



Inception Report

for

Ministry of Energy and
Mines (MEM)

Department of Energy
(DoE)

Biofuel Assessment Study in Lao PDR

Inception Report

Gaillard, Rietzler

Vientiane, Lao PDR

August 2009



Lao Institute for Renewable Energy

LIRE

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About LIRE

LIRE is a non-profit organisation dedicated to the sustainable development of a self sufficient renewable energy sector in the Lao PDR. The institute offers agronomical, technological and socio-economic research services, and works to provide a free public resource of information and advice on the use of renewable energy technologies in Laos. LIRE strives to support the development of the country by exploring commercially viable means to establish renewable energy technologies in rural parts of the country, in areas without connection to the national grid and with little access to technical expertise.

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1. Introduction

The six-month assignment: Biofuel Assessment and Policy (BFAP), commissioned by the Department of Electricity (DoE), Ministry of Energy and Mines (MEM), was initiated with an inception meeting at DoE on 20th July 2009. The meeting was attended by representatives for DoE, the Ad Hoc Committee on Biofuels, key representatives from international development initiatives in renewable energies in the Lao PDR, the private sector, and the consultant for this assignment: The Lao Institute for Renewable Energy (LIRE). This report documents the presentation and discussions of that meeting, and additionally serves as an introduction to the assignment for stakeholders related to the biofuel sector in the Lao PDR.

There are two main aims of the assignment:

- 1) Assess and evaluate the status of biofuels in the Lao PDR in the context of the GoL target to achieve a significant offset of diesel import by 2020, taking into account the interests of the key stakeholders in the sector, and by comparing to examples from other nations**
- 2) Produce recommendations towards a draft policy for biofuels in the Lao PDR, based on the findings of the assessment, including suggestions of modified targets if appropriate.**

More specifically, the consultant was assigned five tasks, to be completed during the term of the work:

1. Baseline assessment of the overall potential for domestic production of bio-fuels including ethanol and biodiesel in Lao PDR
2. Evaluation on social, economic, technical, and sustainability grounds of alternative modalities of bio-fuels cropping
3. Describe the investment, land use, policy and pricing requirements to achieve a target of 30% displacement of gasoline and diesel imports through development of ethanol and biodiesel production, respectively
4. Recommendation of initiatives such as pilots and more analysis for MEM to undertake in deciding upon a bio-fuels development program for Lao PDR
5. Development of specific suggestions for government-sponsored bio-fuels development strategies and policies,

The objectives of the inception meeting were to discuss the following components of the assignment:

- Overall methodology to be used for the study;
- Work plan and schedule, including expected deliverables;
- Relevant documents and data sources to be considered as part of the baseline assessment;
- Relevant Ministries to be consulted;
- Overall scope of the study, including problems or constraints;
- Need for public consultation with various stakeholders, especially as regards the social, economic, technical, and sustainability grounds of alternative bio-fuels business and cultivation models;

- Discussion of ideas for government-sponsored bio-fuels development strategies and policies

Each of these items are described in the following sections. First, some background and context is offered for the assignment.

2. Background

2.1 Present energy and fossil fuel situation in Lao PDR

The Lao PDR has an estimated population of 6.1 million¹. The economy exhibits strong growth: 6.8% on average from 2002–2006, 8.0% in 2007, and in 2008 income per capita had exceeded USD 700². At present agriculture and forestry remains the largest sector, supporting more than 80% of the population, and growing by 2.7% in 2007. Other sectors are growing rapidly, with industry accounting for nearly one third of the economy in 2008, largely due to exports of hydropower and minerals (mainly gold and copper) that have grown largely thanks to Foreign Direct Investment (FDI). The service sector grew by 7.2% in 2007 and the number of tourists visiting the Lao PDR rose by 15% to an estimated 1.4 million per year. With such rapid economic growth, national energy demands are increasing rapidly³.

The Lao PDR imports 100% of its fossil fuels from abroad (mainly through Vietnam and Thailand). Most imported fuel is used in the transportation sector. Due to the abundant availability of hydropower, unlike many other nations, only a small proportion of fossil fuel is used for electricity generation in the Lao PDR. However, in rural areas without grid access, fossil fuel is widely used for cooking, lighting and generators and stationary stable-load motors (e.g. rice mills, water pumps). Since 2000 the import of oil to the Lao PDR has increased annually by ~5%, and this is likely to accelerate to 10% when taking into consideration the rise in numbers of vehicles in the country⁴. The MEM has estimated that in 2020 914 million litres of fossil fuel will be needed. An update of this estimate will be calculated during the present assignment.

2.2 Definition of biofuel for the study

To help constrain the scope of the present assignment, it is appropriate to establish an unambiguous definition of Biofuel. In general Biofuel is defined as solid, liquid or gaseous fuel obtained from relatively recently lifeless or living biological material and is different from fossil fuels, which are derived from long dead biological material. For this study, definition is limited to

¹ Lao PDR National Census 2005

² Economic@anz; Economic Update Lao PDR, 2008

³ Tender Document Lao PDR Renewable Energy; Strategy Development and Capacity Building, Tauno Kääriä 2008

⁴ Motorbikes have increased from 51,000 in the year 2000 to 557,000 in the year 2004 (MEM, SNC, 2006)

Plant oils, Biodiesel and Bioethanol which are produced from energy crops.

Additionally, the following terms are hereby defined for the benefit of the reader:

Energy crops (plantation): Energy crops are plants grown to explicitly to produce biofuels. Commercial energy crops are typically densely planted, high-yielding crop species containing suitably high concentrations of oil, starch or sugar.

Plant oil: Vegetable fats and oils are lipid materials derived from plants. Oils are distinguished from fats in that they are liquid at room temperature (20°C).

Biodiesel: Biodiesel refers to a diesel fuel derived from vegetable oil or animal fats, characterized by containing long-chain alkyl (methyl, propyl or ethyl) esters. Biodiesel is typically made by chemically reacting lipids from vegetable oil or animal fat (tallow) with alcohol. Biodiesel can be used in standard diesel engines.

Bioethanol: Bioethanol fuel is ethanol (ethyl alcohol), the same type of alcohol found in alcoholic beverages. Ethanol can be made from crops commonly used in food production such as sugar cane, potato, cassava and corn. Bioethanol can be blended with gasoline and used in standard gasoline engines.

2.3 Current biofuel efforts in Lao PDR

2.3.1 Feedstock production

Biofuel production depends upon a reliable supply of feedstock. To date, such a supply chain has not yet been established in the Lao PDR. Although the climate is suitable for energy crop production, there are core challenges related to agriculture:

- Changing agricultural practices (e.g. Shifting cultivation, introducing monocultures, modernization...)
- Land use changes: "Turn land into capital", land concessions and contract farming
- Exploitation of Biodiversity

At present, the local production of biofuel from dedicated energy plantations is believed to be negligible. Indeed, the produce of existing "energy plantations" is for human consumption, animal feed or export. The first major energy crop projects for Biodiesel production have been focused on *Jatropha*, an inedible plant whose seed have a high oil-content. More recently, interest for other potential biofuel crops has also increased, with Cassava, Sugar Cane, and Sweet Sorghum among the most popular of candidate crops. The table below gives a short list of energy crops which are cultivated in Lao PDR.

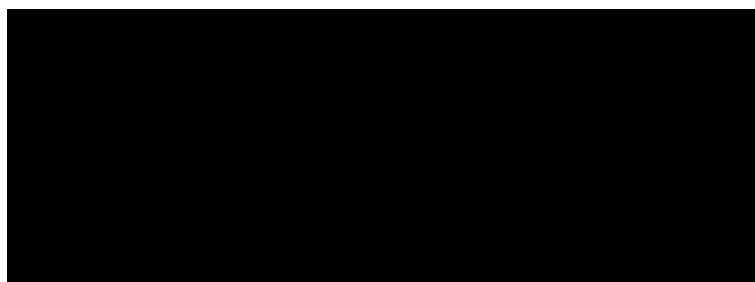


Table 1: Energy crop production in Lao PDR⁵

Regarding Jatropha, efforts are both orientated on large scale production and contract farming with small holders. Despite outstanding issues for Jatropha plantations in the Lao PDR such as low yields (< 1 ton seeds/ha)⁶, at present around 20 – 30 companies are known to operate in the Biofuel sector (mostly agribusiness / feedstock production).

To date, investors from China, Thailand, Vietnam, Korea, Italia, France, and Japan have all tried to establish Jatropha plantations in the Lao PDR. The failure rate has been high, with many projects facing serious agronomical challenges or having abandoned their activities due to (i) improper business models, (ii) lack of understanding of the local context, (iii) lack of experience with Jatropha cultivation, or (iv) overestimated expectations. A range of cultivation and business strategies (plantation models and contract farming) have all encountered difficulties resulting in an insufficient performance of seed yield. Some of the problematic were already described in the Policy Brief on Jatropha⁷

2.3.2 Current Biofuel production facilities

Technical facilities for the conversion of feedstock into Biofuel are already present in Lao PDR, however the current capacity and level of utilization are low. One oil extraction unit (oil screw press) and a transesterification plant⁸ are installed at the NAST, although with limited feedstock, operation is negligible at present. There are no facilities installed for the production of Bioethanol. The present alcohol production is based on rice and for human consumption only. In general, due to limitations on sufficient feedstocks (oil, starch or sugar crops), current Biofuel production in the country is marginal.

⁵ National Statistic center 2006

⁶ LIRE results from experimental Jatropha plantations

⁷ Developed by LEAP and LIRE, 2009. www.lao-ire.org

⁸ Batch system with a capacity of approximately 500 litre iodiesel per day

2.3.3 Existing Biofuel documents

In 2008, the New Energy and Industrial Technology Development Organization (NEDO) assigned the DoE to draft a policy document on biofuel promotion and development in Lao PDR. The study was conducted by LIRE and intended to stimulate an exchange of knowledge within the key stakeholders involved in the Biofuel sector and secondly to suggest strategic orientations that would assure the viability of such policy. In the ANNEX a list of relevant documents for Biofuels in Lao PDR will be presented.

2.3.4 LIREs activities in Biofuels

Since its establishment in 2006, LIRE has been working intensively on Biofuels, particularly on Jatropha including agricultural research as well as studying and investigating viable implementation models in the Lao context. LIRE researchers have made several presentations at international conferences and for national stakeholders.

LIRE's approach has been to establish a baseline understanding of Jatropha as an energy crop through basic research in the local context. Especially for a crop with so many uncertainties and challenges, it is essential to evaluate the real opportunities represented by Jatropha prior to establishing any plantation models. This approach has been somewhat at odds with most of the investments and promotion campaigns into Biofuel in the Lao PDR to date.

Highlights of LIRE's biofuel programme include

- Implementation of a comprehensive monitoring program for assessing seed yield performance of Jatropha plantations;
- Established Jatropha breeding test field with a gen pool of 40 different Jatropha plants for teaching purposes;
- Established test fields for agronomic research, investigating impact of spacing and fertilization to the crop yield;
- Production and analysing of Jatropha oil and Biodiesel (comparison to EU standard);
- International partnership with companies and organisations working on biofuels;
- Feasibility study about production and utilization of Biofuels for rural electrification;
- Jatropha extension material for farmers in rural areas (decision making material and cultivation handbook);
- Policy brief on Jatropha (Lao and English version available);

3. Overall scope of the study

As a result of an unprecedented rise in the price of crude oil in 2008, the GoL established an Ad hoc Committee for the Formulation of National Strategy on Bio-fuel Energy, chaired by the concerned Ministries. The GoL has also initiated the development of a strategy document on bio-fuel and a draft policy on fuel-saving opportunities. The current assignment is expected to help support and act as a catalyst for these efforts.

The development of a biofuel strategy and policy for the Lao PDR should be preceded by a **Biofuel assessment of the benefits and impacts of biofuel production and use**. This will enable Lao policymakers to anticipate and address future developments and the expected outcomes of their actions. A biofuel policy drafted by DoE should be done in close collaboration with the Ministry of Agriculture and Forestry in order to reflect its potential role and effects on rural development. It should also take into consideration the targets and pillars of the NGPES, namely economic growth, socio-cultural development and environmental preservation. This assessment study will help to ensure the development of a balanced and comprehensive biofuels policy.

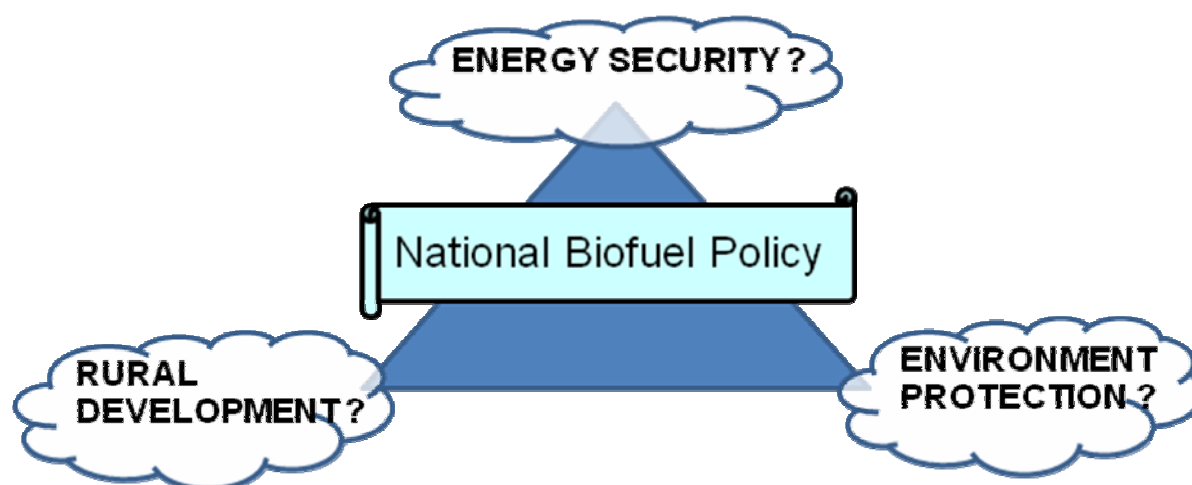


Figure 1: Important components for the National Biofuel Policy

Key to the development of recommendations and strategies for biofuels is the understanding for these three core aims. Moreover, when considering market interventions, it will be noted which of these aims are satisfied and to what degree by each activity. See section for a further discussion of this.

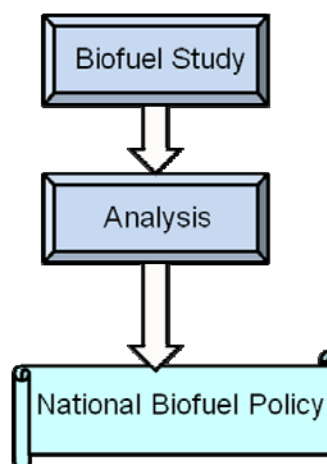
In terms of which biofuels are relevant for consideration, DoE has specified that for the baseline assessment and evaluation, all biofuels can be included. However, for the economic analysis of requirements to meet GoL targets to decrease the consumption of diesel in the country, the study may focus on oil-based biofuel. The final decision regarding the scope of the later part of the study will be made by the DoE at an interim consultation.

4. Methodology

The proposed methodology for this study consists of 5 distinct phases and are described in the paragraphs below.

- **Part I:**
 - Data collection
 - Baseline study & impact analysis
 - Interim report and consultation

- **Part II:**
 - Requirements to meet GoL targets
 - Economic analysis
 - Evaluation of possible interventions
 - Recommendations
 - Draft Policy



Phase I: Assignment Launch

The assignment shall be launched at a kick-off workshop to be held at DOE/EDL in Vientiane to key stakeholders who will be approached in follow-up consultations. The inception report will be reviewed in the meeting, and will be made available to DOE prior to the workshop.

The event will raise the awareness of the project, the involvement of LIRE on behalf of DoE, and motivate stakeholders for further participation. Additionally, potential partnerships will be sought with other organisations operating complementary programmes.

Phase II: Data collection and assessment

This phase includes *tasks 2) and 3)* of the TOR, i.e. the baseline assessment and comparative impact analysis. The phase includes a desk study, plus stakeholder consultations and a short study tour to Thailand (see supplementary description below).

A compilation of relevant publications and other information shall be generated, and then used to formulate and baseline assessment of the potential for biofuel in the Lao PDR. Key stakeholders in the Lao PDR shall be consulted to develop an accurate description of current biofuel activities; these include government offices and organisations, the local private sector, and international NGOs, organisations and companies with interests in the Lao Biofuel sector. An estimate of biofuel production from present until 2020 will be given based on the current status, including projections taking into account the existing promotion activities of GoL.

The proposed biofuel cropping and refining modalities shall be reviewed and evaluated in terms of social, economic, and technical aspects, and the issue of sustainability. Case studies of other efforts

in the region will be integral to the comparative impact analysis. A short study tour to Thailand is proposed in order to obtain verified data on biofuel production and use in a region with similar conditions. Finally, any potentially adverse impacts of Government-supported bio-fuels production programs shall be identified and recommendations will be made for mitigation strategies.

Phase III: Midterm DoE Consultation

The study team will present an Interim report to the DoE, containing the results of Phase II. At this key stage in the assignment, DoE will be consulted regarding the following analysis and formulation of recommendations to be carried out in the subsequent phase.

Phase IV: Analysis and strategy development; policy recommendations and reporting

Tasks 4), 5) and 6) shall be integrated into phase IV) of the work plan. This phase comprises a desk study, utilising the baseline assessment, impact analysis, regional review, plus additional expertise as required.

The understanding of biofuel status and potential developed in the previous phases of the assignment shall be directed to evaluate the GoL target of achieving 30% displacement of fossil fuels by 2020. A review will be made of possible market interventions that can overcome the current challenges to this target.

Following the assessment of measures to enable the realisation of the GoL target, and taking into account the costs and benefits associated to each, a set of programmatic recommendations shall be formulated. As specified by the TOR, both programmatic and organisational recommendations shall be offered.

Finally the assessments and recommendations produced by the study team shall be refined into a policy statement and government strategy for bio-fuels in Lao PDR. Taking into consideration the level of intervention required to meet the GoL target. The study team will indicate whether the target is attainable, and if not, will offer an alternative strategy and goal.

Phase V: Presentation of results to DoE and public workshop

The draft final report, containing the outputs of all phases of the assignment, will be presented to DoE. The event will be also act as a summary workshop to introduce the results of the assignment to the key stakeholders in the Lao Biofuel sector. The secondary objective of this event would be to establish a common awareness of the current situation and to help foster a more integrated sector.

DoE will be provided a draft version of the final report for consideration. Upon receiving a list of required amendments from DoE, the study team will carry out all necessary changes to the final document to meet the client's specifications.

Finally, the biofuel policy document are proposed to be translated into Lao language, in order to make the document more accessible.

5. Work Plan and Schedule

Seven milestones are defined in the assignment. The proposed timeframe is included in the table below. The additional milestones proposed in the methodology above are also included. For a detailed timeframe, a more detailed schedule is available.

The proposed study team is available to start the assignment immediately following the signing of the project contract. Assuming week zero to be the week commencing Monday 13th July, the final report will be submitted to the DoE 24 weeks later in the week commencing 28st December.

Milestone	Activity	
	Phase I: Assignment Launch	0 - 6
1	<i>Contract signature</i>	0
2	<i>Project initiation meeting (task 1)</i>	1;2
	Writing: inception report	3
3	Submit inception report	5
4	<i>Kick-off workshop (at DOE) plus review of inception report</i>	6
	Phase II: Data Collection and Assessment	7 - 14
	stakeholder consultations	7;8
	Desk Study: Literature survey (tasks 2 and 3)	4;5;7
	<i>Writing: Baseline Assessment (task 2)</i>	8;9
	<i>Study Tour: Thailand</i>	10
	Field report (internal)	11
	<i>Writing: Comparative Impacts Analysis (task 3)</i>	12;13
	Writing: Interim Report	14
	Phase III: Midterm DOE consultation	15
5	Submit interim report	15
	<i>DOE consultation, including policy document TOR</i>	15
	Phase IV: Analysis and Strategy Development	16 - 20
	Analysis	16;17
	<i>Writing: Indicative requirements for GoL target (task 4)</i>	18;19;20
	<i>Writing: Programmatic Recommendations (task 5)</i>	18;19;20
	<i>Writing: Policy and strategy recommendations (task 6)</i>	18;19;20
	Writing: Final report First Draft	18;19;20
	Phase V: Presentation of results	21 - 24
6	Submit Draft Final Report	21
	<i>Presentation to Ad hoc Committee for Bio-fuel Energy</i>	21
	<i>(5.2 also includes public workshop)</i>	21
	<i>Redrafting of Final Report</i>	22;23
7	Final submission of final report	24
	<i>Lao translation (policy document)</i>	22;23

Table 2: Time and activity plan

6. Relevant documents and data sources for the baseline assessment

Several studies have been carried out to evaluate the potential Biofuel production of the Lao PDR. The existing literature will be surveyed during the early stages of this assignment. Resources describing the regional perspective will also be included in this review. Besides general information to develop a good basis understanding of the situation and challenges, specific accurate data are also required in order to calculate and forecast biofuel production. Below is a short summary of data needs for the baseline assessment.

- 1. Current and proposed strategies of GoL (MAF and MEM)**
 - Target 10% diesel or gasoline substitution?
 - Strategies
- 2. Agriculture statistics:**
 - Total land (ha) where jatropha has already been planted
 - total arable land
 - land available (for example for large scale plantation)
 - land use, current status of rice, maize, soy bean, sugar, cassava.....production. Yield/ha for the suitable crop for biodiesel production in Lao
 - average household land seize (small-scale production)
 - quality of the soil?
- 3. Infrastructure data:**
 - Transport costs/km/tonnes (transport cost are one of the main concern)
- 4. Land policy:**
 - Land entitlement
 - Land concession
 - How is possible to reduce slash and burn agriculture and to increase the number of ha for biodiesel production?
- 5. Literature survey of activities in other countries: Thailand, SEA, Brazil, EU.**
 - Policies
 - Current status
 - Business model adopted
 - Feedstock Costs
 - Processing Costs
 - Cost of Sales & Use
- 6. Economic data (social impact)**
 - Macro data
 - Average household income
- 7. Economic forecast (need to be consistent with GoL model)**
- 8. Technical and cultivation references**

Ministries to be consulted

The biofuel sector uniquely interconnects several ministries. As an energy source with a basis in agriculture, and with considerable economic potential for the country, biofuel spans the interests and responsibilities of several ministries. The core ministries to be consulted for the assignment are

- Ministry of Energy and Mines (MEM)
- Ministry Agriculture and Forestry (MAF)
- Ministry of Industry and Commerce. (MIC)
- Ministry of Public Works and Transport (MPWT)

Need for Public consultation with various stakeholders

For the Biofuel assessment study, various stakeholders involved in the Lao Biofuel development will be consulted, including private enterprises. Moreover a short study tour to Thailand will be organized in order to gain new information which can be adopted to the local situation aiming to facilitate the study approach. From the public sector, following public offices will be consulted:

- Department of Electricity (DOE)
- Lao State Fuel Company (LSFC)
- National Agriculture and Forestry. Research Institute (NAFRI)
- Provincial Agriculture and Forestry Office / District Agriculture and Forestry Office (DAFO and PAFO)
- National Land Management Authority (NLMA)
- Department of Production and Trade Promotion (DPTP)
- National Authority for Science and Technology (NAST)

At present some of the largest projects in the biofuel sector in the Lao PDR are operated by private investors. This form of investment is clearly an important component to the development of the sector and it is therefore essential to respond to this through consultation with key private-sector stakeholders. The interests of the private sector will be particularly relevant when considering potential market interventions. One of the more challenge aspects of this assignment will be to balance the interests of the stakeholders, and to find a solution that is amenable to both stakeholders interested in exporting feedstock, and to stakeholders interested in off-setting the import of fossil fuel.

7. Opportunities for government-sponsored bio-fuels development strategies and policies

Governmental interventions into Biofuel offer a means to guide the sector to develop in a desirable direction. As stated above, the GoL states the main development parameters to be

- rural development
- environmental protection
- energy security

These must be respected and considered by all stakeholders in the Biofuel sector. In terms of rural development, it is important to consider the product chain. Government-sponsored activities can pursue the production and use of biofuel on a community level, or instead just consider biofuel feedstock as another group of cash crops for small holder farmers.

In terms of achieving energy security for the country and therefore a high Biofuel production, investigations about mechanized cultivation, harvesting and processing operations have to be studied, taking note of the local context. However an extensive monoculture production of energy crops can harm biodiversity and can cause erosion and land degradation. At the paragraph below, various types of potential interventions are listed which can support the development of the biofuel sector in harmony with the GoL's objectives

- Centralised processing infrastructure
- Rural electrification and local energy security
- Market security for small holder farmers
- Pilot introduction of biofuel consumption, e.g. public transport
- Properly monitored R&D sites
- Public platform about Biofuels for knowledge exchange
- Independent Biofuel Task Force linking relevant stakeholders together
- Linkage between International and Lao Universities – Exchange of experts
- Train impact assessment study team in terms of Biofuels
- GIS mapping program for utilizing specific Biofuel potential in certain areas
- Regulations for biofuel crop cultivation for export
- Processing of biofuels outside of Lao PDR
- Importing biofuels for short term (until local production capacity increased)

APPENDIX 1: Minutes of the Inception meeting at the DoE

Programme	Biofuel		Project	BF Assessment & Policy	
Meeting Reference	DOE_BFAP_1	2	20/7/09	Location	DOE/MEM

ATTENDANCE	Organisation	Contact
Khaitara SISAINOUTH	DoE	ktlssm@yahoo.com
Mahinda KURUKULASURIYA	FCG / DoE	mahindakuruculasuriya@yahoo.com
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Keophayvanh INSIXIENGMAY	NAST	keophayvanhs@yahoo.com
Mr. Chatturong NAKHAVITH	MPO	-
Hatsady SYSOULATH	DoE	-
Bouathep MALAYKHAM	DoE	bouathepmlk@yahoo.com
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Mr. Phouvong PHOMMABOUTH	DPTP (MOIC)	-
Mr. Bouaphet SAYSANE	Departement transport	phetsaysane@yahoo.com
Mr. Touy THAMMAVONGSA	NLMA	-
Mr. Khampay MANIVONG	NAFRI	khamphay@nafri.org.la
Leon GAILLARD	LIRE	leon@lao-ire.org
Jakob RIETZLER	LIRE	jakob@lao-ire.org
Chanto MILATTANAPHENG	DoE	hhpo@laotel.com
Apologies		

ADDITIONAL RESOURCES	detail
LIRE Presentation: Initiation meeting at DoE	Attached below

OUTCOME

The minutes will be used for creating the inception report. LIRE introduced the background and objectives of the study to involved stakeholders. The target of the meeting was to create awareness about the ongoing study and Biofuel policy development. A frequent discussion between the different departures and Ministries was followed after the presentation.

PRESENTATION ITEMS

0. Section		
0.1.	LIRE Presentation	<p>Content Presentation:</p> <ul style="list-style-type: none"> • Study background and objectives <ul style="list-style-type: none"> ○ Reasons why Lao PDR needs urgently a Biofuel Policy • Agricultural context in Lao PDR <ul style="list-style-type: none"> ○ Suitable climate conditions, however agriculture challenges such as reducing shifting cultivation, monocultures, contract farming and others • Current biofuel efforts in Lao PDR <ul style="list-style-type: none"> ○ What is the current feedstock production • Definition of biofuels <ul style="list-style-type: none"> ○ In terms of the study, make clarification • Overview of the proposed activities <ul style="list-style-type: none"> ○ Task 1: Project Initiation Discussions ○ Task 2: Baseline Assessment of biofuel potential in Lao PDR ○ Task 3: Comparative Impacts analysis of different Biofuel Cropping & Refining Modalities ○ Task 4: Indicative Requirements for a GOL Program to Displace 10% of Diesel Imports ○ Task 5: Programmatic recommendations ○ Task 6: Policy and strategy recommendations • Contents of Task 1 of the assignment (introducing each point) <ul style="list-style-type: none"> ○ Define methodology of the study ○ Provide work plan and schedule, including expected deliverables ○ Relevant documents and data sources to be considered as part of the baseline assessment ○ Identification and consultation of relevant Ministries ○ Define overall scope of the study, including problems or constraints ○ Public consultation with various stakeholders, especially as regards the social, economic, technical, and sustainability grounds of alternative biofuels business and cultivation models ○ Discussion of ideas for government-sponsored bio-fuels development strategies and policies • Starting Discussion round

Discussion Contributions	DETAILS	Comment
Ministry / Department / Name		
Open discussion after the presentation		
Hatsady SYSOULATH / MEM / DoE	<ul style="list-style-type: none"> • Mr. Hatsady opened the discussion round • The data for the study shall be assessed based on current condition and future development of the potential crop and other sources of the Biofuel. • There is a need to develop 2 main standards of biofuel quality and production: <ul style="list-style-type: none"> ○ i) for small scale like household production and consumption ○ ii) large scale (industrial processing) like KOLAO; • Is Jatropa suitable to be used in small tractors in Laos? 	

<p>Mahinda KURUKULASURIYA / FCG / DoE</p>	<ul style="list-style-type: none"> • Mr. Mahinda mentioned a couple of statements related to the presentation including <ul style="list-style-type: none"> ○ Rural development ○ Social impact assessment ○ Alternative energy crops ○ Jatropha hedge cultivation 	
<p>MAF/ NAFRI / Khamphay Manivong</p>	<ul style="list-style-type: none"> • Question: How the land issue will be considered during the study and policy. Currently there are land conflicts ongoing since new regulations and policies were introduced. Land speculation has also led to this development. • The current land use is in some areas insufficient. • Conflicts about the proper land use practices are discussed inside the MAF. Since Agriculture and Forestry are two different subjects, there are also conflicts and discussions inside the different departments. 	
<p>Viengthong Chanlivong / KOLAO</p>	<ul style="list-style-type: none"> • KOLAO would like to see that the proposed Policy will consider protecting private companies investment. One issue which was raised was that KOLAO invests in the 2 + 4 model. However after providing around 2,2 Million KIP per ha for the first year of Jatropha cultivation to out growers, other private companies come around and buy the seeds from the contracted farmer • One problem KOLAO admits was that farmers cultivated Jatropha in an area which had nutrient soil. Farmers switched from Coffee to potato and then to Jatropha. This was of course not suitable for the area since Jatropha is not a high valuable cash crop compared to coffee or potato • KOLAO mentioned that poor soils will give only poor yields which is not economic viable • Jatropha hedges should be planted and on areas where no high valuable cash crops are cultivated • Jatropha Mekong Belt • KOLAO mentioned that Slash and burn is generally practiced and instead of burning the field and achieve maybe only on harvest, it is better to replant it with Jatropha • After many trials and experiences working many years in the field, the company found that it is only possible to plant Jatropha as a hedge around farmer's garden. • Farmers cannot rely only growing Jatropha for income as it is not viable and they cannot grow other crops to support their families. Income from Jatropha shall be secondary when farmers finish their harvest. • Trying to explain to the locals about these are difficult. He suggests that the local agriculture office assists in promoting this concept to the locals and possibly makes it a local strategy for rural development. • Currently the company has 30,000 ha contract with 34,000 households in 6 northern provinces. Each owns about 0.6- 	

	<p>0.8 ha of Jatropha plots. About 15,000 ha was already planted;</p> <ul style="list-style-type: none"> • The processing plant hasn't been set up as it needs at least 25,000 ha plantation to supply. It is ordering a smaller compressed machine from Malaysia; • Price of the Jatropha oil per litre is not yet identified by KOLAO. Expected to be much higher than conventional fuel. Better to export Jatropha oil overseas and buy ordinary fuel for use in Laos?? 	
<p>Khamlar PHONSAVAT/ WB</p>	<ul style="list-style-type: none"> • How the Biofuel Policy will fit in with the overall RE Policy and National Climate Change Strategy and Action Plan (NCCSAP) ; • What are the most viable and suitable sources of biofuel for Laos (Jatropha and palm oil for biodiesel, molasses and cassava for bio ethanol? Have these been considered in the policy? • Setting the target for substitution of conventional fuel with biofuel needs to be realistic and achievable instead of just putting the number. The target needs to be based on many other factors including sources, production, consumption demand, etc; • How will be the Biofuel policy enforced or accountable by different ministries or stakeholders; • R&D will be demanded, need to ensure that appropriate technologies are developed and utilized in Lao PDR. There is a need to think about sources of funding for R&D, for example, 1% of fuel tax is subtracted for R&D; • Who will be responsible for setting up the Lao Biofuel standard and monitoring/enforcement for production and quality; 	
<p>Mr. Bouaphet SAYSANE / Department of transport</p>	<ul style="list-style-type: none"> • There are about 700,000 vehicles in Laos. Out of which about 100,000 vehicles are sedans. There is a potential to use biofuel in the transport sector; • Lao people in the rural area also use biofuel derived from vegetable oil or Jatropha to run hand tractors, small generators and lamps. Biofuel shall serve these small household in the rural area too; • The department of Transport fully supports the idea of increased Biofuel production • There is a need for regulations on how the biofuel should be used in trucks and buses 	
<p>Chatturong NAKHAVITH/ MPO</p>	<ul style="list-style-type: none"> • Allegate National poverty • Biofuel should not harm food security • The main purpose of this policy should be poverty reduction. Need to ensure that the locals have benefits from this policy; • Policy needs to consider energy security • Identify suitable Business model 	

	<ul style="list-style-type: none"> • Use SWOT analysis to come up with draft policy • Submit information and consult again • Action plan for the GoL needs to be drafted • Policy efforts should be long term orientated • Target of GoL is replacing imported fuel by 30% by 2020; • The Bank of Lao PDR is considering the assistance to the RE strategy in terms of credits. • the strategy and policy shall compliance with GoL direction, do we need to meet GoL statement (target, what prioritised strategy or action plan need to be taken to meet the demand) 	
	<ul style="list-style-type: none"> • Transportation cost shall not be a problem for KOLAO as it is now easy to transport Jatropha seeds from around the country using public or private busses or other means as long as the company is willing to buy all from the locals; 	
Mr. Chantho MILATTANAPHENG / MEM/ DoE	<ul style="list-style-type: none"> • The National Policy shall prepare to promote the private sector because at this stage the Private sector is already in advance, the national policy shall be taken consideration on what the GOL need to be done and what incentive need to provide to private and public partnership in developing the Biofuel projects, • The Draft Strategy shall be submitted to GOL by end of the 2009 	
Bouathep MALAYKHAM /MEM/ DoE	<ul style="list-style-type: none"> • The policy shall include a component on import tariff exemption for machine or equipments used for biofuel production 	
Keophayvanh INSIXIENGMAY / NAST	<ul style="list-style-type: none"> • 	

APPENDIX 2: Biofuel stakeholder list

No.	Contact Details	Legal Status	Activity
1	National Authority for Sciences and Technology (NAST) Mr. Sitha Phouyavong General Director of Cabinet Tel: (+856-21) 213470-111 Fax: (+856-21) 213472 E-mail: Sitha@nast.gov.La	Research	Jatropha research on cultivation, processing and utilization
2	Lao State Fuel Co., Ltd Mr. Phoukong Keomany (+856-20) 2212375	Government owned Company	Jatropha research for investigating seed yield performance
3	Lao Institute for Renewable Energy (LIRE), Ban Sisattanak, Sikopaluang Road Sisattanak District, Vientiane Capital, Laos. PO.BOX: 9077. Office: Tel: (+856) 21 353430 Fax: (+856) 21 314045. Website: www.lao-ire.org	Research; Non-for-Profit (NPO)	Jatropha research on cultivation, feasibility study, GIS mapping, extension material (decision making material, cultivation manual), transesterification, refining of Biofuels;
4	Bio-Energy Lao Co., Ltd Thatkhao village, Unit 1, House no. 03 Thadeua street, Sisattanak district, Vientiane, Lao PDR Office: Tel: (+856) 21 218750 Fax: (+856) 21 222763	Company	Commercial and test plantations
5	Mekong Agro-industry Co., Ltd Ban Nonghai Hatxayfong district, Vientiane, Lao PDR. Tel: (+856-21) 330 125 Fax: (+856-21) 330 124 E-mail: mekonggreenpower@yahoo.com	Company	Commercial and test plantations
6	Kolao Co., Ltd Mrs. Thavon (+856-20) 5518732 Mr Khanpong Soulienjo Mr. Viengthong Chanlivong viengthong_chanlivong@hotmail.com	Company	Commercial and test plantations
7	Xaysomboun Agriculture Development Co., Ltd Tel: (+856-21) 243551-3 Fax: (+856-21) 243533	Company	Commercial and test plantations
8	Y&P company Ms. Lattana (+856) 20 5437911	Company	Commercial and test plantations

9	Italian-Lao Group Co.,Ltd Mr. Thatsany Keola, Director Mobile: (+856-20) 5668075 Tel: (+856-21) 353517, 353442	Company	Commercial and test plantations
10	Non Profit Organization Lao ABC Mr.Khampong PHANVONGSA, president Mobile: (856-20) 5514412 e-mail: nsclao@hotmail.com office: (+856-21) 243311 Fax: (+856-21) 243309	Company	
11	Lao Promotion Organic Product Association (LPOPA), attached to LUSEA, NSC, Prime Minister's Office Mr.Khamsing SIHATHEP, president Mobile: (856-20) 5704709 Tel: (856-21) 412977 Fax: (856-21) 264318	Association	Commercial and test plantations
12	Tree Plantation and Livestock Promotion Association (TPLPA) Lao Techno Engineering Company.,Ltd is also its member. Mr. Houmpeang MANIPOUN, president Mobile: (+856-20) 5504239	Association	Commercial and test plantations
13	Association of Agriculture and Handicraft Promotion, Vientiane Mr. Thavone Keobandith (+856-20) 5494481 (+856-20) 2007906 Mr. Phasouk Chanthala (+856-20) 5628174	Association	Commercial and test plantations
14	Sunlabob Renewable Energy, Ltd Watnark Village, Vientiane, Lao P.D.R PO Box: 9077 Tel: +856 21 313 874 Fax: +856 21 314 045	Company	Energy provider considering Biofuels for rural electrification
15	The Social and Economic Developers Association (SEDA) PO Box T469 Xaysetha District Vientiane, Lao PDR Office Number: 856 21 314 338 Email: info@seda-laos.org	Association	Jatropha test trials

APPENDIX 3: Terms of references (ToR)

Bio-fuels Assessment and Policy Development - Lao PDR

Introduction

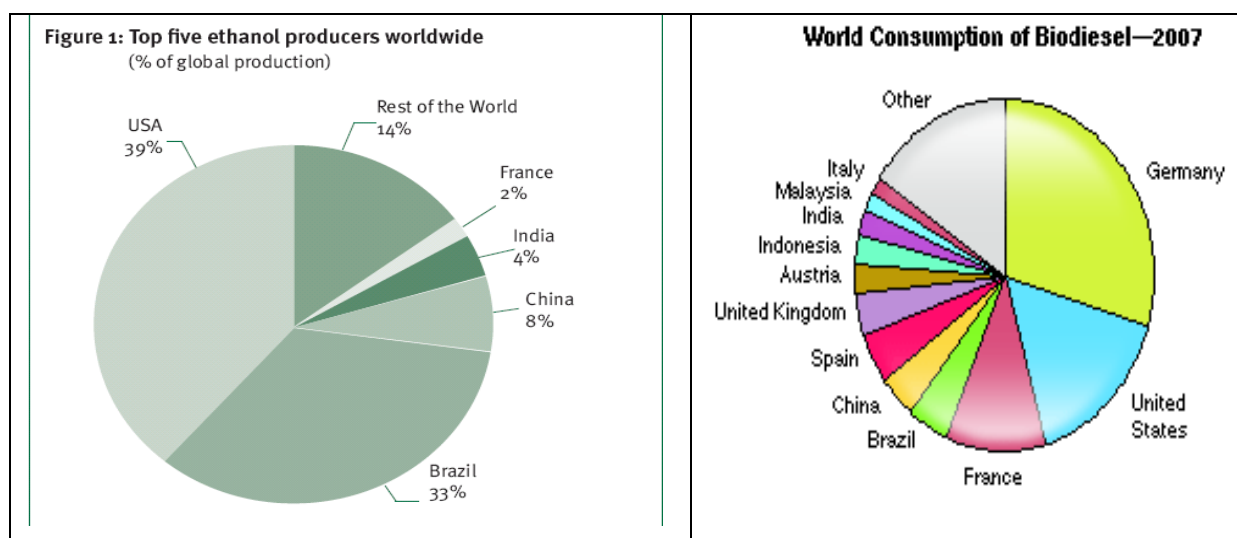
There are two types of liquid bio-fuels with commercial applications that are produced from purpose-grown crops:

- Bio-ethanol is an alcohol derived from sugar or starch crops (e.g. sugar beet, sugar cane or corn) by fermentation. Ethanol can be used in either neat form in specially designed engines, or blended with petroleum fuel.
- Biodiesel is derived from vegetable oils (e.g. rapeseed oil, jatropha, soy or palm oil) by reaction of the oil with methanol. Biodiesel can either be burnt directly in diesel engines or blended with diesel derived from fossil fuels.

World-wide production and consumption of both bio-ethanol and biodiesel has exploded in recent years, with average annual growth of 50% during 2002–2007 and almost doubling in the past two years. Bio-ethanol dominates global production of bio-fuels, as development started some twenty years earlier than biodiesel. In 2007 global production of bio-fuels was 63 billion l of bio-ethanol vs. 4 billion l of biodiesel.⁹ There is a major shift in global biodiesel production and consumption patterns, with Latin America and Asia playing a more important role compared to Europe and the USA (See pie chart).¹⁰

⁹ Bio-fuels represent a very small portion of total biomass production and use. Only about 5 percent of total biomass consumption goes into bio-fuels, compared to the 75 percent which is consumed by rural households for cooking and heating.

¹⁰ *Bio-fuels, Agriculture and Poverty Reduction*, Overseas Development Institute Natural Resources Perspective Paper # 107, June 2007; *Sustainable Bioenergy: A Framework for Decision Makers*, UN-Energy, April 2007; *Potential for Bio-fuels for Transport in Developing Countries*, World Bank ESMAP, October 2005, and *Bio-fuels: Prospects, Risks and Opportunities*, in: **The State of Food and Agriculture 2008**, UN FAO.



Despite recent growth, the future of bio-fuels is difficult to predict as the industry is confronted with considerable uncertainty on several fronts. These include:

- An ongoing fuel vs. food debate
- Falling petroleum prices
- Rising raw material prices
- Uncertainty regarding the regional market in bio-fuel crops and production
- General economic slowdown, including tightening credit

Assessment Considerations for Bio Fuels in Lao PDR

A basic consideration is whether there is sufficient arable land for bio-fuel cropping without affecting the cost of food production. In Lao PDR there are a total of 23.5 million Ha total land area, of which about 10 million Ha is available for “productive uses” (forestry, agriculture and livestock, mining). Another 3.5 mil ha are under national biodiversity conservation area protection.

Jatropha has been identified as the most-likely commercial bio-fuel crop in Laos, as it can be grown as a plantation or as a smallholder crop. Estimates for Lao PDR indicate that in order to displace 5 percent of the 120 million l (750,000 bbl) of diesel importation per year it would be necessary to dedicate 5,000 ha to plantation jatropha cultivation.¹¹

Although it is at least technically possible to displace a significant amount of diesel imports with an intensive program of jatropha production, the impacts on rural cropping patterns, food and bio-fuel prices, and agricultural income are difficult to assess. Such an intensive program might have unintended consequences, such as increased vulnerability of smallholders, congestion on rural roads, commodity price volatility, etc.

¹¹ Although wholesaler/contract farmer operations claim a yield of 4 kg/tree with a plantation tree density of 2,500/ha, more realistic figures under a plantation business model are 2 kg/tree and 2,000 trees/ha, with a Crude Jatropha Oil (CJO) yield of 0.33 l/kg. This works out to a maximum potential yield under plantation conditions of 1200 l/ha (7.5 bbl) annually.

Such a program would have to be considered in a regional context, as neighboring countries will be both markets for and competitors in bio-fuels development. . Although a vertically integrated domestic bio-fuels industry (e.g., both feedstock production and refining) is desirable for economic development, this may not match up with broader market and industry trends. Policies restricting the ability of Lao producers to sell their raw or refined output to the highest bidder would likely be unpopular.

The mode of cultivation will determine the overall scale of the enterprise plus its economics and impacts on rural development. Although jatropa plantations are the most frequent cultivation approach mentioned, recent Lao case studies suggest that smallholder cultivation as a sideline could significantly reduce diesel importation needs, but with less government involvement and less possibility of disruptions to farmers, agricultural income, and commodity prices.¹²

Objectives of the Assignment

The GOL has established an Ad hoc Committee for Formulation of National Strategy on Bio-fuel Energy, chaired by the Vice Minister for Energy and Mine with participation from the Prime’s Minister Office, Ministry of Transportation and Public Works, Ministry of Agriculture and Forestry, Ministry of Industry and Commerce, Ministry Of Finance, Ministry of Educations, Science Technology Agency, and Water Resource and Environment Administration. The GOL has also initiated development of a strategy document on bio-fuel and a draft policy on fuel saving opportunities from promoting bio-fuel production. The current assignment is expected to help support and inform these efforts.

Development of a bio-fuels strategy and policy for Lao PDR should be preceded by an assessment of the benefits and impacts of bio-fuels production and use. This will help Lao policymakers anticipate and address any negative effects of bio-fuels production and use. A bio-fuels policy undertaken by DOE should be done in close collaboration with the Ministry of Agriculture and Forestry in order to reflect its potential role in and effect on rural development. It should also take into consideration the targets and pillars of the NGPES, namely economic growth, socio-cultural development and environmental preservation. This assessment study will help to ensure development of a balanced and comprehensive bio-fuels policy. Specific objectives of the assignment are to:

- Provide a baseline assessment of the overall potential for domestic production of bio-fuels including ethanol and biodiesel in Lao PDR
- Identify and provide a preliminary evaluation on social, economic, technical, and sustainability grounds of alternative modalities of bio-fuels cropping – e.g., smallholder cultivation, plantation, etc.

¹² Case Study Lao PDR 2- Tale of Two Systems: EQUITEC Jatropa plantation system in

Savannakhet Provinces compared with farmer Jatropa hedge cultivation and oil Extraction for local community use, prepared by Stephen Shepley for SNV.

- Describe the investment, land use, policy and pricing requirements to achieve a target of 10 percent displacement of gasoline and diesel imports through development of ethanol and biodiesel production, respectively
- Recommend initiatives such as pilots and more analysis for MEM to undertake in deciding upon a bio-fuels development program for Lao PDR
- Develop specific suggestions for government-sponsored bio-fuels development strategies and policies, such as: (i) Develop improved devices for cold pressing of CJO from jatropha; (ii) Experiment with optimal blends of bio-fuels and commercial fuels for different engines; (iii) Work with PDEM and PDAF to develop programs for bio-fuels collectives and village-level enterprises; (iv) Develop the rural electrification applications of bio-fuels production and localized consumption to produce electricity; (v) Consider whether DOE or DOA might have a standard offer or fuel purchase agreement for purchasing CJO for government use; and (vi) Consider fiscal policies that would encourage investment in bio-fuels infrastructure, especially domestic processing facilities

Task Descriptions

Task 1: Project Initiation Discussions

At project inception the Consultant will convene, with GOL endorsement, a project initiation meeting to discuss the following:

- Overall methodology to be used for the study;
- Work plan and schedule, including expected deliverables;
- Relevant documents and data sources to be considered as part of the baseline assessment;
- Relevant Ministries to be consulted;
- Overall scope of the study, including problems or constraints;
- Need for public consultation with various stakeholders, especially as regards the social, economic, technical, and sustainability grounds of alternative bio-fuels business and cultivation models;
- Discussion of ideas for government-sponsored bio-fuels development strategies and policies

The Consultant will include the substance of these project initiation discussions in the Inception Report to be delivered in Week 5.

Task 2: Baseline Assessment of bio-fuels potential in Lao PDR

The Consultant will prepare a baseline assessment of the potential for domestic production of bio-fuels, including ethanol and biodiesel, in Lao PDR. The bio-fuels baseline assessment should be based on consolidation of available information rather than any new data collection. The baseline assessment should reflect and incorporate available desk reviews and evaluation of existing case studies which have addressed bio fuel development and strategic developmental planning issues in Lao PDR and elsewhere in the region.

The baseline assessment should estimate:

- Current bio-fuels production and refining activity in Lao PDR;
- Likely future bio-fuels production (in 2010, 2015, and 2020) based on forecast market conditions but without a large-scale Government program
- Possible bio-fuels production with Government encouragement including encouragement of production by smallholders and plantations and provision of price and/or market guarantees

Task 3: Comparative Impacts Analysis of Different Bio-fuel Cropping & Refining Modalities

The Consultant will review the proposed cropping strategies for bio-fuels production and describe and estimate the differences on social, economic, technical, and sustainability grounds in their application in Lao PDR. The Consultant will review actual results from elsewhere in the region in formulating the comparative impacts analysis. Based on the impacts analysis the Consultant will recommend mitigation strategies for any adverse impacts of Government-supported bio-fuels production programs.

Task 4: Indicative Requirements for a GOL Program to Displace 10% of Diesel Imports

The Consultant will prepare an indicative program of required Government support sufficient to meet the mooted GOL target of a 10 percent displacement in diesel imports in 2020. The Consultant will draw on experiences elsewhere in the region to identify the types of Government intervention needed to have the desired result over a ten-year period beginning in 2010. Market interventions could include subsidies such as provision of free jatropha seeds, market and price guarantees for jatropha or biodiesel production, investment in rural refining equipment such as village cold presses, encouragement of biodiesel rural electrification, etc. The Consultant will estimate the likely effect attributable to each major market intervention and identify which interventions should work in combination with others.

Task 5: Programmatic Recommendations

The Consultant will make specific recommendations regarding developing GOL's capacity to undertake bio-fuels promotion and development programs. These recommendations should be both organizational (e.g, strengthen this agency or create a new agency) and programmatic (e.g., which programs should be funded or which donors should be engaged with). Program s might include: (i) Developing improved devices for cold pressing of CJO from jatropha; (ii) Experimenting with optimal blends of bio-fuels and commercial fuels for different engines; (iii) Working with PDEM and PDAF to develop programs for bio-fuels collectives and village-level enterprises; (iv) Developing the rural electrification applications of bio-fuels production and localized consumption to produce electricity; (v) Considering whether DOE or DOA might have a standard offer or fuel purchase agreement for purchasing CJO for government use; and (vi) Considering fiscal policies that would encourage investment in bio-fuels infrastructure, especially domestic processing facilities

Task 6: Policy and Strategy Recommendations



The Consultant will pull together the results of Tasks 1-5 to recommend a simple policy statement and government strategy for bio-fuels in Lao PDR. The Consultant should indicate whether the indicative target of 10 percent is worthwhile or achievable and if not recommend another target and accompanying policy/strategy. The Consultant will prepare a presentation containing their findings and recommendations and present to the Ad hoc Committee for Formulation of National Strategy on Bio-fuel Energy. the Consultant will prepare the draft bio-fuel policy/strategy based on output recommendation.

Deliverables

1. Inception Report
2. Final Report
3. Presentation to the Ad Hoc Committee

Timelines

The Consultant will follow the timeline indicated below.

MILESTONES	WEEKS TO COMPLETION
1. Contract signature	0
2. Project Initiation Meeting	2
3. Inception Report with Input from Scoping Discussions	5
4. Meeting to review Inception Report	6
5. Submit Interim Report	15
6. Submit Draft Final Report	20
7. Submit Final Report	24

Reporting

DOE of MEM is formal executing agency and the Consultant will report to the DOE in conducting this work. All reports must be submitted in two hard copies to and one electronic copy.