okinawa	demonstration plant		MAFF, METI, MOE, Cabinet Office
Cosmo Oil Co Ltd.	cassava, corn, peanut or other starchy crops	East Sepik Province, Papua New Guinea	pilot development project		800 million dollars by Japan's third largest oil company cooperating with the government of East Sepik Province
Itochu Corporation	sugarcane	San Mariano, Isabela, Philippines	production plant, operation start planned for 2011	54 million litres/ year	100 million US dollars by Green Future Innovations, a joint-venture of Itochu with local investors
	cassava, sugarcane	Bhien Phuoc province, Vietnam	production plant	100 million litres/ year, construction start in 2010	120 million US dollars, cooperation with Petro Vietnam
Japan Biofuels Supply LLP	sugarcane	Iejima Island, Okinawa	production plant (ETBE)		supplied by Brazilian Copersucar with 200 million litres pure ethanol per year
Mitsubishi Corporation	substandard wheat and sugar beets	Shimuzucho, Hokkaido	production plant (ETBE)	15 million litres/ year, start in 2009	public-private partnership with Hokuren, the Hokkaido federation of agricultural cooperatives
	sugarcane		production plant (ETBE)		cooperation with Brazilian ethanol producer Cosan
Mitsui Engineering & Shipbuilding Co. Ltd.	wood residues	Maniwa City, Okayama	demonstration plant	250 litres/ day	METI
	sugarcane	Cerrado, Goias, Brazil	production plant (operation starting in 2009)	200 million litres/ year	joint-venture with Petrobra (Brazil)
Nippon Steel Co., Ltd.	food waste	Kita-kyusyu City, Fukuoka.	demonstration plant		METI
Oenon Holdings	rice	Tomakomai, Hakkaido	production plant (ETBE)	15 million litres/ year, start in 2009	MAFF subsidized
Ryusek Corporation	sugarcane molasses	Miyakojima Island, Okinawa	pilot plant, operational since 2008	24 million litres/ year	MOE
Shinjo City	sorghum	Shinjo City, Yamagata	demonstration plant		MAFF
Taisei Corporation, Marubeni Corporation	wood residues	Sakai City, Osaka	demonstration plant	1.4 million litres/ year	MOE
Tokachi Shinko Kiko	substabdard wheat and corn	Obihiro City, Hokkaido	demonstration plant		METI, MOE
Zen-noh (National Federation of Agricultural Cooperative Associations	rice	Niigata	production plant	1 million litres/ year, planned expansion to 33 million litres/ year	originally built as a model plant

– Biodiesel Producers Japan [94]–

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Japan BioEnergy Development Corp.	Jatropha curcas Jatropha curcas	Myanmar Bokeo, Vientiane and Savannakhet, Lao	oil mill 3,000 hectares	 10,000 tonnes/ year	1.5 million US dollars, joint-venture with an anonymous private Myanmar company
Japanese Transport Cooperation Association	oil palm	Bangkok and Suratthani, Thailand	40,000 hectares	100,000 tonnes/ year	20 million US-Dollar
Pacific Bio-Diesel Corp.	coconut	Pasuquin, Pagudpud, Ilocos Norte, Philippines	600,000 hectares, oil mill	300 million litres/ year (target)	75 million US-Dollar
Revo International Inc.	waste cooking oil	Kyoto	production plant, started operation in April 2009	30,000 litres of "C-Fuel" (biodiesel blend)/ day	cooperation with Kyoto City

[94] Sources: Data compiled from various articles listed under "Sources"

REPUBLIC OF KOREA

Area: 99,720 km²
Population: 48,508,972 [95]

Biofuels in South Korea [96]	Installed Production Capacity	Planned Production Capacity	Consumption
Biodiesel	667 million litres/ year	180 million litres/ 2008 270 million litres/ 2009 540 million litres/ 2012	180 million litres/ 2008 270 million litres/ 2009
Bioethanol	none	none	No data available

State policies

South Korea depends completely on imported fossil fuels. On its way to becoming one of the world's biggest greenhouse gas producers, the government is determined to introduce a series of policies that will help cut emissions as well as reduce South Korea's dependency on imports. The mandatory use of biofuels is only one of the measures triggered by this decision.

The Korean long-term national energy policy aims to reduce national energy consumption, especially of fossil fuels, and to boost green energy industries. The government earmarked 11.3 billion US dollars until 2030 for supporting the "Green Growth" development. Thereof 21.8 million US dollars will be spent on the development of technologies for biofuels production until 2010.

South Korea started testing biofuels in 2002. National standards were developed on the basis of these tests and implemented in 2006. They are similar to the biodiesel standards of the EU.

The government introduced the mandatory use of B1 (a

[95] Newest data according to the CIA World Factbook

[96] Data according to Ministry of Knowledge and Economy Korea and Korean Institute of Petroleum Quality

diesel blend with 1 percent of biodiesel) in 2006. The mandate of 1.5 percent valid at the moment will be increased to 2 percent by 2010, preparing the mandatory use of B3 (diesel blend with 3 percent of biodiesel) by 2012. Tax incentives for biodiesel producers already in place will be extended to 2010.

The initial target was actually set much higher, but had to be reduced because of the resistance of South Korea's powerful car and oil refining industry. The objective now is to replace 4 percent of the national fuel consumption with biofuels by 2012, rising to 12 percent by 2030. Currently, biofuels cover 2 percent of the country's total fuel consumption.[97]

The government understands biofuels not only as a measure to reduce greenhouse gas emissions and to secure energy resources, but also as one of the growth engines for its domestic industry. Since South Korea's biofuels producers almost fully depend on imported feedstocks, the Ministry of Knowledge and Economy has presented a development plan that concentrates on domestic-grown biodiesel production.

The government will base its decisions on further increasing the mandatory use by 2010 on the development of domestic feedstock production and biodiesel consumption in South Korea. Fossil fuel prices at that time will be another decisive factor.

Feedstock and production

Forecasts consider the biofuel production in South Korea a

[97] Sun/Francom, USDA GAIN Report, 17 November 2008

growing business in view of the introduction of mandatory uses in many countries. The production of biodiesel doubled in only one year, reaching 180 million litres in 2008. The forecast for the 2009 production is 270 million litres. The existing installed production capacity of 667 million litres a year would be already enough to cover the 3-percent mandate becoming effective in 2012 – if sufficient feedstock will be available.[98]

Due to the climate and land deficits in South Korea, most of the biofuels feedstock is grown in other countries: most commonly soy (more than 70 percent) and palm oil. Since soy and palm oil prices proved rather unstable during the recent economic crisis, Korean biofuel producers started investing in the development of Jatropha curcas plantations in Indonesia, Lao, Malaysia, Myanmar and the Philippines. Estimations mention 650,000 hectares of diverse biofuel crop plantations (mainly Jatropha curcas and cassava) that Korean companies are purchasing in all Southeast Asia at the moment.[99]

To limit South Korea's dependency on imports, the government supports intense research and development of second-generation biofuel feedstock such as cellulosic material and algae. They have officially planned to plant 35,000 hectares of offshore seaweed forests in the coming decade to replace 13 percent of the Korean fuel consumption with algae-based biodiesel by 2020.[100]

Additionally, there are three test sites growing winter canola,

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[98] Data according to Sun/Francom, USDA GAIN Report , 17 November 2008

[99] ibid.

[100] Asia Pulse News: South Korea set to expand marine biomass resources, 22 April 2009

a rapeseed variety, in the south of the country. According to the Korea Institute of Energy Research, there would be 300,000 to 500,000 hectares coastal land available to grow the crop. The Ministry of Food, Agriculture, Forestry and Fisheries (MIFAFF) plans to increase the area planted with rapeseed from 1,500 hectares in 2008 (mainly on Jeju Island) up to 45,000 hectares by 2012. This would cover about 8 percent of the annual biodiesel demand.

The only other non-imported feedstock used for biodiesel production is waste cooking oil covering 20 to 30 percent of the national consumption.

Up to date, South Korea produces and consumes only biodiesel. Bioethanol production has just begun with the development of cassava and tapioca plantations in Cambodia, Indonesia, Thailand and Papua New Guinea. Production plants are expected to take another couple of years until they run at full capacity. The government, however, has not yet decided on the commercial use of bioethanol in South Korea.

Local and international markets

Since 2006, biodiesel is available at most gas stations in South Korea. The most common blend is BD-5 (a diesel blend containing 5 percent of biodiesel). BD-20 is also sold for buses and trucks at gas stations around the country. The industry expects a steady rise in domestic consumption due to increasing mandatory use of biofuels in the coming years. The installed production capacity of 2008 is already enough to cover the expected demand for the 3-percent-mandate by 2012. At the moment, however, only 8 out of 20 existing biodiesel producers have access to the few domestic

refineries that are authorized by the Korean government to blend biodiesel. The other producers therefore have begun modifying their products or have chosen to export their products until the new mandate becomes effective.[101]
The main problem remains the purchase of the necessary feedstock. Soy, currently the main crop for South Korea's biodiesel production, is imported from Argentina (86 percent) and the USA (14 percent). Palm oil comes from Indonesia, Malaysia and Thailand, Jatropha curcas from Lao, Indonesia and the Philippines.
Although the commercial use of bioethanol is not approved yet by the Korean government, companies already start preparing for bioethanol production which is estimated to start after 2012. The Korea Institute of Petroleum Quality is currently testing E3 (97 percent gasoline blended with 3 percent bioethanol) and E5 (95 percent gasoline mixed with 5 percent bioethanol). Four gas stations in Gyounggi and North Chungcheong started providing bioethanol blends to government vehicles for a trial phase.

Land issues and working conditions

Labour rights in South Korea are a controversial topic: There were a couple of violent incidents between police and workers' unions demonstrating for their rights during the last decade. And a very recent report by Amnesty International shows that migrant workers do not enjoy their rights granted by law and instead are often beaten, trafficked or even sexually exploited.[102]

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[101] Sun/Francom, USDA GAIN Report, 17 November 2008
[102] Amnesty International: Migrant workers treated as "Disposable Labour" in South Korea, 19 October 2009

Relating to the development of biofuels, though, this issue does not really touch the matter:
Due to a lack of land, there are only few plantations producing energy crops inside the country. South Korea had to look outside its borders and was marked the world's biggest land grabber by international NGO Grain, because it leases 2.3 million hectares of arable land in developing countries in Asia, Africa and Latin America to develop food and energy crop plantations for its domestic market.[103] Land use practices are rarely sustainable and lead to environmental and social degradation in local communities. Exporting the yield to South Korea can lead to food shortage and thus to further social unrest in the respective countries. In this case, the problem lies in the social and environmental consequences of Korean investment using agricultural land in other Asian countries as described in the respective chapters. By outsourcing the plantation work to other countries, the investing companies usually also do not need to apply the higher working and living standards granted by law to Korean workers.

[103] Rees, Eifion, The Ecologist, 22 June 2009

Investors

- Domestic Biofuel Producers South Korea [104]-

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Government of Korea	algae	Offshore	35,000 hectares	1.5 billion litres/ year by 2020	275 million US dollars
3M Safety	soy			48 million litres/ year	
Aekyung Petrochemical Co. Ltd.	soy			32 million litres/ year	
BDK	soy, waste cooking oil			33 million litres/ year	
Biodiesel Energy	soy			9 million litres/ year	
Bio Doil Korea	soy, waste cooking oil			12 million litres/ year	
BND Energy	soy, waste cooking oil			50 million litres/ year	
BND Kunsan	soy, waste cooking oil			50 million litres/ year	
CNG	waste cooking oil			9 million litres/ year	
Dansuk Industrial Co.	soy			60 million litres/ year	
Ltd.					
Ecoenertech	waste cooking oil			33 million litres/ year	
Enertech Co. Ltd.	oil palm, soy	Pyeongtaek Port		80 million litres/ year	
Kaya Energy Co. Ltd.	soy, waste cooking oil			100 million litres/ year	
Mudeung Bioenergy	waste cooking oil			6 million litres/ year	
Next Oil	soy			99 million litres/ year	
Samwoo Oil Chemical Co. Ltd.	waste cooking oil			12 million litres/ year	
SK Chemicals	oil palm, (algae: trial phase)	Ulsan		120,000 tonnes/ year	contract with European trader Trafigura to export 60,000 tonnes/ year to Europe

[104] Source: Ministry of Knowledge and Economy Korea with additional information from various article listed under "Sources"

– Overseas Biofuel Investors South Korea [105] –

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Biomass Korea	Jatropha	Indonesia	150,000 hectares, prodution plant	100,000 tonnes J. oil/ year by 2009	
BND Energy	Jatropha	Lao (Vientiane, Savannakhet). Promotion in Indonesia, Malaysia and Myanmar	200,000 hectares	500,000 tonnes J. oil/ year by 2010	
Chail Jedan Corp.	cassava	Cambodia Indonesia	1,400 hectares N.N.		1996 2008
Changhae Ethanol	cassava	Papua New Guinea	20,000 hectares		2006
Daewoo Logistics	oil palm, corn	Madagaskar	half the size of Belgium	500,000 tonnes of palm oil	MOU
	oil palm Jatropha	Malaysia South Cotabato, Philippines	production plant 11,000 hectares, expansion plans up to 100,000 hectares	500,000 tonnes/year, production start in 2008	37.39 million US dollars 175 million US-Dollar, joint-venture with Eco Global Bio-Oils, MOU with PNOC-AFC signed in 2009
	tapioca	Indonesia	200,000 hectares		MOU
	Jatropha	Indonesia	Pilot project		2005
	rapeseed, Cassava	Thailand	50,000 hectares		MOU
LBL Corp.	cassava	Indonesia	100,000 hectares		2006
Next Oil Co. Ltd.	coconut Oil	Philippines		200,00 tonnes/year	MOU
Odicorp	tapioca	Indonesia	210,000 hectares		MOU
Samsung C&T	oil palm	Indonesia	24,000 hectares		2008
SK Networks	Jatropha	Vietnam	200,000 hectares		MOU

[105] Source: Sun Young Choi and Michael Francom, November 2008 with additional data from industry and various articles listed under "Sources"

LAO PEOPLE'S DEMOCRATIC REPUBLIC

Area: 236.800 km²
Population: 6,834,942 [106]

There are no data available on production capacity or domestic demand of biofuels in Lao

State policies

Although in Lao there are no specific policies on the development and use of energy crops in place yet, the government is seriously interested in the promotion and production of biofuels, mainly from Jatropha curcas – for domestic use. This perspective is included in a poli raise the national electrification rate to 90 percent by with 10 percent of the energy demand being covered renewable energy resources. The government plans to replace 5 percent of the national fossil fuel consumption with biofuels by 2015. A national energy development plan encourages investment in biofuel production and promotes the use of biofuel to reduce the fossil fuel consumption. This is part of the government's ambition to leave the group of least developed countries in the world by 2020. Today, most of Lao's population still depends on wood for cooking.[107]

Feedstock and production

Most activities in Lao with respect to biofuels focus on Jatropha curcas. But since there are only few experiences

[106] Newest data according to the CIA World Factbook
[107] Insixiengmay, Keophayvanh, Technology Research Institute, 2007

with the cultivation of this inedible crop (like in other countries, see Cambodia and Myanmar chapters), the existing plantations only produce limited seed yields and are rather inefficient. The Lao Institute for Renewable Energy (LIRE) estimates that there are currently only 2,000 hectares of Jatropha curcas plantations in operation. According to the Lao State Fuel Company, however, there are plans of 425,000 hectares of Jatropha curcas plantations involving 15 foreign investor companies. 26,000 hectares were planned to be planted by the beginning of 2008. The Lao State Fuel Company itself has set up a 15-hectare-plantation of Jatropha curcas in 2007 for a 5-year-trial in Danchampa, Vientiane.

The National Council of Sciences states that 50,000 hectares were already planted with biofuel crops. According to the WWF, the government targets the development of 500,000 hectares for biofuel crop plantations by 2020.[108] The Deputy Director of the National Council of Sciences even mentions 2 million hectares for the same year.[109]

Other possible biofuel crops are cassava and sugarcane. So far, there is only one small sugarcane factory in Vientiane. Two more are being built in Savannaket Province.[110] Cassava is the third-most important crop in Lao after rice and corn. The yield is still very low and must be increased drastically, if it is to be used for the production of bioethanol. Currently, there are 8,000 hectares of plantations producing 56,000 tonnes of cassava per year. According to a study of the Asia Development Bank Institute, the crop could be used widely in Lao.[111]

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[108] Cook, Jonathan, WWF Greater Mekong Programme, February 2008

[109] Hanssen, Cor H.: Lao Land Concessions, CIDSE-Lao Management, September 2007, p. 3

[110] Insixiengmay, Keophayvanh, Technology Research Institute, 2007

[111] Markandya/Setboonsarng, ADB Institute, March 2008

There are no plans yet to produce biofuels for European countries, since the environmental standards are still far below the requirements of the European Union.

Local and international markets

The government of Lao is very interested in the development of biodiesel and would like to establish production plants inside the country. The investors, on the other hand, who are mostly foreign, plan to export unprocessed vegetable oil or ethanol to existing processing plants in their home countries. Currently, about 15 biofuel companies are active in Lao, but none of them has produced any biofuel so far (at least inside Lao) according to the Lao Institute of Renewable Energy.
The conditions for the export of Jatropha curcas oil are not yet regulated – there is no general policy on renewable energy yet either. The investors therefore face the risk of uncertainty and lobby the government to soon decide on regulations for the renewable energy market.

Location and land issues

Together with Cambodia, Lao is developing into a main supplier of cheap agricultural resources for its neighbours. The influx of foreign investment is bringing economic growth and job opportunities, but it also results in land conflicts between investors and local communities: The sudden expansion of energy crop plantations for sugarcane and Jatropha curcas destroys natural resources traditionally used by rural communities. This not only changes the local environment but it often changes the complete social

structure in the affected communities.
Nevertheless, some international organisations consider biofuels as a possible new cash crop for Laotian farmers and started activities in this sector, for example the Netherlands Development Organisation SNV. Jatropha curcas is promoted as an ideal crop for smallholders here as well (see Cambodia chapter).
Other organisations like WWF or CIDSE (Cooperation Internationale pour le Developpement et la Solidarite) criticise insufficient planning practices in the case of vast plantations and bad management of natural resources. They claim that major problems are caused by not informing planning officials, unclear responsibilities of provincial and national authorities and almost no integration of local communities. Through officially granting land concessions, local farmers have been deprived of hundreds of thousands of hectares of land and they have either lost access or the right to use their land.
In May 2008, the Lao government decided to stop issuing large-scale land concessions to foreign investors. Yet, it doesn't seem to be very difficult to still get concessions - at least on paper. In practice, the companies first have to negotiate with the local communities living and working on the land, if they want to get access and utilize it.

Living and working conditions

According to SNV, human rights and labour rights are well respected, even on large-scale plantations. No other reliable information on living and working conditions on plantations in Lao was available.

Investors

Together with Cambodia, Lao seems to emerge as a major producer of natural resources for its wealthier neighbours. Most investors come from China, South Korea, Malaysia, and Thailand. Some European organisations are initiating biofuel projects for domestic use.

- Biofuel producers in Lao [112]-

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Dynastry Co. Ltd.	cassava	Champassak, Saravan, Xekong and Attapeu provinces	100,000 hectares, production plant (Champassak)		400 million US dollars, joint-venture with Chinese company ZTE Cooperation Co. Ltd.
Hainan Yedo (China)	cassava		4,500 hectares feedstock for a production plant in China's Hainan province	400,000 tonnes/ year	51 million US dollars (for the Chinese production plant)
Japan Bioenergy Development Corporation	Jatropha curcas	Bokeo, Vientiane and Savannakhet	3,000 hectares	10,000 tonnes/ year	
Kolao (South Korea)	Jatropha curcas	Phonhong district and Champassak province	planned: 144,000 hectares (existing concessions for 70,000 hectares with 10,00 hectares already planted). 2 production plants	400,000 tonnes/ year each plant, production starting 2010	45 million US dollars, subsidiary of the South Korean car manufacturer Hyundai
Lao State Fuel Company	Jatropha curcas	Danchampa village, Naxaithong district, Vientiane	15 hectares, trial plant, planned production plant using min. 3,000 hectares of plantations by the Lao Organic Product Promotion Association	40,000 litres/ year, starting production from 2011	

[112] Data compiled from various articles in the Vientiane Times listed under "Sources"

Lao State Fuel Company	Jatropha curcas	Danchampa village, Naxaithong district, Vientiane	15 hectares, trial plant, planned production plant using min. 3,000 hectares of plantations by the Lao Organic Product Promotion Association	40,000 litres/ year, starting production from 2011	
Mekong Agro-Industry Ltd.	Jatropha curcas	Savan-Seno Special Econ. Zone, Savannakhet province, plantations in Vientiane and Chamapassak province	15,000 hectares, production plant	10,000 tonnes/ year, production start in 2010	5 million US dollars, cooperation between Lao and Chinese investors
Mitr Phol (Thailand)	sugarcane	Tak province	20,000 hectares, sugar mill and ethanol plant		125 million US dollars, joint-venture with Padaeng Industry and Thai Oil which is supposed to be the only customer
Manivone Industrial Tree Plantation Development Company	oil palm	Vientiane and Attapeu province	10,000 hectares, 2 production plants	production start in 2011 (Vientiane) and 2013 (Attapeu)	for local use
Phetdala Agriculture Company Ltd.	Jatropha curcas	Ta-oy district, Saravan province	600 hectares planted with expansion plans to 1,000 hectares		3,5 million US dollars, agreement with the Ministry of Planning and Investment, plants to export to China, Malaysia and South Korea
Y&P Agro Industry Biodiesel Co	Jatropha curcas, agarwood,	Vientiane, Xekong province	200 hectares test farm		100,000 US dollars
Ltd	rubber				

REPUBLIC OF MALAYSIA

Area: 329,847 km²
Population: 25,715,819 [113]

Biofuels in Malaysia [114]	Installed Production Capacity 2008	Actual Production in 2008	Consumption 2008
Biodiesel	1.5 million tonnes/ year	171,700 tonnes (128,000 tonnes exported until Sept.)	25,000 tonnes (Starting from 2010: 500,000 tonnes/ year)
Bioethanol	none	none	None

State policies

In 2006, the Malaysian government introduced the National Biofuel Policy promoting biofuel production, especially biodiesel from palm oil. With the help of tax incentives for biodiesel producers and retail companies providing biodiesel at their gas stations, people are encouraged to use biodiesel. Car manufacturers are also offered incentives to produce convertible engines which can run on conventional fuels as well as on biofuels.
According to the Malaysian Biofuel Industry Act adopted by the Parliament in 2007, a mandate for the obligatory use of B5 (a diesel blend with 5 percent biodiesel blend) was supposed to have been implemented by 2008, but it was delayed until 2010 due to the price fluctuations of palm oil. After a deep decline during the global financial crisis at the end of 2008, the market became profitable again during the first half of 2009. Since February 2009 all government vehicles have been running on B5 as a way to help the industry to grow.

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[113] Newest data according to the CIA World Factbook
[114] Sources: Hoh, Raymond, USDA GAIN Report, 12 June 2009 and Wong, Shannen, The Star, 20 July 2009

The Malaysian government generally sees the development of biofuel crops as an opportunity to generate employment and to become more independent from fossil fuel imports. Therefore it plans to expand palm oil plantations to 4.9 million hectares by 2020. A government policy says that for food security reasons only an annual quota of 6 million tonnes of palm oil is allowed to be used for future biodiesel production, so that a bigger share of palm oil productions still goes into food and cosmetics production.
There are also plans to set up a Biofuels Park at Tanjung Langsat in the Pasir Gudang Industrial Estate. On 480 hectares, the park shall provide easy access to palm oil producers and the port of Tanjung Langsat in Johor. Some companies are also already operating at the Palm Oil Industrial Cluster Lahad Datu in Sabah on Borneo.

Feedstock and production

As the world's second biggest palm oil producer, Malaysia concentrates on biodiesel production from palm oil. Almost two thirds of the country's agriculture is devoted to oil palm plantations (11 percent of its land mass in 2007). Before Indonesia took first rank in 2007, Malaysia was at the top with a production of 16.5 million tonnes of palm oil in 2006. Biodiesel production was about 120,000 tonnes with 53,000 tonnes that were exported in the second half of 2006. While palm oil production rose to 17.7 million tonnes by 2008, biodiesel production increased only to 171,700 tonnes. By September 2008, Malaysia had exported 128,000 tonnes of biodiesel.[115]

[115] Hoh, Raymond, USDA GAIN Report, 12 June 2009

At the end of October 2008, the Ministry of International Trade and Industry issued licenses for 91 palm oil-based biodiesel production plants with a total capacity of 10.2 million tonnes per year. But by mid-2009 there were only twelve plants operating with a total production capacity of 1.5 million tonnes a year. Another four biodiesel production plants with a combined capacity of 190,000 tonnes a year are planned to go online by the end of 2009. The installed production capacity is expected to increase about 30 percent during 2009.[116]

To fulfil the planned B5 mandate, an annual production of 500,000 tonnes of biodiesel would be sufficient – this would not even require 3 percent of the country's current palm oil production as feedstock.

The Malaysian government is still reluctant to promote other feedstock before gathering more detailed knowledge on the economic risks. The Malaysian Palm Oil Board together with the Malaysian Rubber Board and the National Tobacco Board are currently running research and test cultivations of Jatropha curcas in the north of the country.

Bioethanol production is close to non-existent in Malaysia and is currently not attractive commercially, because gasoline prices are subsidized by the government. Cellulosic ethanol production from oil palm biomass is an option for the future, but research is still going on.

Local and international markets

Until 2008, Malaysia planned to produce so-called Envo Diesel for local use, a mix of 95 percent petrodiesel and 5

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[116] ibid.

percent processed palm oil. It differs from the European biodiesel blend B5, a petrodiesel blend with 5 percent methylester which is extracted by transesterification (see chapter: What are biofuels?). After the industry expressed its concern that Envo Diesel could wreck their engines, the government cancelled its plan and focuses now on the production of B5 as defined by international standards.
Although a B5 mandate for privately-owned cars is scheduled for 2010, commercial sales of biodiesel inside the country have only just started and are still limited to the Klang Valley which includes Kuala Lumpur and its suburbs. Biodiesel producers have expressed their hope that the government would set up more initiatives to boost domestic use. Most of the current production goes to other countries – mainly to Europe, the USA and India, but also to Japan, South Korea, Taiwan and China. Malaysia will export approximately 350,000 tonnes of biodiesel by 2010.[117]
A biodiesel power plant will be constructed in Labu, Negri Sembilan. There are also plans to set up a demonstration mill for the production of palm-oil-based biodiesel for cold climates. This project is obviously export-oriented.[118]

Location and land issues

The vast oil palm plantations on West-Malaysia's peninsula have almost reached their natural limits, so that further expansion is only possible in the Eastern provinces of Sabah and Sarawak on Borneo. Therefore, major Malaysian palm oil conglomerates have expanded their plantation business already to neighbouring countries – mainly to Indonesia

[117] According to the Malaysian Palm Oil Board
[118] Malaysia Biofuel Policy, 19 June 2006

which has much more land mass. This implicates a plethora of problems concerning sustainable development: be it from an environmental perspective for destroying the biodiversity of rain forests or from a social perspective with respect to the indigenous people living on their traditional community lands in those provinces. The Malaysian Palm Oil Board has announced further plans by Malaysian companies to establish oil palm plantations in Indonesia, Latin America and West Africa.

Around 10 percent of Malaysian oil palm plantations are in the hands of smallholders.

At the end of 2008, Malaysia's government granted 20,000 indigenous families permanent ownership rights for 50,000 hectares farmland for the first time. However, the government proposal includes a plan to plant rubber and oil palms on the granted land. A groundbreaking court ruling from May 2009 gave the indigenous Penan people in Sarawak the right to use their traditional community land for hunting and farming.[119] Before that, they had to prove that they had cultivated their land continuously for a long period. Otherwise the government would lease it to plantations companies. As hunters and gatherers, the Penan were hardly ever able to provide any such proof.

Since many companies were still not interested in the rights of the indigenous people and most of their traditional community land was already destroyed by logging, the Penan staged vehement anti-logging protests in August 2009. They not only fought for their land, but also for justice: NGOs documented numerous cases of rape and other human rights abuses against the so-called jungle people.[120]

[119] Survival International, press release, 11 May 2009

[120] Kuppusamy, Baradan, IPS News Europa, 24 October 2009

Living and working conditions

By and large, established plantations in West-Malaysia have problems with the working conditions of plantation workers. Despite the existence of the National Union of Plantation Workers in Malaysia, workers on plantations are still marginalized, working long hours with very low pay. At least, basic accommodation is usually provided, but only in some plantations the workers have a regular supply of water and electricity. Access to safety and health services is minimal. Most plantations are run like private property and access to the outside world is closely monitored and sometimes controlled.[121] Not surprisingly, many plantation owners have problems to fill their vacancies with local workers – despite a government policy asking for a reduction in foreign workers.

In Borneo, the Eastern part of Malaysia, oil palm plantations are still growing – providing much needed jobs in a region where half of the population are migrants. But even for smallholders owning their own piece of land, the working and living conditions on those plantations are close to slavery.[122]

Another big issue on Malaysian oil palm plantations is the use of pesticides. Surveys by the NGOs Tenaganita and Pesticide Action Network Asia and the Pacific (PAN AP) show the lack of training and information about risks at work: Workers spray highly poisonous chemicals without

[121] Information by Pesticide Action Network Asia and the Pacific (PAN AP)

[122] Rhett A. Butler describes very clearly, how and why smallholders become almost like bondsmen entirely depending on the plantation companies ("The social impact of oil palm in Borneo", www.mongabay.com/borneo/borneo_oil_palm.html)

wearing any protective cloths and without even being aware of the danger. Among the chronic health effects resulting from this practice are cancer, reproductive health problems and hormonal disruption. The workers, however, do not usually report their illness out of fear of losing their jobs. In the long run, the situation could threaten the survival of whole rural communities. The impact on women is worst, since they are usually doing the spraying –for eight hours a day.[123]

In the meantime, the Malaysian government has announced a ban on paraquat, one of the most toxic pesticides forbidden in the EU. However, the ban has not been implemented yet, because of the pressure from the industry. According to PAN AP, the National Union of Plantation Workers in Malaysia does not take the health impacts of pesticides seriously enough and instead supports the continued use of paraquat.

Investors

The palm oil industry in Malaysia has caused the rise of powerful transnational conglomerates based in Kuala Lumpur and Singapore, operating all over Malaysia, Singapore, Indonesia and Papua New Guinea. The biggest palm oil player in Southeast Asia is the Malaysian state-owned company Sime Darby Bhd. holding about 550.000 hectares of palm oil plantations after merging with Golden Hope Plantations Bhd. and Kumpulan Guthrie Bhd. The group employs about 100,000 people in 20 countries in plantation, energy, automotive and other palm-oil-related businesses.[124]

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[123] Rengam, Sarojeni V., WRM's bulletin N° 129, April 2008

[124] Data according to Pye, Oliver: 18 December 2008

Another important player in Malaysia is the Federal Land Development Agency (FELDA) under the Ministry of Agriculture that has the mandate to develop forest areas for the migration of the rural poor from other parts of the country. With 360,000 hectares of state-owned commercial plantations plus the administration of another 300,000 hectares owned by around 10,000 smallholders, FELDA has a strong influence in Malaysia's rural society.
Other huge state-owned palm oil companies are Kulim Malaysia Bhd and Tradewinds Plantation Bhd.
The biggest private palm oil company in Malaysia is the IOI Corporation, followed by Genting Group (Asiatic Development Bhd., 168,000 hectares) and Kuala Lumpur Kepong Bhd.
There are very few non-palm oil investors in the Malaysian biodiesel sector.

– Palm Oil Companies [125]–

State-owned companies	**Total Area (Int.)**
Sime Darby Bhd.	550,000 hectares
Federal Land Development Agency (FELDA)	360,000 hectares
Kulim Malaysia Bhd.	180,000 hectares
Privately-owned companies	
IOI Corporation	376,000 hectares
Asiatic Development Bhd. (Genting Group)	168,000 hectares
Kuala Lumpur Kepong Bhd.	150,000 hectares

[125] Source: ibid.

- Biodiesel Producers [126]-

Company	Feedstock	Location	Area/ Facility	Production Capacity	Investment
Alam Widuri Sdn Bhd	Jatropha curcas	Sarawak and Brunei	175,000 hectares	not producing yet	20 million US dollars in cooperation with Brunei company Koperasi Kampung dan Mukim
Asiatic Development Bhd. (Genting Group)	Jatropha curcas	Sepang	„Jatropha Experimental Station"		
Biodiesel LD Sdn.Bhd.	still researching low-cost feedstock	POIC Lahad Datu, Sabah	production plant	not operating yet: 200,000 tonnes/ year planned	
Carotech Bio-Fuel Sdn.	oil palm	Ipoh, Perak	production plant	93,000 tonnes/ year	
Carotino Sdn.Bhd.	oil palm	Pasir Gudang,	production	180,000 tonnes/	
		Johor	plant	year	
Global Bio-Diesel Sdn. Bhd.	oil palm	POIC Lahad Datu, Sabah	Production plant	150,000 tonnes/ year, planned expansian to 500,000 tonnes/ year	65 million US dollars, wholly owned subsidiary of South-Korean bio-tech company ECO Solutions Co. Ltd
Golden Hope Biodiesel Sdn. Bhd. (Sime Darby Group)	oil palm	Pulau Carey, Selangor and Panglima Garang Teluk, Selangor	2 production plants	60,000 tonnes/ year + 30,000 tonnes/ year	
Kulim Malaysia Bhd.	oil palm	Johor and Singapore	2 production plants; 32,000 hectares (only Malaysia	Johor not yet operating	joint-venture with German company Peter Cremer
Lereno Sdn. Bhd.	oil palm	Setiawan, Perak	production plant	60,000 tonnes/ year	
Malaysia Vegetable Oil Refinery Sdn.	oil palm	Pasir Gudang, Johor	production plant	100,000 tonnes/ year	
Mission Biotechnologies Sdn. Bhd.	oil palm	Petaling Jaya, Selangor	production plant	99,000 tonnes/ year	

[126] Data sources: Hoh, Raymond, USDA GAIN Report, 12 June 2009 ; Profile of Investors (Palm Oil Industrial Cluster Lahad Datu, www.poic.com.my/index.asp?p=news_20061107); Biofuels Database East Asia: Malaysia overview, Chapter 3; with additional information compiled from several articles listed under "Sources"

PGEO Bioproducts Sdn. Bhd.	oil palm	Pasir Gudang, Johor	production plant	100,000 tonnes/ year	
QL Bioenergy Sdn. Bhd.	oil palm	Bukit Wang, POIC Lahad Datu, Sabah	production plant	not operating yet	57 million US dollars
SPC Bio-diesel Sdn. Bhd.	oil palm	POIC Lahad Datu, Sabah	production plant	100,000 tonnes/ year	
Vance Bioenergy Sdn. Bhd.	oil palm	Johor	production plant	300,000 tonnes/ year	
Zoop Sdn. Bhd.	oil palm	Shah Alam, Selangor	production plant	100,000 tonnes/ year	
Zurex Corporation Sdn. Bhd.	oil palm	POIC Lahad Datu, Sabah	production plant	not operating yet	717,000 US dollars, joint-venture with British comapny Biofutures Pls

UNION OF MYANMAR

Area: 676,578 km²
Population: 48,137,741 [127]

Biofuels in Myanmar [128]	Targeted Production Capacity by 2008	Actual Production (until May 2009)	Consumption
Biodiesel	10.9 billion litres (2.4 billions gallons)/ year	No production yet	No data available
Bioethanol	50 million litres (11 million gallons)/ year	3.9 million litres (860,000 gallons)	No data available

State policies

In 2005, the government of Myanmar started a nation-wide campaign to plant Jatropha curcas (also called Jet Suu in Burmese). Their plan was to establish 3.2 million hectares of Jatropha curcas plantations until 2008 – and to double this number by 2015. The target was to produce 20 million tonnes of biodiesel a year from this feedstock.[129]
The Ministry for Agriculture and Irrigation stated that every state or division had to plant 20,234 hectares (500,000 acres) of Jatropha curcas plantations – irrespective of the availability of land, the density of the population, geographic or climatic conditions. For the the district of Yangon this means that 20 percent of all available land will be used for Jatropha curcas plantations. In mid-2006, the government requested every farmer to plant 200 Jatropha curcas seeds on 0.4 hectares of their land. The seeds were to be purchased from the government for 60 US cents which is about half the day's wage of labourers (some reports mention much

[127] Newest data according to the CIA World Factbook
[128] Data source: Ministry of Energy Myanmar
[129] Data according to the most quoted source: Ethnic Community Development Forum: Biofuels by Decree. Unmasking Burma's bio-energy fiasco, May 2008

higher prices). A manual by the Ministry of Agriculture stated that 1,200 trees had to be grown per 100 square metres.
To attract foreign investors for its biofuel plans, the government granted incentives for agricultural industries such as exemption from income tax and custom duties and also cheap land leasing rates. Investments in perennial crop plantations such as palm oil or facilities like sugar mills for ethanol production were particularly encouraged.

Feedstock and production

The Jatropha curcas action plan imposed on the whole population by force missed its targets by far. While there is varying information on how much land has already been cultivated with the inedible shrub, the production of 2006/2007 probably reached only between 25 and 50 percent of the planned yield (estimation by several NGOs), depending on the region. Although the trees already grow in vast areas, there were massive crop failures due to poor seedlings, insufficient knowledge on growing techniques, bad climate and soil conditions. At the beginning of 2007, the Director General of the Energy Planning Department, however, told possible investors in Singapore that 2.8 million hectares of Jatropha curcas plantations would be operational by the middle of the same year, allowing the country to start exporting biodiesel which was produced in seven plants run by local government authorities.[130] A Japanese business source mentions 2 million hectares planted with Jatropha

[130] Cropley, Ed: Myanmar biofuel effort raises doubts, Reuters, 12 March 2008

curcas by 2008.[131] If the government's programme succeeds, Myanmar will be the world's largest producer of Jatropha seeds as soon as these plantations are fully operational.
Up until 2008, nothing was heard about even one biodiesel processing plant running in the country. The government has not yet set up the necessary production facilities and the farmers were not able to sell their fruits. In some parts of the country, people tried to produce biodiesel from Jatropha curcas by themselves without any know-how. Their products damaged many engines.[132]
Other potential biodiesel feedstock in Myanmar could be rubber seed, sugarcane or palm oil. In 2004, Myanmar had 46,000 hectares of oil palm plantations producing 95,000 tonnes of crude palm oil and 275,000 hectares of sugarcane plantations with a production output of 7,030,000 tonnes. At the same time, the country had 12 sugar mills in use. The country operated 302,000 hectares of rubber plantations in 2007.[133]
According to the Ministry of Energy, an unnamed private company installed a sugar ethanol plant with a production capacity of 50 million litres a year. 3.9 million litres were produced until May 2009.There are several private companies producing ethanol from sugarcane in rather large scales. So far ethanol has been mainly used for alcohol production. The Ministry of Energy announced plans for large-scale production of bioethanol from cassava and sweet sorghum.

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[131] Matsuda, Chiho: Japan-Myanmar JV Established to Produce Biofuel from Tropical Plant, Green Technology,3 March 2009
[132] Fah,Hseng Khio, Shan Herald Agency for News (S.H.A.N online), 12 June 2008
[133] Data according to Myanmar Ministry of Agriculture and Irrigation

Local and international markets

The state-owned Myanmar Oil and Gas Enterprise wants to replace all fossil oil imports with locally produced biodiesel from Jatropha curcas in the near future. However, there are no working production facilities yet.
Although the government says that the Jatropha curcas project's main intention is to achieve energy self-sufficiency in the country, government officials have already talked about biodiesel exports to possible investors in several countries, mainly Singapore and Thailand, but also China and South Korea.

Locations and land issues

Very little data and reports are available about plantation developments in Myanmar.
Oil palms are mainly planted in the provinces of Kayin, Mon and Tanintharyi.
Jatropha curcas trees now grow all over the country.[134] According to Human Rights Watch, the military, responsible for meeting the quota in the rural areas, confiscated land from farmers to grow Jatropha curcas plants. Planters do not earn any income from it until the trees become productive after five years. At the same time, they cannot produce as much food for themselves as before, because their land is occupied with the inedible plant.[135]
Hunger was already a common problem in Myanmar before this programme was set up. According to the United Nations World Food Programme, ten percent of the Burmese were

[134] ibid.
[135] Friends Without Borders magazine, Issue 27 July-August 2008

short of food in 2007. The situation worsened due to the government's Jatropha curcas project. It was neither cancelled nor postponed after cyclone Nargis hit Myanmar and destroyed large areas of the Irrawaddy Delta which is known as the "rice basket" of the country.

Living and working conditions

Statistically speaking, every citizen of Myanmar had to buy and plant 177 Jatropha curcas trees within three years without any support by the authorities – often on land people used for private farming before. The military controls the progress of planting: People from all groups of society were forced to provide land, labour and money to grow Jatropha curcas. Not only farmers, but also civil servants, nurses, teachers and school children had to spend long working hours alongside roads, school and hospital gardens or even religious compounds to plant Jatropha curcas. Many areas used to be land for food crops which were needed by the population. There are several reports about children being poisoned by Jatropha curcas fruits they tried to eat, because they were hungry.[136]

Those who were not able to fulfil the requested quota of Jatropha curcas planting could expect to be punished by the military. To escape the sanctions, many Burmese try to flee their homes. In 2008, 850 Myanmar refugees from the Shan State were officially registered in Thailand. They said they could not fulfil their task and plant enough Jatropha

[136] Greacen, Chris, Bangkok Post, 1 May 2008. The Friends Without Borders magazine of July-August 2008 published a disturbing eye-witness report by Say Kur Sang of the Ethnic Community Development Forum on the Jatropha curcas development in Myanmar.

curcas and fled out of fear of punishment which included fines, beatings, arrest or even death. In some villages, 80 percent of the population has run away according to eye-witness testimonies.[137]

Investors

There is hardly any information on who participates in Myanmar's biodiesel investment programmes. According to some reports, there are investors from Singapore, Thailand and Great Britain.
The Energy Planning Department stated in 2007 that Malaysian and Indonesian companies were conducting negotiations with the aim of setting up processing plants. China, Japan and South Korea have also announced to provide technical assistance to Myanmar for improving its biodiesel production from Jatropha curcas.

– Biodiesel producers Myanmar [138]–

Company	Feedstock	Location	Area/ Facility	Investment
Myanmar Combiz Services Company in cooperations with Green Future Company	oil palms	Southern Myanmar	60,000 hectares, three mills (25 years devolopment starting from 2008)	200 million US-Dollars in partnership with Malaysian company Astral Asia
Myanmar Industrial Crops Enterprise	Jatropha curcas	Lay Daung Kan, Yangon	150,000 hectares, bio-research centre	cooperation with South-Korean company Haejohyub Bio Energy Myanmar
Plantation Resources Limited	Jatropha curcas	Irrawaddy River Valley	40,000 hectares	

[137] Greacen, Chris, Bangkok Post, 1 May 2008 and
[138] Information compiled from several articles listed under "Sources"

PAPUA NEW GUINEA

Area: 462,840 km²
Population: 6,057,263 [139]

There is no recent data available on production capacity or domestic demand of biofuels in PNG

State policies

While the government is definitely interested in positioning Papua New Guinea (PNG) as a leading biofuels producer, there are no official policies implemented yet. But the rising global demand for biodiesel feedstocks such as coconut and palm oil pushes the development of further plantations in the country.

The commercial use of oil palm plantations in PNG in a so-called Nucleus Estate-Smallholder System (NESS) first started in 1967 following a recommendation by the World Bank. The intention was to diversify the agricultural economy and to increase the export income of PNG. This plan included resettlement programmes by the government. Since then the government has actively promoted the expansion of oil palm plantations, often without caring too much about the consequences for rain forests and local communities.

Other development projects for biofuels production such as bioethanol production from cassava are particularly welcome.

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[139] Newest data according to the CIA World Factbook

Feedstock and production

Papua New Guinea is a major producer of palm oil and thus focuses on the production of palm-oil-based biodiesel. The oil palm surpassed coffee as the most important cash crop in 2001. Palm oil production by that time was about 300,000 tonnes a year. According to the PNG Oil Palm Research Association there were around 111,000 hectares of oil palm plantations in cultivation in 2004, approximately half of them operated by companies and the other half by smallholders. Feedstock number two for biodiesel production in PNG is coconut oil with an approximate production of 50,000 tonnes in 2002.[140]

Just recently, some international companies have developed an interest in other biofuel crops, especially cassava. Although the root grows everywhere throughout the country, large-scale plantations only exist on paper. The government supports these new cassava projects hoping for new job opportunities (for example an estimated number of 5,000 jobs for the Changhae Tapioca project mentioned below). [141]

Local and international markets

Most of PNG's palm oil production is exported, the majority of it to Europe. The development of projects using other biofuel feedstock is mostly initiated by other Asian investors, mainly Japan and South Korea. The first domestic palm oil refinery in PNG was opened in 2002 by the Malaysian

[140] These numbers according to the Papua New Guinean Oil Palm Research Association were the most recent official data available.

[141] Biofuels Digest, 17 May 2008

company New Britain Palm Oil Ltd (NBPOL) to produce cooking oil for the local market.
There is no reliable information on production capacity and consumption of biofuels in PNG. It is very common to blend filtered coconut oil or other straight vegetable oils (SVO) with diesel. These blends are used in private cars as well as in government vehicles, simply for their widespread availability on the diesel-driven market in PNG.

Location and land issues

Palm oil is a major driving force for rural development in the provinces where it is mainly grown: West New Britain, Oro, Milne Bay and New Ireland. It is also a major driving force for deforestation in the country, where 65 percent of the land mass is still covered with rainforests and other original vegetation.
In 2007, the World Bank granted a 27.4-million-US-dollar loan to the PNG government for a "Small Holder Agriculture Development Project" aiming to alleviate poverty in West New Britain and Oro provinces through a community-based approach to agricultural development. The government received the money in January 2009.
However, there is strong opposition, for example from residents of Oro province where plantations have already been established with World Bank loans. According to the local people, the money was misused by the companies to push the expansion of their plantations: Instead of promoting a potentially diverse agricultural development, smallholders were persuaded to sell their land or set up oil palm plantations, leaving no alternative crops and making

them totally dependent on the companies who own all necessary processing facilities.[142]

Living and working conditions

In 2002, the oil palm industry employed about 6 percent of formal employees in the country: by that time about 8,000 persons in the estate and mill sector and 15,000 smallholders were supplying fruits to the mills. Around 100,000 people have benefited from the industry.[143] More and more oil palms in PNG are grown in accordance with the NESS model. The smallholders are either migrants from other places who lease their land from the government or they are local people who grow oil palm on their own land. Both types depend on the access to milling facilities. These are all owned by private companies that buy the palm fruits.

The smallholders are supported by the Oil Palm Industry Corporation (OPIC), usually through loan schemes provided by large lending institutions such as the World Bank and the Asian Development Bank (ADB).

The social consequences for the people originally inhabiting the land who are not involved in the palm oil business are severe. They not only lose the basis of their livelihoods, usually with very little compensation, but as a consequence the traditional social structures of their communities are also lost.[144]

Working conditions are harsh, even for smallholders. A report by the Australian Conservation Foundation (ACF) describes the problems: Every other week, the companies

[142] WRM's bulletin N° 138, January 2009

[143] Papua New Guinean Oil Palm Research Association

[144] See Tan, Lee, Papua New Guinea Case Study Australian Conservation Foundation, 2007

collect the fruits that have to be processed 24 hours after the harvest. An entire family working two days from sunrise to sunset may harvest 1.7 tonnes of fruits worth 65 Dollars - minus the costs deducted by the company for fertilisers, transportation repayments and other supplies and services that can add up to 70 percent in total. That leaves the family with less than 20 US-Dollars for two weeks' work which they need for preparing the next harvest.[145]

A study by the ACF shows that the consequences for women are even worse. They usually only get a tiny amount of the money earned together with their husbands and have less control since the oil palm companies usually only deal with men. For a traditionally matriarchal society this means a significant change, since the men sell the land which used to be owned by women. Becoming aware of the difficult situation for women, the Oil Palm Industry Corporation introduced the "Mama Lus Frut Scheme", a system where women pick up the leftovers. The women were given harvest nets and a payment system (called a 'mama card') and were asked to pick and sell the loose fruits to the company. Many national and international organisations (including AusAID) saw this scheme as a good solution to help the women. However, many men seeing their wives earn an independent income start spending their own (much higher) incomes on themselves, mostly on alcohol – leaving the welfare of the family entirely to the women. Another consequence is increasing prostitution on the oil palm groves: Women have sex with some of the pickers to get more leftovers from them.[146]

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[145] Babon, Andrea, Australian Conservation Foundation, July 2006

[146] Tan, Lee: The Impact of Oil Palm on Women and Families, Australian Conservation Foundation, 2007

Investors

The palm oil industry in PNG was established with heavy support from the government and international donors, such as the World Bank and the Asian Development Bank. In January 2009, the government received the 27.4-million US dollars loan the World Bank had granted two years earlier for further promoting oil palm cultivation in West New Britain in Oro provinces.

Until 2004, there were five big palm oil companies dominating the market, initially all partly owned by the government. In the meanwhile, most of the private owners took over the government's share. The biggest palm oil producer in PNG is New Britain Palm Oil Ltd., a local subsidiary of Kulim Malaysia Berhad. Almost half the oil palm plantations in 2004 were owned by more than 18,000 smallholders who had to sell their products to one of the company-owned mills.[147]

– Palm Oil Companies PNG [148] –

Company	Location	Area	Production Capacity	Investment
Hargy Oil Palms Ltd.	West New Britain Province	9,700 hectares, 2 mills (2008)	55,000 tonnes/ year (2003)	wholly owned by Belgian company S.A Sipef N.V since 2003
Higataru Oil Palms	Oro Province	10,000 hectares (2004)		CTP Holdings Pte Ltd, Singapore (subsidiary of Cargill)
Milne Bay Estates Ltd.	Milne Bay	11,200 hectares (2004)		CTP Holdings Pte Ltd, Singapore (subsidiary of Cargill)
New Britain Palm Oil Ltd.	West New Britain Province	44,714 hectares (2008), expansion to 53,000 hectares planned, 4 mills, 1 refinery	380 tonnes/ day	subsidiary of Kulim Malaysia Bhd.
Poliamba Ltd.	New Ireland	5,800 hectares (2004)		CTP Holdings Pte Ltd, Singapore (subsidiary of Cargill)
Ramu Agri-Industries	Morobe Province	5,500 hectares (2008), 1 mill	2,000 tonnes after production start in 2008	private local company, 2008 tender offer from New Britain Palm Oil Ltd.

Company	Feedstock	Location	Area/ Facility	Production Capacity	Investment
Changhae Tapioca (South Korea)	cassava	Launakalana, Central Province	36,000 hectares	Production for the Korean market	100 million US dollars
Buka Metal Fabricators	coconut	Buka Town			run by Mathias Horn, former DED consultant
Copra Products Ltd.	coconut	Malaguna			
Cosmo Oil Co Ltd.	cassava, corn, peanut or other starchy crops	East Sepik Province	pilot development project		800 million dollars by Japan's third largest oil company cooperating with the government of East Sepik Province
New Britain Palm Oil Ltd.	oil palm	West New Britain Province	44,714 hectares (2008), new plantation planned, currently constructing a production plant in Liverpool, England	200,000 tonnes/ year starting from 2010	subsidiary of Kulim Malaysia Bhd.
PNG Sustainable Energy Ltd.	coconut	Aroma Coast, Central Province, East Pomio	1 production plant in Pomio, testing small-scale production for locals at Aroma		

[147] Papua New Guinean Oil Palm Research Association

[148] Data from 2004 according to the Papua New Guinean Oil Palm Research Association, with additional information from Adnan, Hanim, The Star, 8 September 2008 and PalmOilHQ, 6 May 2008

REPUBLIC OF THE PHILIPPINES

Area: 300,000 km²
Population: 97,976,603 [150]

Biofuels in the Philippines [151]	Installed Production Capacity 2009	Actual Production 2009	Consumption 2009
Biodiesel	395 million litres/ year	150 million litres/ year	140 million litres/ year
Bioethanol	39 million litres/ year	30 million litres/ year	208 million litres/ year

State policies

The "father" of the biofuel programme in the Philippines, Senator Juan Miguel Zubiri, followed the Brazilian model using sugarcane for bioethanol and the Indian model using Jatropha curcas for biodiesel. By doing this, the government hoped to reduce the Philippines' dependency on imported oil and to thus gain higher energy security in the country. The plan includes the target of 60 percent energy self-sufficiency by 2010.

In January 2007, after long disputes, the Philippine government ratified the "Biofuels Act" which requires the introduction of a minimum of 1 percent biodiesel in all diesel fuels consumed in the country within three months following the implementation of the law. In February 2009, the biodiesel mandate was doubled to 2 percent and might even be increased to 3 percent by the end of the year. All gasoline distributed and sold in the Philippines has now to be mixed with a minimum of 5 percent of bioethanol. In 2011, the bioethanol blend shall increase to 10 percent of the total volume of gasoline sold in the country.

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[150] Newest data according to the CIA World Factbook
[151] Data according to Corpuz, Perfecto G.,USDA GAIN Report, 1 June 2009

The Biofuels Act is understood as a chance for rural development and to provide the population with cheaper and cleaner alternatives to fossil fuels. In order to encourage investments, production and consumption of biofuels the government exempts energy crops from value-added tax and enables favourable loans for biofuel investors.
In 2008, an additional Renewable Energy Law was adopted. In March 2009, the government implemented the controversial "Joint Administrative Order No. 2008-1, Series of 2008" (or: "Guidelines Governing the Biofuel Feedstocks Production and Biofuels Blends Production, Distribution, and Sale under RA 9367"). These guidelines regulate among other things – the process of converting agricultural land for biofuel production. While investors appreciate the new regulation because it encourages more private investment, NGOs fear a new dimension of the biofuel-versus-food controversy and criticize that the rights of small farmers and indigenous people are not taken into consideration.
The Philippines want to become a leading producer of biofuels in the region. But to fulfil the requirements of the Biofuels Act, the country has to largely expand its feedstock production, especially for bioethanol – and has to set up 25 additional ethanol plants according to Senator Juan Miguel Zubiri.[152] Due to their huge deficit in production capacities, the Philippines currently have to import bioethanol from other countries to fulfil the obligatory 5-percent share. The government, however, has limited those imports to four more years. If the local production is still far below the demand by 2013, the National Biofuels Board might reduce the mandate according to the local production capacity.
Six government institutions are altogether responsible for

[152] Padilla, Arnold , 9 June 2007

the implementation of the Biofuel Act: The leading agency is the Department of Energy; the Department of Agriculture is responsible for the development of feedstock production, the Department of Environment and Natural Resources and the Department of Agrarian Reform for the necessary land development, the Department of Science and Technology for research and the technical development of the biofuels and the Department of Finance and Department of Trade and Industry for providing business incentives.

Feedstock and production

The Philippines currently produce mainly biodiesel. As one of the world's biggest producers of coconut oil (1,400 million litres per year), the country concentrates on biodiesel production from coco-methyl ester (CME) derived from coconut oil. 60 percent of the coconut oil production is located in Mindanao. In mid-2009, there were twelve coco biodiesel plants accredited with a potential output of 395 million litres a year. At least seven were already in operation in 2008.[153]

The government also promotes other biodiesel crops - particularly Jatropha curcas which is called tuba-tuba in the Philippines. The government plans to cultivate about 2 million hectares of unproductive land nationwide with Jatropha curcas to allow for a production of 5,600 million litres of biofuel in the coming twelve years.[154] Another possible biodiesel crop would be oil palms, but there have been only a few pilot plantations on the Philippines, mainly in Mindanao.

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[153] Apec Biofuels, July 2008 and Corpuz, Perfecto G.,USDA GAIN Report, 1 June 2009

[154] Corpuz, Perfecto G.,USDA GAIN Report, 1 June 2009

For its bioethanol production plans, the government focuses on sugarcane, which it sees as the most reliable feedstock due to well-known farming techniques and high yields. Corn, cassava, nipa palm and sweet sorghum are considered only secondary choices. To fulfil the quota of the Biofuels Act, sugar production has to increase. In 2007, the production was far from providing the required 400 million litres a year needed for a 5-percent ethanol blend. The national ethanol demand for 2009 is estimated to reach more than 200 million litres (460 million litres in 2011). To cover the demand for the planned E10-mandate by 2011, the country would need at least 18 ethanol plants running by then. Currently, only two plants are in operation.[155]
The Sugar Regulatory Administration (SRA) has identified almost 238,000 hectares of sugar cane fields for the bioethanol production, mainly in Mindanao. The "Sugar Island" Negros is presented as a potential capital for future bioethanol production from existing and new sugarcane plantations. To meet the demand, sugarcane plantations in the Philippines have to be more than doubled to about 345,000 hectares from 167,000 hectares in 2007.[156]

Local and international markets

B1 (a one-percent biodiesel blend) has been used since 2002 and is available at all gas stations in the Philippines. E10 (a 10-percent ethanol blend) was initially only sold by Seaoil stations. More companies are ready to join the business soon. In 2007, Ford Philippines opened a factory in Santa Rosa, Laguna, for the production of engines that can run on a 20-

[155] ibid.
[156] Apec Biofuels, July 2008

percent-ethanol-blend. This will increase local demand. Exporting them to other ASEAN countries is also part of the plan. However, to meet its own demand of a 5-percent-ethanol-blend by 2009, the country has to import much of the needed bioethanol (around 185 million litres in 2009, mainly from Brazil and Thailand).[157]

While the ethanol production is still far from covering the local market, the capacity for biodiesel production from coconut oil is far bigger than the national demand. Therefore the producers are looking for export markets. Chemrez Technologies Inc. for example, the biggest biodiesel producer in the Philippines, would be able to provide 75 million litres per year on maximum production. This would cover 96 percent of the country's biodiesel supply. Currently they run far below capacity and produce only 60 million litres per year. According to the company, Chemrez still dominates 55 percent of the market and has exported 500,000 litres of surplus production to Europe, China, Japan, South Korea and Malaysia.[158] The export, though, recently slowed down due to the high production costs of coconut biodiesel. Only when petrol oil prices are rising, will coconut biodiesel become truly competitive.

In June 2009, the President of the Philippine signed a deal with Brazil on bilateral technical cooperation in the field of bioenergy. The government claims to have concluded similar agreements with South Korea and some Arab countries.[159]

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[157] Corpuz, Perfecto G.,USDA GAIN Report, 1 June 2009

[158] C., Maria Kristina, Conti Business World, 18 January 2008

[159] Government of the Philippines, Press Release, Thursday, 25 June 2009

Locations and land issues

The main target areas for biodiesel production from coconuts are Northern Luzon and Southern Tagalog (Quezon) with their already existing vast coconut plantations. Palm oil plantations are located in the provinces Sultan Kudarat and Bukidnon on Mindanao. Jatropha curcas plantations are planned on the Visayas, some parts of Luzon and Mindanao. The state-owned PNOC Alternative Fuels Corporation (PNOC-AFC) wants to establish 1.2 million hectares of Jatropha curcas plantations in Mindanao, and is planning more projects, for example on Palawan and Negros. Conflict-ridden Mindanao is considered by state officials to be the most suitable place for planting Jatropha curcas because of the climate and large areas of idle land. In its Jatropha promotion programme, the state-owned PNOC-AFC is encouraging farmers in Mindanao to plant the biodiesel crop.[160] The Department of Energy affirms that it does not intend to make the farmers abandon food crop farming completely, but to add Jatropha curcas to their income. According to the government, all new projects will be established on idle land.

Although the government and private companies promote their biofuel projects as a chance for development, many NGOs have expressed their concerns with regard to the massive land grabbing and displacement of whole communities. They also point out human rights violations and the very probable impact on water and food security on the impoverished island. Many observers are concerned about an intensification of the armed conflict between the

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[160] Ho, Abigail L., Philippine Inquirer, 3 December 2007

army and the rebels in the Southern Philippines, since the conflict is centred on the access and control of water, land and agrarian products.[161]

Another main location for biofuel development is Negros, where already existing huge sugarcane plantations could be extended for bioethanol production. Alternatively, land could be converted into Jatropha curcas plantations. According to critics and the media, plantation owners could use this option as an excuse and avoid losing land that otherwise according to the Comprehensive Agrarian Reform Program (CARP) would have to go to landless agrarian workers. For example: Herminio Teves & Co Inc. signed a MoU with Spanish biofuel company Global Tree Trust to develop Jatropha curcas plantations on the sugar island Negros. The Philippine media suspect that this deal was used as a way for presidential brother-in-law Teves to bypass CARP. Without the deal he would have to redistribute parts of his land to landless farmers.[162]

CARP was scheduled to end by December 2008, but was extended to June 2009. Meanwhile the Philippine Congress is expected to approve a new land reform law as soon as possible. The outcome of this new law together with the mentioned Guidelines on the Biofuels Feedstocks Production will most probably be decisive for the efficiency of the Biofuels Act in the Philippines.

The communist militias of the New People's Army even vowed to fight against any development of inedible biofuel crops on Negros and to destroy new plantations.

There are also some positive examples of biofuel development, e.g. a small-scale Jatropha curcas project in

[161] AFRIM Advocacy Committee, 7 February 2008 and statements from Kalikasan, September 2009

[162] Files/Hermosa, Manila Times, 7 April 2008

Bayawan City, Negros Oriental, securing the energy for the municipal government building, and some oil palm areas in Sultan Kudarat, Mindanao. All these projects are run by co-operatives of smallholders who are beneficiaries of the Agrarian Reform Program and now farm their own land which they obtained from the redistribution programmes of the government.

Living and working conditions

There is no documentation yet on the living and working conditions on biofuel feedstock plantations, but there is plenty of information on the poor standards on other plantations, especially Mindanao and Negros. Most workers are contract workers and are not even paid minimum wages, let alone other benefits. There are also harsh restrictions for union activists on commercial plantations. On „Sugar Island" Negros for example (also known as a "stronghold of landlordism") workers' unions do not have a good standing at all against the feudal plantation systems of the owner clans, who usually also represent the political elite. Many representatives of unions and workers' organisations were already murdered in broad daylight. Their cases never had a fair trial: Most of the possible witnesses were too afraid to lose their jobs or even their lives as a consequence of their testimony. Political murders of members of opposition parties, workers' unions or human rights organisations happen frequently in the Philippines. In his report in 2007, UN special envoy Philip Alston mentioned the responsibility of the military concerning these murders. Nevertheless, the number of victims continued to increase.[163]

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[160] Schott, Christina, Berliner Zeitung, 30 May 2007

Many NGOs fear unfair market conditions for smallholder farmers – like onerous financing and leaseback arrangements – especially in Mindanao and Negros. Additionally, there are concerns with regard to the high water demand for biofuel production in areas that already suffer from water shortages. Impacts on food security can be expected, if more and more food plants are converted into biofuel feedstock plants.

Investors

Due to the high sums for setting up new processing facilities, most biofuel projects in the Philippines are financed by foreign corporations, mainly from China and Japan. Twelve production plants have so far received their accreditation from the Department of Energy. The government has reached agreements on the development of bioenergy with the governments of Brazil, South Korea and Saudi-Arabia.

– Biodiesel producers in the Philippines [164]–

Company	Feedstock	Location	Area/Plant	Production Capacity	Investment/ Partners
Abundant Biofuels Corporation	Jatropha curcas	Lumad Ancestral land, Mindanao	750,000 hectares		The US company plans a community development project.
Bioenergy 8 Corporation	CME	Sasa, Davao	production plant		
Chemrez Technologies	CME	Quezon City	production plant	75 million litres/ year (currently 60 million litres)	partnership with British company Bronzeoak Ltd
Bioenergy Northern Luzon Inc.	CME	Pasuquin, Pagudpud, Ilocos Norte	more than 1,000 hectares		74 million US dollars, in partnership with Japanese company Pacific Bio-Fields Corp.

[164] Data compiled from various articles listed under "Sources"

Golden Asian Oil International	CME		production plant		
Herminio Teves & Co Inc.	Jatropha curcas	Negros	10,000 hectares, production plant, scheduled start in 2009		MoU with the Spanish biofuel company Global Tree Trust
Petron Corporation	Jatropha curcas	Mindanao			40-percent-owned by Saudi Aramco
PNOC Alternative Fuels Corporation	Jatropha curcas	Mindanao	1.2 million hectares		105 million US dollars
Pure Essence International	CME		production plant		
Senbel Fine Chemicals	CME	Barangay Cotta, Lucena City	production plant	72 million litres/ year (currently 36 million litres)	
Toyo Engineering Corporation	CME			600,000 hectares	

- Bioethanol producers in the Philippines [165] -

Local companies	Feedstock	Location	Area/Plant	Production Capacity	Investment/ Partners
Alsons Consolidated Resources	cassava	Misamis Or., Bukidnon, Mindanao	production plant	36 million litres/ year, starting in 2010	partnership with Thai company Electricity Generation Public and the Japanese Toyota Tsusho
Basic Energy	sugarcane	Zamboanga del Norte	6,250 hectares of new plantations, production plant	49 million litres/ year, starting 2011	in joint venture with Canadian company Nexum Energy
Biofuel International	sugarcane, sweet sorghum molasses	Central Negros	2,000 hectares, production plant	38 million litres/ year, starting 2010/11	
Biofuels 88	molasses	Bataan	production plant	18 million litres/ year, starting 2010/11	
Bronzeoak Capas	sugarcane, molasses	Capas, Tarlac	production plant; 5,000 hectares existing plantations, planned expansion to 10,000 hectares	30 million litres/ year, starting 2010/11	30 million US dollars

[165] Data source: Sugar Regulatory Administration (2008), additional information from various articles on the Biofuels Digest Blog Philippines, 2009

Bronzeoak San Carlos Bioenergy	sugarcane, molasses	San Carlos City, Negros Occidental	production plant, based on 5,000 hectares	30 million litres/ year, started in 2009	
Bronzeoak Southern Bukidnon	sugarcane, molasses	Kibawe, Bukidnon, Mindanao	production plant, 9,000 hectares existing plantations, planned expansion to 11,000 hectares	45 million litres/ year, starting 2010/11	
Cavite Biofuels	sugarcane, molasses	Maragondon, Cavite	production plant, 2,500 hectares existing plantations, planned expansion to 6,000 hectares	37.5 million litres/ year	
E-cane Fuel	sugarcane, molasses	Lallo, Cagayan	production plant, 20,000 hectares of new plantations	45 million litres/ year, starting 2011/12	
Eastern Petroleum	cassava	Saranggani, Cotabato	production Plant	30 million litres/ year, starting 2010/11	
Fuel Inc.	sugarcane, molasses	Binalbagan, Negros Occidental	7,000 hectares, production plant	30 million litres/ year, starting 2010/11	
JCG/ ITOCHU	sugarcane, molasses	San Mariano, Isabela	production plant; 7,000 hectares of new plantations	30 million litres/ year, starting 2010/11	
JC Summit	molasses	Manjuyod, Negros Oriental	production plant	30 million litres/ year, starting 2010/11	
Leyte Agri Corporation	molasses	Ormoc, Leyte	production plant	9 million litres/ year, started in 2009	in cooperation with Indian company Praj
Negros Biochem	sugarcane, molasses	Bago, Negros Occidental	7,000 hectares, production plant	30 million litres/ year, starting 2010/11	
North Cotabato	molasses	North Cotabato	production Plant	scheduled start 2010/11	
Robson Agro Ventures	cassava	Cotabato	production Plant	60 million litres/ year, starting 2010/11	
Roxol Bioenergy	molasses	La Carlota, Negros Occidental	production Plant	30 million litres/ year, scheduled start February 2010	
Palawan Bioenergy	sugarcane and molasses	Aborlan and Narra, Palawan	production plant; 7,000 hectares of new plantations	30 million litres/ year, starting 2011/12	

REPUBLIC OF SINGAPORE

Area: 697 km²
Population: 4,657,542 [166]

Biofuels in Singapore [167]	Installed Production Capacity	Consumption
Biodiesel	868.000 tonnes/ 2008 (1 million tonnes/ 2010)	No data available ("negligible")
Bioethanol	none	none

State policies

Singapore is determined to take over the lead in Asia's green development business. Their ultimate target is nothing less than to become the world's leading centre for biofuels. Consequently, biofuels play an important role in the city-state's long-term energy policies. In November 2007, the government launched its National Energy Policy Report "Energy for Growth". Aware of Singapore's limited energy resources, the report aims to highlight the crucial role sustainable energy policies will play for Singapore's future economic growth. Hereby, the development of biofuels production serves two purposes at the same time: It presents one possible solution for satisfying the national energy demand and also opens up new business opportunities to satisfy global demand. Therefore, the city-state is trying to position itself as a processing and trading hub at the centre of Asian biofuels markets.

In May 2007, the government announced its intention to spend 240 million US dollars in the coming five years and turn Singapore into a leading centre for renewable energy production with its main focus on solar power, but also on the development of biofuels.[168] The city-state thus promotes

[166] Newest data according to the CIA World Factbook

[167] Data source: Yan, Rong, Nanyang Technological University Singapore, July 2008

[168] Kolesnikov-Jessop, Sonia, New York Times, 29 October 2007

itself as some kind of global testing ground for the research and the development of new techniques. With extensive research, Singapore also wants to ensure its leading role in the development of so-called second-generation biofuels. Nonetheless, there is no policy on the mandatory use of biofuels in the city-state itself. The local use of biofuels thus totally depends on free market forces.

Feedstock and production

Although Singapore does not have any domestic fossil oil resources at its disposal, it is the world's third-largest oil refining centre. The oil industry alone accounts for about 5 percent of Singapore's gross domestic product.[169] The government wants to gain a similar position in the production of biofuels. In 2008, there were five biodiesel plants operating on Singapore's Jurong Island with a combined production capacity of 868.000 tonnes. Several more plants are under construction.[170] The Economic Development Board of Singapore expects the production to exceed 1 million tonnes per year from 2010 on, reaching 3 million tonnes by 2015.

Finland's Neste Oil is currently building a giant production plant in Singapore. The facility is supposed to go online in 2010 with a capacity of 800,000 tonnes biodiesel. It is supposed to be the biggest biodiesel-processing plant by then - until an even larger plant by a Chinese-Indonesian joint-venture in West-Kalimantan will go online in 2015 with a capacity of 5 million tonnes/year. The Neste product is called

[169] Ravindran, N.,Singapore Institute of Management Public Magazine, June/July 2008

[170] Deducted from information in: Yan, Rong, Nanyang Technological University Singapore, July 2008

NExBTL, using palm oil, vegetable oil and animal fat and is promoted as the "cleanest renewable diesel in the world" that can run in every diesel engine according to the company. The feedstock will primarily come from certified palm oil plantations in Malaysia.[171]

Most of the plants in Singapore have been using palm and soy oils. A local company produces biodiesel from waste cooking oil. Jatropha curcas is used in small amounts and is expected to become more important, when the relatively new plantations in countries such as Cambodia, Lao or Myanmar start their productions (see respective country chapters). The first Jatropha-curcas-based biodiesel plant was built by Van Der Horst Energy Ltd. on Jurong Island with an expected capacity of 200,000 tonnes a year. The feedstock will come from plantations the company runs in Cambodia and China, and in the future probably also from new plantations in India, Lao and Myanmar.[172]

Since December 2007, Singapore's Temasek Life Sciences Laboratory has joined forces with the Chinese Academy of Sciences for research and development of energy-intensive plant hybrids for biofuels. Scientists announced to focus on sweet sorghum as an ideal feedstock for biofuel production. This would present Singapore's first step towards the production of bioethanol.[173]

Other possible future feedstocks under research are algae and animal fats.

Local and international markets

Almost all biofuel production in Singapore is deemed for

[171] AFP, 6 March 2009

[172] Biopact, Mongabay News, 22 March 2007

[173] Gudong, Du, Chinaview, 27 November 2007

export. There is only a very small local market.

Singapore has a strategic location overseeing a vast agro-industrial network in neighbouring Indonesia and Malaysia, the world's biggest palm oil producing countries, where Singaporean companies dominate the market. Close links to the huge markets in China and India are another significant advantage.

Furthermore, Singapore's research and transportation facilities present a crucial infrastructure for international companies to use and operate their Asian activities from the small city-state: Most of the international players in the business have their headquarters and some of their production facilities in Singapore.

The Finnish company Neste Oil, for example, chose Singapore explicitly for its proximity to Indonesia and Malaysia, the biggest suppliers of crude palm oil and other raw materials for its biofuel production.

Although the demand for biofuels and particularly biodiesel from palm oil dropped when fossil fuel prices fell as a result of the global financial crisis in 2008, most biofuel investors still believe that their long-term investments will be successful.

German trading company Peter Cremer, who was among the investors kick-starting the biofuel business in Singapore, currently runs its two biodiesel processing plants in Singapore and Malaysia at only half of its production capacity. The management, however, still believes that the future energy market will compensate for the current losses: Instead of focusing mainly on European and American markets, the company now also starts to explore Asian markets, where more and more mandatory regulations for biofuel blends will come into effect soon.

Neste Oil, too, originally targeted only the European market when they started constructing their giant processing plant on Jurong Island. But the company is now also talking to Japanese and South Korean customers and has announced exports to North America. In a test run for its product, Neste Oil co-operates with the Singaporean government in the project "Gardens by the Bay": 100 hectares of coastal land at Singapore's downtown Marina Bay will be turned into three tropical parks and all energy needs for this venture will be exclusively covered by NExBTL biodiesel.
Van Der Horst Energy Ltd., which is the first company to produce biodiesel from pure Jatropha curcas in Singapore, envisages China to be its initial export market, but expects Japan, South Korea and North America to follow later.
A small local company, Biofuel Research Pte Ltd, produces pure biodiesel from waste cooking oil for local use in Singapore. Their processing plant in Tuas on Jurong Island uses 200 tonnes of raw material per year. Although the product's price is below that of mineral diesel, it is still only a niche market in Singapore.[174]

Land issues and working conditions

Being a small city-state on an over-populated island, Singapore itself has no space for plantations. Due to its strategic location between supplying and demanding countries, it serves as a centre for administration, distribution, processing, development and research for biofuel companies.
Most of the processing plants are located on Jurong Island, Singapore's chemical industry hub. The feedstock

[174] Asia News Network: Biodiesel from kitchen, The Straits Times, 18 May 2006

plantations of Singaporean biodiesel producers are located all over Southeast Asia. There were many cases of illegal land acquisitions and recruiting practices, which NGOs (mainly in Indonesia) linked to Singaporean companies.

Investors

Many international companies active in the palm oil business have their Asian headquarters in Singapore (Nestlé, Unilever) and become more and more involved in biodiesel production, for example Cargill or Archer Daniel Midlands (ADM). ADM holds a 10-percent-stake of the Singaporean Wilmar Holdings, the biggest private palm oil producer in the world. The Wilmar Group operates 500,000 hectares of palm oil plantations in Southeast Asia and aims to become the world's biggest biodiesel producer by constructing 3 palm-oil-based biodiesel production plants on the Indonesian Riau Islands with a combined capacity of more than 1 million tonnes per year.

Another huge Singaporean joint-venture between British Petrol and D1, called D1-BP Fuel Crops Ltd., announced its break-up in July 2009. They had originally planned to develop 1 million hectares of Jatropha curcas plantations in Southeast Asia, India, Southern Africa, Central and South America with an investment of 160 million US-Dollars. It is unclear, if D1 will be able to implement its original plans now that British Petrol pulled out of the venture.[175]

Several industrial players such as Bosch, DaimlerChrysler, Kuok Oil, Nexsol, Shell Eastern Petroleum and Volkswagen started a biodiesel-testing project for diesel-powered cars in Singapore. The objective of this trial is to improve the use of palm-oil-based biodiesel in a tropical climate.

[175] Biofuels Digest: D1 Oils, BP divorce, 19 July 2009

- Biodiesel Producers in Singapore [176]-

Company	Feedstock	Facilities abroad	Facilities Singapore	Production Capacity	Investment
Biofuel Research Pte. Ltd.	waste cooking oil	–	production plant	18,000 tonnes/ year	subsidiary of Oakwell Engineering Ltd., received 2006 and 2009
					funding by the Singaporean SPRING SEEDS (Startup Enterprise Development Scheme)
Continental Bioenergy	oil palm, Jatropha curcas, soy	production plant in Ghuangzou China (70,000 tonnes/ year	production plant	150,000 tonnes/ year	
Natural Fuel Pte. Ltd.	oil palm, Jatropha curcas		production plant	600,000 tonnes/ year	130 million US dollars by the Australian company
Neste Oil	oil palm, Jatropha curcas	production plants in Finland (170,000 tonnes/year, one plant currently constructed in Rotterdam/Netherlands (800,000 tonnes/ year)	production plant	800,000 tonnes/ year, starting in 2010	776 million US dollars
Nexsol	oil palm	production plant in Johor, Malaysia	production plant	100,000 tonnes/ year	joint-venture of German Peter Cremer Group and Kulim Malaysia Bhd.
Van der Horst Energy Ltd.	Jatropha curcas	supplied by plantations in Cambodia, China, India, Lao and Myanmar	production plant	100,000 tonnes/ year, starting from 2010 (increasing to 200,000 tonnes/ year by 2012)	Joint-venture with the Institute of Environmental Science and Engineering of Singapore's Nanyang Technological University
Wilmar Holdings Pte. Ltd.	oil palm	3 biodiesel plants in Riau/Indonesia and 500,000 hectares of plantations in Southeast Asia	production plant	150,000 tonnes/ year	30 million US dollars, 10-percent-stake owned by US food company Archer Daniel Midlands

[176] Data source: Yan, Rong, Nanyang Technological University Singapore, July 2008 – with additional information from several articles listed under "Sources"

KINGDOM OF THAILAND

Area: 513,120 km²
Population: 65,905,410 [177]

Biofuels in Thailand[178]	Installed Production Capacity 2009	Actual Production 2009	Consumption 2009
Biodiesel	4.4 million litres/ day	1.58 million litres/ day	1.35 million litres/ day
Bioethanol	2.58 million litres/ day	1.18 million litres/ day	1.34 million litres/ day

State policies

In terms of environmental awareness, Thailand is a forerunner in Southeast Asia. It was the first country in the region to launch biodiesel production as a national programme in 2001. Its national standards were developed according to European standards. The government considers biofuels as an opportunity for rural development and trade and therefore plans to invest 2.75 billion Dollars into the expansion of biofuel crops. 550 million dollars alone have been earmarked for a special investment zone for palm oil in the south of the country.

In 2005, the Thai government announced its "Strategic Plan on Biodiesel Promotion and Development". This ambitious plan aims to reduce fossil fuel oil imports and carbon emissions by substituting 10 percent of the country's diesel consumptions and 20 percent of the fuel consumption for transportation needs with renewable energy sources like biodiesel and ethanol until 2012. The more recent 15-year "Alternative Energy Development Plan" aims to increase the share of renewable energies to 20 percent of the total energy consumption by 2022. With this plan, the

[177] Newest data according to the CIA World Factbook
[178] Data by Ministry of Energy Thailand, Department of Alternative Energy Development and Efficiency, June 2009

government wants to reduce oil imports, increase domestic energy security and reduce greenhouse emissions by 40 million tonnes per year. Biofuels shall make up 4.1 percent of the total energy use by 2022.
The success of these plans heavily depends on Thailand's domestic biofuels production. The Thai government introduced several policies and incentives such as waiving excise taxes for ethanol-blended gasoline and subsidising this so-called gasohol. This subsidy helps to guarantee that the price for a litre of gasohol will be about two bahts cheaper than regular gasoline. All government vehicles run on gasohol.

Feedstock and production

90 percent of the country's ethanol production is based on sugarcane molasses, a fermented by-product of sugar manufacturing. The remaining 10 percent come from cassava. The government plans to increase that number in the near future. Thailand is already the largest producer of cassava in Asia. Around half of its ethanol is used for alcohol production.[179] Sweet sorghum is expected to be a new resource, but at the moment it is still undergoing research. There are currently 11 bioethanol plants with an average production of 1.18 million litres per day. Six additional plants are being installed.[180] According to the Ministry of Energy more than 30 additional ethanol-producing plants are planned to be set up in order to satisfy the expected daily use of 9 million litres by 2023.
To reach the proclaimed target for biodiesel production, the

[179] APEC Biofuels: Thailand Biofuels Activities, 2008
[180] Ministry of Energy Thailand, Press Release by the Departement of Alternative Energy Development and Efficiency

Ministries of Agriculture and Energy plan to increase palm oil cultivation to 400,00 hectares by 2012 (1.6 million hectares in the next 20 years) and to almost double the cultivation of non-palm oil energy-crops. According to the World Rainforest Movement, vast plantations are also planned in neighbouring countries, but most Thai ethanol producers still prefer to look for domestic feedstock supplies. In June 2009, there were twelve biodiesel plants with an installed production capacity of 4.4 million litres per day. The actual production, however, is still far below the installed capacity due to insufficient feedstock resources.[181] The government wants to invest 91.6 million US dollars in soft loans for farmers growing oil palms. With a production of 1.3 million tonnes crude palm oil a year, Thailand is already the third biggest producer of palm oil after Indonesia and Malaysia.[182] One of the important crude palm oil producers in the country is Univanich Palm Oil with a production of around 150,000 tonnes in a year.
Besides, the government is promoting community-based and commercial biodiesel production of other raw materials such as Jatropha curcas and coconut oil.

Local and international markets

A national mandate for B2 (petrodiesel blended with 2 percent palm oil) was introduced in February 2008 requiring the production of about 420,000 tonnes biodiesel a year. B2 is now available nationwide. State-owned companies PTT and Bangchak started selling B5 (5 percent palm oil) in 2007 and it has become quite popular among

[181] Information by Ministry of Energy Thailand, Department of Alternative Energy Development and Efficiency
[182] APEC Biofuels: Thailand Biofuels Activities, 2008

farmers, because it costs about one baht less than normal diesel. The government wants to further push biodiesel consumption by means of a nationwide B5 mandate planned for 2011. This will require almost 4 million litres of biodiesel per day and mean a huge increase in energy-crop plantations. A B10 mandate is scheduled for 2012, which will remain optional unless there are enough resources available. Currently however, biodiesel is still mainly used by the industry and is far less popular than ethanol-based gasoline among private consumers.

Thailand sells E10 gasohol (a gasoline blended with 10 percent bioethanol) accounting for about 20 percent of total petroleum sales at the country's service stations. In January 2008, PTT and Bangchak started supplying E20 (a 20-percent ethanol blend), but until the beginning of 2009 only a number of stations around Bangkok sold the fuel blend. Nevertheless, the government plans to go mainstream with E20 over the next five years – and even started introducing E25 at the beginning of 2009 – while car manufacturers (Ford, Honda, Nissan, Toyota) are going to launch new models supporting gasohol.[183] At the same time, the government also started to promote E85.

Fuel ethanol export is now promoted by the government as the production in Thailand is expected to grow to a capacity of 5.85 million litres a day by 2010 (12.5 million litres by 2022).[184]

From January 2008 to May 2009, about 73.5 million litres of fuel ethanol were exported to Singapore, the Philippines, Indonesia, Japan, South Korea, Taiwan, Australia, the United Arab Emirates, and Europe.[185] Being already a major

[183] Energy Current News, 2 November 2008

[184] Information by Ministry of Energy Thailand, Department of Alternative Energy Development and Efficiency

[185] ibid.

exporter of sugar and cassava, Thailand could easily become a leading distributor of ethanol for energy-hungry countries such as China, Japan and South Korea.

Locations and land issues

Sugarcane and cassava plantations are mainly located in the northeast, in the east and in central Thailand. There are no large-scale Jatropha curcas plantations yet in the country. The development was delayed because of the low petrol oil price.

Most of the existing palm oil plantations are located in the south of Thailand, 40 percent alone in the provinces Krabi, Surat Thani and Chumphon, where the government plans further expansion and wants to attract new investors in a special investment zone. The plantations, however, develop more slowly than originally planned, because rubber revenues are still more attractive, especially for smallholders. In addition, the average oil extraction rate from the fruits lies far below the one in Indonesia and Malaysia.[186] The government therefore provides a training programme for palm oil farmers together with the German agency GTZ, in order to improve yields.[187] The government also started promoting palm oil in the north and north-east of the country, but the implementation seems to be rather unrealistic and is judged to be a mere political move by observers.

As a response to the expansion plans, governmental and non-governmental organisations request to define certain areas for food crops to be separated from those for energy

[186] Amraapali, WRM bulletin N° 137, December 2008

[187] German Technical Cooperation, Thai-German Programme for Enterprise Competitiveness: Eco-Efficiency ComponentEnergy and Eco-Efficiency in Agro-Industry

crops to ensure national food stability as well as Thailand's food exports.
Of the 21 million hectares of farmland in the country, more than 10 million hectares are occupied by rice fields. Around 2.8 million hectares are used for food crops that can also be turned into energy like cassava, sugarcane and oil palms.[188] The Ministry of Energy claims that the expansion will not harm food security in the country. 160,000 hectares of the planned expansions would be covered by government-owned land.

Living and working conditions

Almost 90 percent of the oil palm plantations in Thailand are owned by smallholder farmers. Since the installed production capacity of palm oil mills up to date exceeds the available resources by far, smallholders have a quite comfortable position in dealing with their industrial partners and the government.[189]
Sugarcane and cassava plantations are mainly owned by big companies. According to official reports, the working conditions for contract workers are relatively good and well-controlled, compared to neighbouring countries.
There are few independent reports about working conditions on cassava or sugarcane plantations in Thailand. The conditions of migrant workers on rubber plantations, however, are infamous. In February 2009, a strike of Burmese workers on a plantation in Suratthani made headlines – a rare incident and only possible because the striking workers had ID cards and a relatively good

[188] Arunmas,Phusadee, Bangkok Post, 20 May 2008
[189] Information by GTZ Thailand, September 2009

relationship with the plantation owner. Most migrant workers usually are too scared to go on strike because of punishments consisting of either violence or losing their jobs.[190]

Thailand's agricultural industry heavily depends on migrant workers. There are an estimated two million of them in the country, around 90 percent come from Myanmar. Many of them are illegally working in Thailand and are thus easy victims to bad labour practices such as low pay, long working hours, unbearable living conditions without adequate housing or healthcare – and always under the threat of deportation. With the economic slowdown at the end of 2008, they are now also the first ones in danger of losing their jobs and basic livelihoods.[191]

Most of the legal workers are residents or smallholder farmers who lost their land due to land grabs of plantation companies, state appropriations or land transfers to agribusinesses. They are usually heavily dependent on the nearest industry and thus have no real freedom to choose. Chinese and Vietnamese companies use to bring their own workers, which creates a lot of new social problems.

Farmers' organisations in Thailand tend to be rather small-scale, with only few big workers' unions who back-up plantation workers and smallholder farmers. Usually, these organisations have very limited resources and influence to effectively defend the rights of local communities versus high-profile industries. According to Focus on the Global South, environmental and labour standards on the plantations are becoming increasingly deregulated. As a result, agrarian areas are getting poorer while satisfying the needs of growing urban consumption.

[190] Htaw, Jaloon: Migrant workers strike for full pay on rubber plantation in S. Thailand, Independent Mon News Agency, 17 February 2009

[191] Information by Focus on the Global South, May 2009

Investors

- Biodiesel Producers Thailand [192]-

Local Companies	Feedstock, Raw Material	Location	Area/ Plants	Production	Investment
Asian Insulators (AI) Energy	CPO, stearin	Samutsakorn	production plant	200,000 litres/ day	300 million bahts since 2006
Bangchak	used vegetable oil, CPO	Bangkok	production plant	50,000 litres/ day	
Bangkok Renewable Energy	CPO	Chachoengsao	production plant	200,000 litres/ day	
Bio Energy Plus	stearin, RBD PO	Ayutthaya	production plant	100,000 litres/ day	
Charoen Pokphand	oil palm	Nakhon Si Thammarat, Songkhla, Ranong, Saraburi, Kamphaeng Phet	672 hectares in 2008, expansion to 32,000 hectares in 2018	start in 2011	600 million bahts
Green Power Corporation	stearin	Chumporn	production plant	200,000 litres/ day	40 million bahts since 2006, partner of B.Grimm Group
New Biodiesel	oil palm	Suratthani	production plant	220,000 litres/ day	
Pathum Vegetable Oil	CPO	Pathumtani		800,000 litres/ day	
Pure Biodiesel	oil palm	Rayong	production Plant	300,000 litres/ day	
Raja Diesel	oil palm	Suratthani	production Plant	established the first biodiesel plant in Thailand	
Siam Gulf Petrochemical	oil palm	Petchaburi	production plant	1.200,000 litres/ day	
Sun Tech Palm	CPO,	Prajeenburi		200,000 litres/	
Oil	stearin			day	
Thai Olechemical	oil palm	Rayong	production plant	685,800 litres/ day	
Veerasuwan	stearin, RBD PO	Samutsakorn	production plant	200,000 litres/ day	
International Companies					
Japanese Transport Cooperation Association (JTCA)	oil palm	Bangkok, Suratthani	40,000 hectares	100,000 tonnes/ year	20 million US dollars
Sun Care Corp.	sunflower	Loei	22,500 hectares	150,000 tonnes/ year	

[192] Data by Ministry of Energy Thailand, Department of Alternative Energy Development and Efficiency, 2009, additional information by various articles mentioned under "Sources"

– Bioethanol Producers Thailand [193]–

Company	Feedstock	Location	Production Capacity	Investment/ target
Ekrath Pathana	molasses	Nakhorn Swan	200,000 litres/ day	production for export with 95 percent purity
ES Power	molasses/cassava	Sakaew	150,000 litres/ day	
Khon Kaen Alcohol	molasses	Khon Kaen	150,000 litres/ day	
KI Ethanol	molasses	Nakhorn Rachasima	100,000 litres/ day	
Maesawd Clean Energy	sugarcane Juice	Tak	200,000 litres/ day	
Petro Green	molasses/ sugarcane juice	Chaiyapoom, Kanlaseen	2 plants a 200,000 litres/ day	Currently the biggest exporter
Ratchburi Ethanol	cassava/ molasses	Ratchburi	150,000 litres/ day	
SupThip	cassava	Lopburi	200,000 litres/ day	
Thai Agro Energy	molasses	Supanburi	150,000 litres/ day	
Thai Alcohol	molasses	Nakhornprathom	200,000 litres/ day	
Thai Nguan Ethanol	fresh Cassava	Khon Kaen	130,000 litres/ day	
ThaiRungRueng Energy	molasses(baggase)	Saraburi	120,000 litres/ day	
Thai Sugar Ethanol	molasses	Kanchanaburi	100,000 litres/ day	

[193] Data by Ministry of Energy Thailand, Department of Alternative Energy Development and Efficiency, 2009

DEMOCRATIC REPUBLIC OF TIMOR LESTE

Area: 14,874 km²
Population: 1,131,612[194]

There are no biofuels production facilities installed yet and no data on biofuel demand.

State policies

Timor Leste is one of the poorest states in Asia. Although there are huge fossil gas and fuel resources in the Timor Sea, the country neither has the money nor the technology and know-how to mine them on its own without foreign aid. Finding alternative energy supply thus is crucial. In 2008, the government of Timor Leste signed – despite heavy protests from international NGOs – several agreements with private investors to develop plantations and production facilities for biofuels. In a press release, the government stated that the commitments to these international companies would help "promoting alternative energy sources" for the people of Timor Leste and thus "reduce the country's reliance on foreign-based energy sources". The MoUs, however, do not define who will pay for environmental, social or safety management of the processing plants. Additionally, the government started promoting Jatropha curcas cultivation for energy self-supply in farmer communities.

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[194] Newest data according to the CIA World Factbook

Feedstock and production

The currently largest project in biofuel production discussed in Timor Leste is proposed by GT Leste, a private Indonesian investor, and focuses on bioethanol production from sugarcane. According to experts, however, this plan does not seem to progress at all. Neither GT Leste nor the Timorese government are taking serious measures to implement the project. According to experts, the investment would not be profitable on the designated land, which the Ministry of Agriculture recently reduced from 100,000 hectares (as indicated in the MoU) to 50,000 hectares.[195]

The government seems willing to focus on the development of Jatropha curcas cultivation instead. So far, Jatropha curcas is only grown on small lots of lands owned by independent farmers. Since the non-edible crop has never been planted in Timor Leste before, the outcome is unclear and risky. In an earlier agreement between Enviroenergy Developments Australia (EDA) and the local company Daba Loqui, the Australian company agreed to buy local Jatropha curcas seeds. According to the farmers, they were encouraged to replace food crops with Jatropha curcas. They were promised that EDA would buy all the Jatropha curcas they could grow. Yet, the project was never implemented - maybe because of high internal transport costs or maybe due to the lack of economies of scale. The government is now running its own programme to encourage co-operatives to grow Jatropha curcas. These are planned to be used by community-based small-scale refineries.[196]

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[195] Information by La'o Hamutuk and Watch Indonesia

[196] Information by La'o Hamutuk

Local and international markets

The government hopes for foreign investments in biofuel development as it could also be used to serve local energy demands. But so far, most investors interested in growing any kind of energy feedstock aim to produce raw materials for export and use in their own markets (e.g. Indonesia or South Korea). Australian company EDA even planned to import feedstock from the Philippines, Malaysia, Thailand, India for a Jatropha curcas processing plant in Timor Leste. The final product was supposed to go to Australia, Europe and the USA. But this project does not seem to take off the ground either as indicated by insiders.[197]
Currently, the government tries to find its own strategy to establish small-scale plantations and refineries on a community base.

Location and land issues

There are no huge plantations operating yet in Timor Leste. Most farmers intercrop or plant only small fields with a single plant. Even coffee, their main export product, is alternated with food crops. The sustainable agriculture systems in Timor Leste are quite sophisticated and would be very vulnerable to any sort of large-scale monoculture or commodity cash crop such as sugarcane. Since independence from Indonesia in 2002, local and international NGOs have been supporting sustainable agriculture projects with the main intention to oppose the commercialisation and agricultural policies of big

[197] The La'o Hamutuk Bulletin Vol. 9, No. 3: November 2008

organisations like the World Bank, AusAID and USAID. In their opinion, these will cause damage to small farmers and poor rural communities.

It came as a shock therefore when the government signed a MoU with Indonesian company GT Leste Biotech to develop a large sugarcane plantation. Although the company assured in a public presentation that no local residents would be removed, the Centre on Housing Rights and Evictions (COHRE) warned of the high potential of human rights violations when setting up such a huge plantation in such a short time.

There are many smallholders in Timor Leste and most people have access to some land, although they may not formally own it. Because of its troubled past, the land titles in Timor Leste are usually unclear, and most of the cultivated land is assumed to be owned by the communities living on it. A land dispute in 2005 between coffee farmers and the government, which gave a land concession to a Singaporean company, was mediated by NGOs in favour of the farmers.[198]

A controversial, new law on land rights, however, opens the door for foreigners who want to buy land in Timor Leste. This might even contradict the country's constitution.

Living and working conditions

80 percent of Timor Leste's population work and live from agriculture. Although the country's agriculture and land systems were drastically changed during Portuguese colonial rule and during the Indonesian occupation, the traditional social structures among rural communities are

[198] Information by La'o Hamutuk and Watch Indonesia

still very strong. Farmer's cooperatives, in particular, have an important function and thus some socio-political weight: In 2008, there were 94 cooperatives with 30,000 members.[199] The strong support for the country's successful coffee growers for example comes generally from cooperatives, mainly to ensure farmers get a larger share of the final prices through more transparent or fair trade. The biggest and strongest cooperative is the Cooperativa Café Timor that could become a role model for other agricultural production branches like Jatropha curcas or sugarcane.

Since there is no specialized co-operative for sugar workers yet, the NGO La'o Hamutuk is afraid that the working conditions on the planned sugarcane plantation of Indonesian company GT Leste Biotech would be similar to the situation of workers on Brazilian sugarcane plantations: low income, extended working hours leading to drug use, health impacts due to fertilizer application without proper protective clothing and so on. There are no control systems in Timor Leste yet to monitor social or environmental standards. Most farmers and potential plantation workers in Timor Leste are illiterate and do not know their rights.

Other NGOs and the opposition party Fretilin are concerned about food shortages in the already impoverished country, if large energy crop plantations were established. The government, however, points to the expectation of thousands of jobs, although according to the MoU it has no legal means to do anything, if these turn out to be only a few hundred vacancies for low-paid labour.[200]

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[199] Direccao Nacional Das Cooperativas, Newsletter Volume 2, Edition March 2008

[200] Budi, Setyo: East Timor, Inter Press Service, 17 June 2008

Investors [201]

In January 2008, the government has granted the Indonesian company GT Leste Biotech a concession of 100,000 hectares of so-called unproductive land for developing a sugar plantation together with a sugar and an ethanol plant. With an investment of 100 million dollars the company promised to generate 10,000 jobs in the districts of Covalima-Suai, Lautem-Lospalos, Baucau and Viqueque. The proposed facility could become the largest non-oil private investment in Timor Leste, if it is ever constructed. Recently the Ministry for Agriculture reduced the promised land to 50,000 hectares. GT Leste, however, officially still pursues the project and seeks credits from international banks for it. Some NGOs suspect that international credits are the main reason behind the whole plan which might never be implemented.

Only a month after the agreement with GT Leste, the Timorese government signed a MoU with Enviroenergy Developments Australia (EDA) to set up a biodiesel plant for processing Jatropha curcas seeds and a biomass power plant in Carabela, Baucau district. Over the next decade this 550-million-dollar-project was expected to generate 3,000 jobs and produce 2.5 million tonnes of refined biodiesel and 4.7 million tonnes of biomass per year. Increasing difficulties in the implementation, though, seem to render this project unprofitable too.

The government signed two additional agreements in 2008: one with the Norwegian company Jacobsen Elektro AS about developing a "Build, Operate and Transfer Programme" for Jatropha curcas oil and a power plant for

[201] Information by La'o Hamutuk

local demand. The plant would be based on biofuel and heavy fuel oil, although Jatropha curcas oil would be far more compatible with diesel fuel. The Jatropha curcas seeds for this project are supposed to come from local co-operatives.

Since the Norwegian company Jacobsen Elektro AS specialises in heavy oil plants, NGOs suspect that it is their intention to offload heavy oil from Norway by creating a need for it. Since heavy oil and heavy oil plants produced in Norway are not very high in demand anymore in developed countries, the Norwegian government might be interested in supporting Jacobsen Elektro AS, in order to create new markets in Africa and Asia.

A second agreement was signed with the Korean company Komor Enterprise Ltd for the development of 100,000 hectares of corn and Jatropha curcas plantations for biofuels in Lautem, Bobonaro, Baucau, Same and Viqueque for export markets. The MoU does not specify whether land will be leased from the government or from farmers.

- Biofuel Investors in Timor Leste [202] -

Company	Feedstock	Location	Planned area	Facilities/ Production	Investment
GT Leste Biotech	sugarcane	Covalima-Suai, Lautem-Lospalos, Baucau and Viqueque	100,000 hectares (recently reduced to 50,000 hectares)	one sugar and one ethanol plant	
Enviroenergy Developments Australia (EDA)	Jatropha curcas	Carabela, Baucau		One biomass power plant producing 2.5 million tonnes biodiesel and 4.7 million tonnes organic matter per year	550 million US dollars
Jacobsen Electro AS	Jatropha curcas, heavy fuel oil			One power plant based on heavy fuel oil blended with biodiesel	
Komor Enterprise Ltd.	Jatropha curcas, corn	Lautem, Bobonaro, Baucau, Same and Viqueque	100,000 hectares	production planned for the export market	

[202] Data source: ibid.

SOCIALIST REPUBLIC OF VIETNAM

Area: 331.210 km²
Population: 86,967,524 [203]

Biofuels in Vietnam [204]	Planned production Capacity 2010	Consumption
Biodiesel	50,000 tonnes of B5/ year	No data
Bioethanol	100,000 tonnes of B5/ year	No data

State Policies

In November 2007, the Vietnamese government adopted its "Scheme on development of biofuel up to 2015, with a vision to 2025" deciding on the future production and use of biofuels. The target is to produce 250,000 tonnes of ethanol and vegetable oil to meet one percent of the country's petroleum demand by 2015. Until 2025 the production shall increase to 1.8 million tonnes and cover 5 percent of the country's fuel demand. By then E5 (a gasoline blend with 5 percent bioethanol) and B5 (a diesel mix with 5 percent biodiesel) must be available all over the country.

All renewable energy sources together are supposed to contribute 2 percent of the national energy demand by 2010 and 3 percent by 2015.

The government primarily sees the introduction of biofuels as a way to reduce the increasing demand for fossil fuels in the energy-hungry country. The objective is to produce 99.8 percent of the required bioethanol domestically.

To reach these targets, the government wants to create favourable conditions for the development of biofuels and wishes to promote investments by means of tax incentives and low-interest loans.

The priorities for biofuels research and development in

[203] Newest data according to the CIA World Factbook

[204] Data source: Ministry of Industry and Trade Vietnam, September 2008

Vietnam are the enhancement of crop yields and the development of advanced conversion technologies. In 2007 Vietnam signed an agreement with leading ethanol producer Brazil to share knowledge and technologies for bioethanol production.[205]
In June 2008 the government approved a special scheme for the "Research, Development and usage of products of Jatropha curcas in Vietnam in the period 2008-2015 with a vision to 2025". This scheme aims to develop 300,000 hectares of Jatropha curcas in Vietnam by 2015 with expansion plans for up to 500,000 hectares by 2025.

Feedstock and production

Biofuels production in Vietnam is still in its infancy. The country has a constantly growing output of rice, cassava, corn and sugarcane – they all are potential feedstock for bioethanol. Vietnam is already producing large amounts of ethyl alcohol from sugarcane molasses and starches (76 million litres in 2005), but mainly for alcoholic beverage and the pharmaceutical industry. With 10 percent of its cassava and corn production as well as all cane molasses, Vietnam could probably produce around 320 million litres of bioethanol per year.[206]
The first bioethanol production plants are scheduled to go online by the end of 2009. This means that there would be 5 plants operating by 2010.[207]
Biodiesel is already produced in smaller amounts: Since 2004, some local companies in the Mekong Delta have

[205] Stromsta, Karl-Erik, Recharge, 9 September 2009
[206] APEC Biofuels: Vietnam's Biofuel Activities, June 2008
[207] Concluded from information compiled from various articles listed under "Sources"

produced biodiesel from catfish oil. Production targets had to be reduced, when the price for catfish rose drastically in 2008, because too many companies started to export catfish oil for biodiesel production.[208] Minh Tu Ltd. Co. recently signed a contract for the export of 200,000 litres/month of its fish oil-based biodiesel to Singapore.

Other potential biodiesel feedstock in Vietnam includes waste cooking oil, coconut, soy, rubber seed, and especially Jatropha curcas: A national action plan of 2008 requires the development of 300,000 hectares of Jatropha plantations by 2015. The Vietnamese Department of Agriculture and Rural Development currently runs a Jatropha curcas trial plantation on 5,000 hectares.[209]

The government also considers the development of special energy crops such as elephant grass and seaweed as potential feedstock and is running trials with these plants. The Institute of Applied Materials Science and the Institute of Tropical Biology at the University of Ho Chi Minh City have intensively researched several alternative feedstocks for biodiesel production.

Local and international markets

Vietnam as a producer of crude oil has just opened its first refinery. It is even planning to build one or two more to further boost the local production of petrofuel – not the best condition for a booming domestic biofuels market. Not surprisingly, most of the biofuels feedstock produced in Vietnam is designated for export, mainly to Europe and the United States. China, Japan and South Korea turn into

[208] Viet Nam News, 19 August 2008

[209] APEC Biofuels: Vietnam's Biofuel Activities, June 2008

increasingly interesting markets, too.
A mandatory use of biofuels is only scheduled for 2025, which means that the domestic market is still insignificant. Once the 5-percent-mandate is implemented, the country will need 1.8 million tonnes a year to cover the predicted demand. Nonetheless, locally produced biodiesel is already used in some parts of the country, usually in blends of 5 to 20 percent vegetable or fish-oil based biodiesel with petrodiesel. According to fish-oil-based biodiesel producer Minh Tu Ltd. Corporation, Can Tho City alone consumed up to 250,000 litres of B20 (80 percent petrodiesel mixed with 20 percent biodiesel) per day by mid-2008 (by then biodiesel was cheaper than fossil oil).[210]
By the end of 2008, two gas stations of state-run PetroVietnam Oil Corporation started selling bioethanol imported from China, also to test it for retail use in Vietnam. The E5 (5 percent bioethanol blended with 95 percent gasoline) is sold for a slightly cheaper price than common gasoline.[211]
The first bioethanol produced in Vietnam is expected to be available at PetroVietnam gas stations in the second quarter of 2010.

Locations and land issues

The government has identified 4.5 million hectares of "waste land" in different parts of the country where the production of biofuel feedstock is permitted. Despite the economic and environmental benefits expected from biofuel development in Vietnam, many NGOs are concerned about food security.

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[210] Viet Nam News, 19 August 2008
[211] Xinhua News, China Daily, 5 September 2008

Agriculture is still the most important sector in the country which is also a major food exporter. In the last few years, Vietnam even had to import a number of staple foods such as corn to fulfil the needs of the population.
Vietnam has already developed 12 million hectares of farmland and idle soil is getting rare[212] :Deforestation of mountainous areas often leads to land loss by erosion, while fertile areas in the coastal region increasingly struggle with salination and will be seriously affected by possibly rising sea levels.
All these factors could become a strain for the planning capacities of the authorities responsible for the development of biofuels.
The biggest producer of sugarcane and cassava at the moment is the Tay Ninh province where Bien Hoa Sugar Company and Singaporean Fair Energy Asia Ltd. are setting up Vietnam's second-largest bioethanol project together.[213]
State-owned PetroVietnam plans a Jatropha-planting project in Quang Tri (by PVI-Invest) and a cassava-planting project by its biofuel subsidiary Petrosetco in Lao, close to Dung Quat.[214]

Living and working conditions

Vietnam has ratified all ILO labour standards. The application of international environmental and social standards in the local production, however, is often not easy. Especially the huge demand from non-certification markets such as China is highly problematic, because nobody on

[212] Biofuel Database in East Asia, Japan Cooperation Initiative for Clean Energy and Sustainable Growth, 2009
[213] Biopact, Mongabay News, 17 August 2007,
[214] Duc, Nguyen Anh, 7th Asian Petroleum Technology Symposium, Ho Chi Minh City, 18-20 February 2009

the consumers' side controls the living and working conditions of the people involved in production.
Most of those international standards are designed for large production plants requiring large volumes and high investment costs anyway- and not for smallholder production, which is the most common system applied in Vietnam.

Investors

- Biodiesel Producers in Vietnam [215]-

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Agifish	catfish oil	An Giang	production plant	10,000 tonnes/ year	cooperation with Saigon Petro
Enerfish	waste from fish processing	Can Tho province	production plant	production starting in 2011	5 million euros from the EU (60 percent) and Finland's Ministry of Foreign Affairs
Green Energy Vietnam	waste cooking oil, Jatropha curcas	Ninh Thuan, Quang Tri and Thua Thien Hue provinces	by 2010: One agro station, 14 trial stations and 10,000 hectares owned by smallholders	production start in 2011 (earliest)	joint-venture with Australian company JatOil, in cooperation with Vietnam's Centre of Forestry Development and Department of Forestry
Minh Tu Ltd. Co.	catfish oil, Jatropha curcas	Can Tho City (plant), An Giang province (plantations)	production plant of fish oil-based biodiesel, 10 nectares of Jatropha pilot plantations	2 million litres/ year	exporting to Singapore and Cambodia
Thien An Co.				10,000 tonnes/ year	
Vamco Biochemical Joint Stock Company		Long An province		100 tonnes/ day	

[215] Sources: Vinh Xuan Cao, 24 October 2007 and information compiled from several articles listed under "Sources"

– Bioethanol Producers [216]–

Company	Feedstock	Location	Area/ Facility	Production capacity	Investment
Bien Hoa Sugar Company	sugarcane and cassava molasses	Ninh Dien, Chau Thanh district Tay Ninh province	production plant	50,000 tonnes/ year, production start expected in 2009	joint-venture with Singaporean company Fair Energy Asia Ltd.
Dong Xanh Joint Stock Company	cassava	Dai Loc, Quang Nam	production plant	100 million litres/ year	30 million US dollar
Eco-Carbone	Jatropha curcas	four regions	min. 30,000 hectares	80,000 tonnes/ year by 2012 starting production in 2010	partnerships with local farmers and communities
PetroVietnam (Petrosetco)	cassava and sugarcane	Bhien Phuoc province	production plant	100 million litres/ year, construction start in 2010	120 million US dollars, cooperation with Japanese company Itochu Corporation
PetroVietnam (Petrosetco)	cassava	Dung Quat, Qang Ngai	production plant	100 million litres/ year, construction start in 2009	138 million US dollars, joint-venture with British Bronzeoak Group
PetroVietnam (PVB)	cassava	Tam Nong District, Phu Tho province	production plant	100 million litres/ year, starting production 2009	85 million US dollars, joint-venture with Alfa Laval from Sweden and US company Delta T
Saigon Biofuel Co.	sugarcane and cassava	Ho Chi Minh City	production plant	40 million litres/ year	
Vietnam Ethanol Joint Stock Company	tTiboca	Dak Lak	4.000 hectares, production plant	66,000 tonnes per year	

[216] Sources: Ministry of Industry and Trade, September 2008, and Duc, Nguyen Anh, February 2009 with additional data compiled from several articles listed under "Sources"

ANALYSIS

Despite social conflicts and environmental destruction, despite food shortages and economic risks, biofuels are nonetheless on their way to become a really large, global business sector. The demand resulting from newly implemented or rising mandates in Asia, Europe and the USA and large over-capacities of production facilities in Asian and western countries will lead to further investments in the development of alternative energy feedstocks regardless of possible negative impacts (see chapters "Introduction" and "Life in Southeast Asian plantation areas"). Lots of changes in legal and business practices as well as in operation methods and consumption habits will be necessary, in order to turn biofuel production into a more positive contribution to a sustainable development.

1. Biofuel boom: longing for clean and secure energy resources

Initially, Europe and the USA promoted biofuel production as a means to reduce greenhouse gas emissions and also their dependency on fossil fuel imports. This seemingly simple solution to grow one's own energy resources on plantations and simultaneously slow down climate change was thought to be a major achievement for the global environment and energy security. Only a few years ago, European countries and the USA started introducing obligatory quotas for the use of biofuels[217] - obviously without sufficiently taking into consideration the global consequences and side-effects of the newly stimulated market, among them the conversion of vast agricultural land

areas into feedstock plantations for biofuels. Due to limited land availability and climate conditions in industrial countries, most feedstock is produced in developing countries where food often is already scarce even without food crops being converted to energy crops. In view of rapid population growth and subsequently a growing need for food resources – especially in developing countries and particularly in Asia – competition is bound to occur.[218]
In contrast to western countries, most developing countries see biofuels production primarily as a new chance for creating their own industry with a lot of job opportunities, especially in underdeveloped rural areas. Moreover, fast-growing nations such as China, Indonesia or the Philippines urgently need to find alternative resources to supply their increasingly energy-hungry people: the energy consumption of the ASEAN[219] countries for example is predicted to rise by 76 percent by 2030, faster than in any other region of the world.[220] Industrial countries Japan and South Korea,

[217] The European Union started with a target of 2 percent in 2003 and aims at a share of 5.75 percent biofuels in its energy consumption by 2010. It has adopted an obligatory quota of 10 percent biofuels by 2020 (currently under renewed discussion). The USA introduced a 2.78-percent quota in 2006 and have set a 100-million-gallon bioethanol mandate for 2010, which most probably will be reduced, because there is not enough feedstock available.

[218] A UNEP study of September 2009 predicts, that the world's population will grow by 36 percent between 2000 and 2030. While crop yields will probably also rise to a certain degree, the available farmland will be diminished among others by the demand for non-food crops and climate change effects („Assessing Biofuels", UNEP and International Panel for Sustainable Resource Management, September 2009, page 6)

[219] The Association of Southeast Asian Nations has ten members: Brunei, Cambodia, Indonesia, Lao, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam.

[220] International Energy Agency: World Energy Outlook, 10 November 2009

on the other hand, want to reduce their heavy dependency on fossil fuel imports, something they have in common with Europe and the USA.

2. Growing feedstock market in Southeast Asia

It is no surprise that one of the biggest feedstock markets is now emerging in Southeast Asia and the Pacific region – pushed further by sharply rising demand from China, Japan and South Korea[221]: Japan and South Korea do not have enough landmass to set up large plantations for energy crops and China needs most of its farmland to feed its huge population. This has the consequence that all of them look for arable land in neighbouring regions where they not only find perfect climate conditions, but also cheap labour. Southeast Asia – on its part – is hungry for investment and technological know-how.

– Forerunners

Thailand might be labelled the forerunner of biofuel production and consumption in Southeast Asia as it was the first country in the region to launch biodiesel production as a national programme in 2001. In the meantime, it also established a significant bioethanol production in accordance with national standards that match the guidelines of the European Union. No other country in the region provides such extensive supply of biofuel blends at domestic gas stations.

[221] India, of course, is also a huge emerging market for biofuels. But the South Asian subcontinent rather focuses on growing its own feedstock to become self-sufficient. Currently India invests little in the biofuel development in Southeast Asia. As a buyer of palm oil (mainly for other purposes than biofuels), however, India plays an important role.

The other driving forces of the biofuel market in Southeast Asia are Indonesia and the Philippines. Indonesia, the world's largest palm oil producer, has announced that it wants to allocate 22 billion US dollars for the development and promotion of biodiesel and bioethanol from various feedstocks. The Philippines too have ambitious plans and wish to reach 60 percent self-sufficiency in their energy consumption with the help of biofuels in 2010.[222] The Philippines are among the largest coconut oil producers and sugarcane growers in the world, but they also have plans to establish large Jatropha curcas plantations.

- Palm oil crisis

Malaysia on the other hand has felt the impacts of the economic crisis. The world's second largest palm oil producer relies totally on palm oil-based biodiesel production. Up to date they have exported almost all of it. But oil palms, only two years ago considered the most promising feedstock for biodiesel, are not the trend anymore after reports from NGOs revealed the disastrous practices on palm oil plantations (see chapters on Indonesia, Malaysia, Papua New Guinea and "Life on Southeast Asian Plantations"). Additionally, the price for palm oil rose at the same time when the price for petrol fuel was subject to a sharp decrease as a consequence of the global financial crisis in 2008. Malaysia is therefore far off its target to become the world's largest biodiesel producer.
Nevertheless, being the world's most productive oil crop, oil palms will surely re-emerge as biodiesel feedstock as soon

[222] According to its government, the Philippines already reached 57 percent energy self-sufficiency in 2008 (President Gloria Macapagal-Arroyo in her speech during the signing ceremony of the Renewable Energy Act of 2008).

as fossil oil prices have risen high enough for biofuel production to be profitable again. Indonesia and Malaysia together with Singapore's logistics network are already dominating 80 percent of the global palm oil production. With regard to palm oil, they cannot even be labelled developing industries any more, since they are the world leaders in the business.

- Going Jatropha

The poorer nations of Southeast Asia whose land is less suitable for palm oil cultivation opt for Jatropha curcas: Cambodia, Lao and Myanmar are planning large plantations of the oily nut tree as a future energy source - Myanmar even forcing its entire population to join in the world's largest cultivation project of the inedible shrub so far. Indonesia, Thailand, Timor Leste, Vietnam, and the Philippines too, plan large-scale Jatropha projects, but they will not be depending on it to the same extent. Cambodia and Lao are also planning large-scale bioethanol production from cassava.

3. Biofuel plantations in Southeast Asia: a chance for development?

Most governments in Southeast Asia see the establishment of energy crop plantations as an opportunity for the development of rural areas where the majority of their population lives. They claim biofuels production to be a chance for many new jobs and more energy independence. The influx of foreign investment is indeed bringing with it economic growth and job opportunities and some projects

really help improve rural electrification. But the lion's share of the production is exported and in most cases the countries' own population does not directly benefit from it. On the other hand, the sudden expansion of energy crops such as palm oil, sugarcane or Jatropha curcas destroys the natural resources traditionally used by rural communities and – more often than not – this leads to immense environmental destruction and increases social conflicts caused by forced land conversions or the eviction of whole communities. As a consequence, these millions of hectares of new plantations across the countries not only change the natural environment, but also the social structure of the largely rural societies in the multi-ethnic region heavily depending on agriculture.

– Land use practices

Overseas land leasing is one of the latest global developments widening the gap between rural and industrial societies. Frequently, corrupt officials and the military are involved in those deals. The British environmental magazine "The Ecologist" lists South Korea and China as the world's biggest "land grabbers", in total operating 4.4 million hectares of overseas plantations in Southeast Asia, Africa and Latin America.[223] In Southeast Asia, especially Cambodia and Lao are turning into main suppliers of cheap agricultural resources for their richer neighbours, including Thailand and Vietnam. But also Indonesia and the Philippines lease out large areas to foreign investors, primarily from China and South Korea, with Japan and Malaysia on their heels.

[223] Rees, Eifion: Extent of agricultural land-grab revealed on new website, The Ecologist, 22 June 2009

Although most of these land acquisitions are used for food production, a report by the Food and Agricultural Organisation of the United Nations (FAO) calls the global biofuels production targets a "key driving force" for the overseas leasing trend.[224] According to a study by researchers at Cornell University, up to a third of all available cropland on earth might be needed to produce 10 percent of all transport fuels from energy crop plantations by 2030.[225] The United Nations warned that around 60 million people could be displaced from their homeland because of this development.

- Consequences of monocultural agroindustries: degradation and migration

The land is degradated first: Large monocultures and an extensive use of fertilizers and water dry up the country, acidify the soil and pollute rivers. Formerly safe environments protected by forests become prone to erosion and later to floods and landslides. Social degradation follows: After clearing the land, the management of the investing companies often prefers employing migrant workers who supposedly cause less trouble because they are neither attached to the community nor the land. Local residents hardly ever get what they were promised and are left without property.

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[224] Cotula, Lorenzo; Vermeulen, Sonja; Leonard, Rebeca and Keeley, James: Land grab or development opportunity? FAO, IIED and IFAD, 2009

[225] Ravindranath, N.H. et al.: Greenhouse Gas Implications of Land Use and Land Conversion to Biofuel Crops. In: R. W. Howarth and S. Bringezu: Biofuels: Environmental Consequences and Interactions with Changing Land Use. Report of the International SCOPE Biofuels Project, 2009 (http://cip.cornell.edu/biofuels/)

They not only lose their land and with it free access to clean water and food resources, but are also left jobless. At the same time the influx of migrant workers causes rising food prices and social competition. This process frequently leads to violent conflicts between the companies and residents, migrant workers and local farmers, bribed leaders and their communities.

Even when smallholders plant the energy crops on their own lot, they often cannot keep up with the quick conversion from communal agro-forestry to a private, commercial plantation industry. Many of them become totally dependent on the companies, which provide them with seedlings, equipment and distribution service – finally working as impoverished labourers on their own land.

To escape the hard working and living conditions in and around the plantations, many people from rural communities migrate to bigger cities where they want to look for a better life – and often end up living in slums.

4. Certified biofuels: Too little too late

Up to date, consumers of biofuels have widely neglected the social destruction and human rights violations caused by the conversion of land for the production of energy crops. Even the new by-laws for sustainability in Europe do not adequately take into account the pressure on local residents and indigenous people to sell or even leave their homeland without any compensation. Current certification methods concentrate on energy efficiency, carbon balance, environmental impacts and list only basic working standards.

While Germany's new sustainability by-law for example requests relatively high environmental standards and focuses on a climate-effective carbon balance in the production, it was widely criticised for not paying enough attention to the social impacts.[226] These are indeed difficult to control – especially since most plantations are located in remote rural areas. The reality of life there hardly lives up to to European labour standards.
Now that the global public is slowly becoming aware of the startling impacts of biofuel production on environmental and social structures in feedstock producing countries, some Western governments and international organisations (for example the United Nations Environmental Programme) would like to backpedal and downsize mandates and introduce tougher regulations for a more sustainable production.

- Asia overtaking Europe

Yet, it's probably too late to control the spirits that were called: The development hived off, at least in Asia. The world's mostly populated countries, China and India, introduced biofuel mandates, which means that producers in Southeast Asia no longer need to focus on the demand from Western markets. Even more so, ever since the

[226] See "MISEREOR-Stellungnahme zum Entwurf der ISCC-Standards zur Zertifizierung von Biomasse vom 17.4.2009", Aachen 9 July 2009, as well as open letters to the German Federal Ministers Horst Seehofer (Food, Agriculture and Consumer Protection) and Sigmar Gabriel (Environment, Nature Conservation and Nuclear Safety) signed by 14 NGOs, among them Forum Umwelt und Entwicklung, Misereor and WWF Germany, 10 January 2008 (www.forum-ue.de) and 5 October 2007 (www.plattform-nachhaltige-bioenergie.de)

technically and financially strong countries Japan and South Korea with their huge car industries have joined the boom. With an estimated consumption of 8 billion litres of biofuels in 2011, Asia will soon overtake Europe.[227]
While the European Union is still discussing its planned biofuel mandate of 10 percent by 2020, China is already heading for the same quota in ten of its provinces. Almost all countries in East and Southeast Asia are planning the implementation of biofuel mandates from 5 to 10 percent in the coming decade. None of those countries has so far requested credible certificates for environmental or social sustainability from their feedstock suppliers. To gain ground again, controversial palm oil producers might just have to redirect their exports to China instead of Europe and the USA. They will face fewer restrictions through certification mechanisms there. Without a global agreement on conditions for sustainable biofuel production certificates as currently requested solely by the European Union and North America, the developments in Southeast Asia will not be halted.

– Economic viability

But European countries will not cancel all their biofuel plans either because of difficulties in producing countries, in order to comply with sustainability regulations. They have made huge investments, large production facilities remain idle and they desparately need more feedstock to balance their current over-capacities. Their products would of course be

[227] Biodiesel in the Asia Pacific Region: Advancement Amidst Uncertainty, Frost & Sullivan, 2006. For a comparison: The global biofuel demand is estimated to reach 90 million tonnes in 2011 (Freedonia Group Inc.: World Biofuels Forecast 2011 & 2016, March 2008).

easier to sell if the so-called green energy was "greener" and socially less destructive, but the key for success will always be the economic viability of the product.
And biofuels most probably will be viable once mandates and facilities are in place. The global demand for fuels – especially in the transportation sector (including aviation[228]) – will significantly increase in the near future, mainly driven by the developing countries. Carbon credits, too, play an increasingly important role in economic calculations, as biofuel plantations have just recently become eligible for carbon credits under the Clean Development Mechanism of the United Nations' Kyoto Protocol. According to the developers of this new methodology, though, relatively few plantations will comply with the strict conditions for sustainability.[229] Biofuels production from algae is expected to have the best chances of earning carbon credits in the future.

5. Second generation biofuels

Southeast Asian countries, too, have recognized that in the long run the development of biofuel from second generation feedstock will be more beneficial for the environment, social development and – most importantly – for business. Second-generation biofuels do not compete with food crops and are primarily made of products that would be thrown away or ignored unless they are further processed. The Japanese

[228] Japan Airlines conducted a test flight running on a biofuel mix at the beginning of 2009, as did Virgin Atlantic (UK), Continental Airlines (US), Air New Zealand and recently KLM/Air France with more airlines following.
[229] Bioenergy Business: Methodology opens way for carbon credits for biodiesel plantations, 21 October 2009

Ministry of Economy, Trade and Industry estimates that all ASEAN countries together have the potential to produce 43 billion litres of bioethanol from waste products such as bagasse, corn stems, palm fibres, rice straw and husk. Additionally, Indonesia, Malaysia, Thailand and the Philippines could produce 6.5 billion litres of biodiesel from palm and coconut waste.[230]
The rub in this potential is that it is still untapped and will probably stay unused for the coming one or two decades due to insufficient technology and know-how. Currently, the production of biofuels from cellulosic material is technologically difficult and far from viable. Also the development of production technologies using algae, considered to be one of the most important future biodiesel feedstocks, will still need some time. The USA, but also Japan and South Korea strongly push pertinent research in their own interest, since it would make them independent from the imports of energy crops. However, the technology will not be ready any time soon.

– The Jatropha hype

The only second-generation energy crop that will probably be able to feed biodiesel production facilities in the near future is Jatropha curcas: Many investors, officials and NGOs are currently pinning their hope on this inedible oily nut-growing shrub. Huge formal and informal plantations have recently been set up all over the world and the first ones among them have just started to become productive.

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[230] Ministry of Economy, Trade and Industry: Biomass Policy in Japan, New and Renewable Energy Division, Agency for Natural Resources and Energy, 1 February 2007

More than 85 percent of these plantations are located in Asia[231], led by India. Jatropha curcas grows on almost every soil, does not need a lot of water and its oil is easy to process, even in small amounts. This seems to make it a perfect crop for smallholders.

It is not suprising that especially newcomers in the biofuel production opt for Jatropha: Cambodia, Lao, Vietnam and East Timor are planning large plantations as a future energy source. Myanmar will soon even have the world's largest Jatropha curcas plantations, even if only a fraction of the military government's plans turn out to work – which might probably happen thanks to the support of China, Japan, Malaysia, Singapore and South Korea.

The positive dimension of this development is that – in theory – neither primary forests need to be cut down nor huge plantation facilities are needed (this does not mean that the practice might not show the opposite). The majority of Jatropha projects indeed lies in the hands of smallholders. Rain and compost fertilizer are supposed to be sufficient for the cultivation of the crop.

The snag is, however, that nobody can really predict the outcome, since there is no long-term experience of large-scale Jatropha curcas cultivation and its use for the production of biodiesel. It is likely that the yield will only match the expectation if the shrub is planted on fertile soil and given enough water – just like any other plant. The risk is that poor farmers who only put the seedlings in and have no further knowledge or training about growing or processing techniques will not succeed.

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[231] GEXSI LLP: Global Market Study on Jatropha, prepared for the World Wide Fund for Nature (WWF), London/Berlin, 8 May 2008

OUTLOOK AND CONCLUSION

The development of the global biofuel industry seems to be unstoppable. The question is not whether biofuels will influence international energy supply and demand and in turn agro-industrial structures, but how this process will unfold. While biofuel production from waste materials such as plant residues seems to offer a lot of advantages, it will still take at least one or even two decades until technological preconditions allow for the commercial production of cellulose-derived biofuels. The short-term objective therefore must be to limit the evident damages of the current development and to channel the market towards a more sustainable and socially compatible development.

Downsizing demand, improving management

The first and most obvious measure should be to stop further expansion of plantations where they are not needed. The most effective way to do this would be to considerably curb the obligatory mandates for biofuel use in many countries to a reasonable level – and to not push the market to an uncontrolled growth creating demand that cannot be fulfilled in a sustainable way. Instead of investing in countless new production facilities, the existing plantations could produce a lot more than they currently do, if their operators were provided with better knowledge and technologies. A project by the German development agency GTZ tries to demonstrate the difference in a development project with palm oil smallholders in the south of Thailand.[232] International support for research and training

[232] Example of an Intervention: The Thai Palm Oil Sub Sector, Thai-German Programme for Enterprise Competitiveness, GTZ Thailand, October 2009

in new cultivation and production techniques as well as for simply improving the management systems of existing facilities would definitely be an effective investment.

Globally applicable social standards

The certification methods used up to date have proved to be insufficient and cannot be applied easily in the soaring biofuels markets of Asia. To guarantee an improved and controlled development of feedstock plantations and global market practices means to improve the social conditions of sustainability certification processes. These are closely intertwined with the environmental conditions, but their direct human impact might be a more effective instrument to exert pressure and reach more acceptable standards in the business – starting with the working conditions on plantations. But regulations will only be of use, if the sustainability of biofuel production becomes part of an international agreement that includes all affected countries. To achieve this goal, trade unions and farmers' associations must play a much more important role. While only very few countries in the region have a union for plantation workers (e.g. Malaysia and Indonesia), farmers' associations exist all over Southeast Asia. Instead of leaving certification control mechanisms to outsiders and management executives, these farmer associations should be much more involved. Ideally, the establishment of a representative workers' or farmers' committee that is not identical with the company management and able to take over controlling tasks should be made a requirement for the certification of the plantations.

An internationally applicable definition of when land is to be deemed abandoned, marginal or degraded is also absolutely essential. In many parts of Southeast Asia, for example, communities use land in a traditional rotating rhythm – a practice that implies plots of communal land to be left idle for a certain period of time to leave nature time and space to recover. These intervals are often used as a pretext by officials and private companies to classify the land as abandoned or degraded. Communities having lived from this land for centuries usually do not possess valid property certificates. If plantations companies promise money and jobs, it is therefore easy to manipulate them. They are pushed to sign agreements for the conversion of their land into plantations. Sometimes this might even raise their living standards for the short term. Without knowing about their legal rights, however, they often end up as day labourers, jobless or migrants without livelihoods. Consequently, a conversion only makes sense on land where energy crops do not compete with food crops or traditional livelihoods of whole communities – and where using the land saves more greenhouse gas emissions than waiting for nature to grow back on its own.

Local use and rural electrification

Biofuels could indeed be very useful for increasing living and working standards in rural communities if they were produced for local use and not primarily for national consumption or export purposes. It would be more effective if more biomass was directly turned into power instead of being processed into transportation fuels – to be shipped to

distant markets, which has an adverse effect on its carbon balance.
International support for research and development would certainly be helpful for Indonesia and the Philippines, for example: Both are huge archipelagos facing energy shortages caused by mismanagement and transportation problems rather than a lack of resources. Not only in their case, locally produced biofuels and biomass would be a good way to increase rural electrification. Supporting such a development could become an important focus for the future work of international aid organisations. The biggest part of Southeast Asia's biofuel production is currently bound for export.

Second-generation biofuels development

After the expansion of first-generation biofuel production has slowed down, the focus is shifting to second-generation biofuels. Cellulose-based bioethanol derived from plant residues such as rice husk, wheat straw or wood chips, in particular, are expected to provide a sustainable solution in the future. The advantages are obvious: The biomass will be first used to produce either food or other conventional products before its energy content is extracted from the residues. This process is not only cutting down the demand for land, but also maximizing the potential to reduce greenhouse gas emissions.
Current research is, however, still far from providing technologies for a commercially viable production of cellulosic bioethanols. Jatropha curcas and algae are some second-generation feedstocks considered viable to date and in the near future along with animal fat and waste vegetable

oil. While biodiesel production from waste fats and oils is already common in several countries (for example Vietnam), biodiesel derived from algae is not yet produced in large amounts due to technological difficulties.

That seems to leave Jatropha curcas as the most practicable option for the time being. This boom, though, will only have a positive outcome if it complies with international standards of environmental and social sustainability. Jatropha might indeed become the up-coming energy crop if it stays in the hands of smallholders who are provided with technological know-how and logistical back-up by international government agencies or NGOs. This could especially work for local use and rural electrification in remote areas (as planned in parts of Indonesia and Timor Leste for example). If projects are set up by foreign investors as a large-scale industrial development against the will of local communities, it is likely to fail in its social dimension as was the case with other major plantations projects in the past. The question about what will finally happen to all the first-generation crop plantations and the people living from them once second-generation biofuels become marketable, is another major question which has not yet been addressed appropriately. Some forecasts see the demand of biofuels constantly rising to such an extent that both – first- and second-generation feedstock – will be viable. But they do not take into account the development of completely different energy and storage technologies that might supersede the need for any biofuels in a few decades.

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