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Jatropha Program of LIRE

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Jatropha curcas is a perennial plant growing wild also in Laos. It is presently used by farmers mainly for live fencing because no animal will eat it. It will grow also on poor soils and does not require irrigation. The seeds of the plant contain an oil which can be extracted and processed into fuel for operating diesel type motors. For this reason Jatropha has been under close scrutiny over the past years for its potential as a **biofuel** plant. Also in Laos efforts are under way to explore its potential.

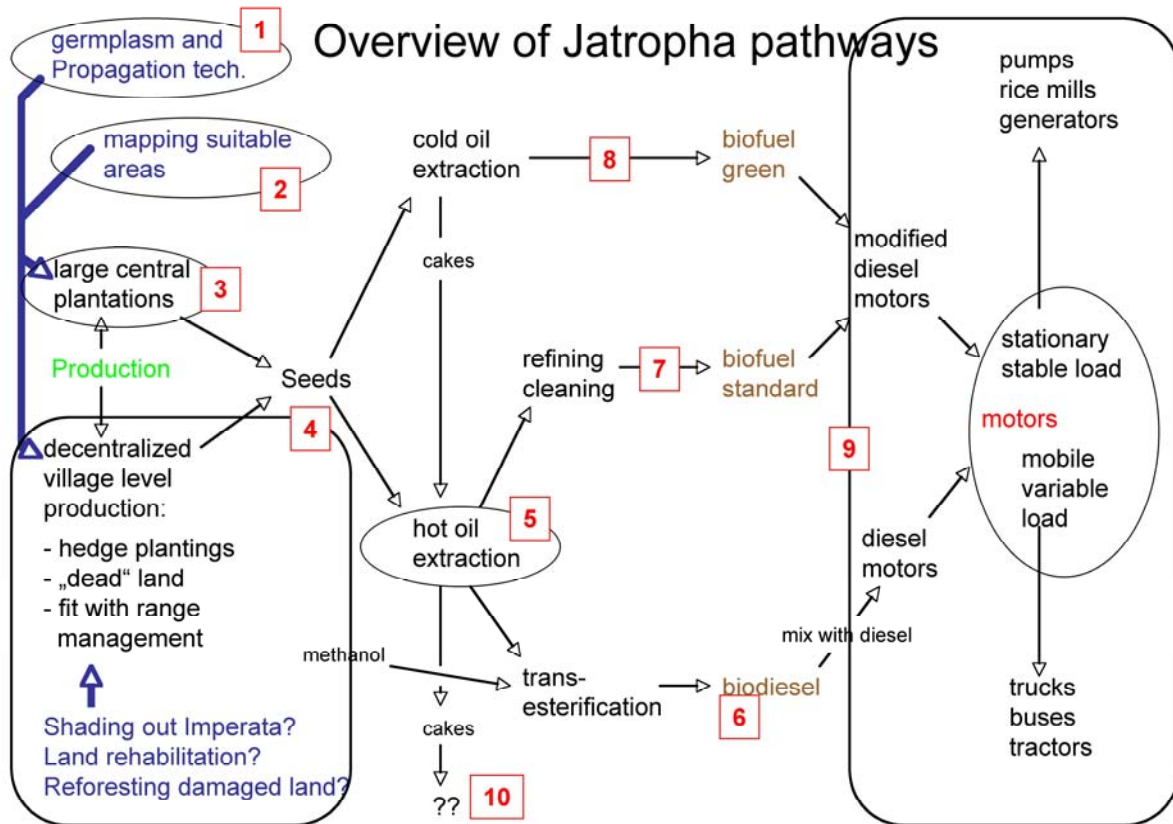
There is strong interest in this potential in Laos, both from private enterprises as well as from government agencies. The high energy expenditures of the country have led to **government policies** that aim for increasing the use of local energy sources. Jatropha also appears to have a potential for increasing the **income** of remote rural people and in **creating jobs** in rural areas.

LIRE has therefore initiated a Jatropha program for gaining an understanding of the potential. An initial analysis of the material pathways has resulted in an overview of all the processes and mechanisms that need to be in place for motors in Laos to operate with fuel from Jatropha plants growing in Laos. From this overview 10 **projects for Research & Development** have been identified, which all interlink.

The overview is presented on the next page, and for each of the 10 R&D projects a sketch is added with the aims, activities, expected results, institutional settings and budget line items. The annexed Excell spreadsheet gives a first rough indication of the **costs** for running the program, built up from the estimated costs for running each project. It is clear that not all projects will be initiated simultaneously.

This paper is presented to **interested parties** among government, development agencies and industry. LIRE is searching for **funding** of the program or of the individual projects. The presented figures are a rough estimate. Detailed planning and calculations will be made after interest for funding has been secured.

Please take up **contact with LIRE** if you are interested in following up on any parts of this program. See contact coordinates in letter head above.



1. Germplasm and propagation techniques for various purposes

Which varieties grow best under what conditions? What are the efficient propagation techniques suitable on the spot?

2. Mapping suitable areas for planting and logistics for various operational approaches

Which are the ecological, social and economic criteria for mapping suitability of landtypes and locations for growing Jatropha? Produce maps accordingly

3. Operating large plantations (similar to tea estates)

What are the most efficient ways to operate large scale plantations?

4. Decentralized village level production

How to fit Jatropha production into the village farming systems: Hedges, "waste" land, degraded land, erosion control, interactions in grazing/fencing, etc... ? (Participatory Technology Development?)

5. Hot oil extraction

Explore and demonstrate viability of hot extraction in Laos

6. Transesterification and producing biodiesel for normal diesel motors

Explore and demonstrate viability of producing biodiesel in Laos

7. Refinement and producing standard biofuel for modified diesel motors

Explore and demonstrate production of standard biofuel for Lao conditions

8. Cold oil extraction and producing green biofuel for modified diesel motors

Explore and demonstrate cold pressed oil for use as biofuel in modified motors

9. Motor technology for various applications

Which Jatropha fuelled motors for which applications in Laos?

10. Profitable use of presscakes

How can presscakes be most profitably used to offset the costs of processing the fuel?

Project 1,

(see Overview at the front to understand the setting and crosslinkages)

Germplasm and propagation techniques for various purposes

5 years timeframe

Aims

- Collect Jatropha varieties from Laos and abroad.
- Make germplasm of Jatropha varieties available in Laos for research, breeding and propagation for testing under various management situations in Laos.
- Assess growing potential of alternatives to Jatropha which are perennial plants (eg. Pongamia, Oilpalms, etc).
- Which varieties produce best under which conditions?
- Which are the efficient propagation techniques suitable for which conditions at village levels?

Activities

- A. Take up contact with Jatropha researchers and projects worldwide and enter the network of exchange.
- B. Acquire cultivars of Jatropha from abroad
- C. Collect interesting Jatropha plants from Laos (in close cooperation with the team of Project No. 4)
- D. Plant all interesting cultivars in a mother-nursery on a central agricultural/forestry research station.
- E. Establish first level propagation nurseries in outlying agr/forestry research stations in various provinces for promising cultivars
- F. Launch a test program for varietal trials in various growing conditions at village level (hedges, eroded land, dioxin land, imperata land, reforestation land, range land, various soil types, etc) in close cooperation with the PTD efforts in Project No. 4. Test on oil yields and compositions, curcin content, etc.
- G. Trials on most economical propagation techniques, taking into account decentralized planting and production in the established farming systems of villages.
- H. Trainings for establishing and managing propagation nurseries (second level and further) in villages.
- I. Do A-H in a smaller scale for alternatives to Jatropha such as Pongamia, etc. Design a similar follow-up program in case an alternative becomes very interesting for the prevailing farming and forestry systems in Laos.
- J. Documentation and publishing of results in national and international scientific fora.

Expected Outcomes

- a. Fast establishment of propagation nurseries at both provincial stations and in the pilot villages
- b. Established and well documented mother nursery
- c. Established and well documented first level propagation nurseries in provincial stations.
- d. Ongoing close exchange in the international Jatropha scene on cultivars.
- e. The potentials of perennial alternatives to Jatropha are explored and follow-up programs initiated in case one becomes very interesting.

- f. Publications at national and international level, presentations at scientific fora.

Institutional setting

- This project is part of the Jatropha programme of LIRE
- The institutes of NAFRI (National Agriculture and Forestry Research Institute) and possibly of National University of Laos NUOL are partnered to conduct this project.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One project coordinator and one research assistant (both part time).
3. Buy staff time from Project No. 4 for doing the varietal trials in the villages
4. Students doing practicals
5. All services from LIRE office.
6. Purchase of foundation seed of cultivars from abroad
7. Costs for establishing, managing and documenting the mother nursery and the first level propagation nurseries.
8. Costs for a campaign among Lao villagers for finding the most promising local plants (idea: Do this with the school kids. This will automatically also teach them that Jatropha is poisonous and should be handled with care).
9. Costs for lab-testing the oil contents and compositions, etc. (in close collaboration with Project No. 8).
10. Travel costs for field trips of staff.
11. Publications, presentations at scientific fora, website.

Project 2,**(see Overview at the front to understand the setting and crosslinkages)****Mapping suitable areas for planting and for logistics of various operational approaches**

3 years timeframe

Aims:

- Explore and test suitable procedures to identify areas where the production of *Jatropha spp.* at the village level or the plantation level is appropriate and/or beneficial to local communities, watershed management or resumption of agricultural activities on heavily degraded or contaminated land – in association with Project Nos 1, 3 & 4.
- Develop a Participatory Geographic Information System (PGIS) and a Participatory 3-D Modelling (P3-DM) methodology in order to fully involve stakeholders and concerned agencies in the planning of planting strategies, plantation design and watershed management. This participatory approach may be utilised in Project Numbers 1, 2, 3 and 4.
- Develop and maintain a Geo-Database of all *jatropha* project and plantation areas, incorporating knowledge gained through PGIS and P3-DM and all associated attribute data (climate, soils, village infrastructure, topography, socio-economic data, on and off-grid energy supply/demand, dioxin contamination, watershed degradation etc.). This element provides mapping, geospatial and database support for all other LIRE Jatropha Projects (Project Numbers 1,3,4,5,6,7,8,9,10).
- Assess environmental impacts of growing Jatropha in the prevailing farming systems and in plantations.

Activities

A. Identify potential *Jatropha* production areas, beginning in Xiengkhouang Province and possibly Xaisomboune area

- Source and collect required remote sensing data
- Interpret images, sample and map heavily degraded areas
- Ground-truthing: Visit sites to determine exact land use, vegetation cover, soil and slope properties, soil sampling analysis etc.
- With this information classify multispectral images for identifying potential plantation areas to be mapped with GIS for the whole of the Lao PDR.
- Prepare for precise mapping at village level with existing aerial photography for pilot villages.
- Collect further data for mapped areas including – soil analysis, slope and aspect analysis, proximity to rural communities, energy requirement status, infrastructure availability.
- Priorize each identified area for further work by the Jatropha program (and for consideration of partner agencies e.g. watershed management)

B. Identify and map out dioxin contaminated land.

- Contact and discuss with agencies that have carried out research on AO (Agent Orange) contaminated land previously.

- Develop a map based on the above information for areas thought to be contaminated with AO dioxins. Match this data up with data accumulated from Item A activities.

C. Develop Participatory Geographic Information Systems (PGIS) and Participatory 3-D Modelling (P3-DM) methodologies.

- Develop methodology and manual for facilitating workshops with villagers to create physical 3-D topographic models. The second half of the workshop will then use these models to identify appropriate planting strategies, land management, infrastructure development and utilise local knowledge to build a GIS database of the target village or area.
- Facilitate P3-DM workshops with target/pilot villages in association with Projects 1, 3, 4 & 10.
- Carry out post-workshop digitisation and map production for use by village authorities and stakeholders along the Jatropha chain.

D. Initiate and maintain a Geo-Database for all Jatropha Project activities.

- Collect and collate all available geo-spatial data necessary for Jatropha Research and Development efforts.
- Incorporate local knowledge gleaned from P3-DM workshops in the villages.
- Carry out desired mapping and analysis for Projects 3 and 4, this may include Low Altitude Balloon Platform Aerial Photogrammetry (LABPAP) and GPS feature mapping.
- Monitor and maintain geo-database, including data entry, on an on going basis for the whole Project.

E. Conduct an environmental evaluation of growing Jatropha.

- Study preparation
- Fieldwork
- Writing
- Submission and presentation to STEA

Expected Outcomes

- a. Maps and models that are i. understood by farmers, village authorities and entrepreneurs, ii. can be used by them to discuss and plan their activities, and iii. which they know how to update.
- b. An initiated geo-database in LIRE with skilled staff who know how to operate it.

Institutional setting

- This is a project of the LIRE Jatropha program
- Partnerships will be initiated with companies and institutions skilled in remote sensing and geo-spatial mapping.
- Close interaction with the relevant University institutions, and mapping institutions.

Line items for the budget

1. One post part-time project manager
2. One post full-time technician/analyst (this may have to be an international intern, if suitably qualified Lao personnel are not available)
3. One Project assistant/field surveyor/interpreter
4. Budgeting for potential requirement of expert technical assistance

5. P3-DM workshop facilitation team (3-4 persons) & purchase of materials – only for workshops (potentially for 20 villages, although it is possible that villages may be consolidated into areas, meaning less workshops)
6. Purchase of data (maps, satellite data, LABPAP, climate or other data such as literary resources)
7. Travel and accommodation for EIA Fieldwork
8. Rent of equipment
9. Report production, publication and dissemination (conferences, PR, media, printing etc.)
10. One dedicated workstation.

Project 3,
(see Overview at the front to understand the setting and crosslinkages)

Operating large plantations (similar to tea estates)

5 years timeframe

Aims

What are the most efficient ways to operate large scale plantations? "Plantation" is here understood to be large surfaces on good land that are planted with Jatropha and intensively managed for maximizing oil production.

Activities

- A. Collect and clarify all relevant information for Jatropha plantations.
- B. Install pilot plantations, incl. the required equipment. These shall be at least 10 ha.
- C. Manage pilot plantations with various management regimes, collect relevant economic data.
- D. Test the quality of the resulting seed and compare it with other sources of seed in Laos (in close cooperation with project No. 4).
- E. Assess environmental impacts of Jatropha plantations.
- F. Publish findings.

Expected Outcomes

- a. A report on the operations and results of various options for managing Jatropha plantations, and their environmental effects.
- b. A set of commercially relevant data that will allow to build a business plan for operating Jatropha plantations in Laos.

Institutional setting

- This project is part of the Jatropha programme of LIRE
- The institutes of the the National Agriculture and Forestry Research Institute NAFRI and of the National University of Laos NUOL are partnered to conduct this project
- Companies and institutes abroad who work on Jatropha plantations will also be included.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One plantation manager, one research assistant
3. Costs of seed, equipment and machinery and its importation and installation
4. Backup services by LIRE.
5. Costs for operating pilot plantations
6. Costs for lab-testing of the seed
7. Costs for environmental assessment
8. Publications, presentations at scientific fora, website.

Project 4,
(see Overview at the front to understand the setting and crosslinkages)

Decentralized Village Level Production

5 years timeframe

Aims

- Understand and describe present use of Jatropha in the present farming systems, and define possible future use of Jatropha in the evolving new farming systems of the villages.
- Ensure sufficient Jatropha seeds are available for processing at prices that are acceptable for households and villages.
- Assess and explore ownership issues with regard to producing Jatropha on various types of land. This has implications on governance at village level.
- Identify the roles of the people who have interests in the Jatropha production and processing, and how Jatropha production changes their roles. This includes socio-economic effects on gender balance, household incomes and village organisation. Check on potentials for legal, social or environmental conflicts and explore possible ways to deal with them.
- Identify the possible/potential other uses of by-products in the village economy, such as the press-cakes, as extra income generating activities (organic fertilizer, feed, soap, etc.). (Linking with Project No. 10).
- Participatory Technology Development PTD:
 Full utilization of farmers own local knowledge and experience in developing the Jatropha potential in their villages. This shall apply for all action which is undertaken. The results will always be generated in exchange with and in collaboration with villagers. Only insights and technology that have been tested and developed with villagers and are supported by them are considered suitable for demonstration and propagation. The reason for this strict referral to assessment of technology by local villagers is because of the locally specific social/technical/economic complexities of the prevalent farming systems in which they operate, and which are outside the grasp of theoretical science. Ie. with complex multi-variable innovations a farmer usually can assess much better what can work in his/her village than an outsider scientist. PTD is an iterative process of "action research" through collaboration between actively experimenting farmers and outsider experts.

Activities:

A. Program preparations

Develop and define the program, write the research proposals, negotiate with involved agencies and partners and organize the funding.

B. Identify villages, map out their potentials.

Identify and select 20 villages in Xiengkhuang Province and Vientiane municipality in which the experiments will take place. Map out the area of these villages as far as possible, using remote sensing data and existing maps (in close collaboration with the team of Project No. 2). These maps will be used during discussions with villagers on what works now and what could be tried out. Take up contact with relevant local authorities at District and Province for launching the project in these villages. Final selection of a village is after the next step.

C. Assess with villagers and discuss experiments

Together with villagers study and map out the land-uses and land-rights in the villages for developing and organizing the production and collection of Jatropha seeds: Hedges, "dead" lands (heavily degraded soils), Agent Orange (dioxin) contaminated lands, damaged lands, Imperata-infested land, grazing land, etc. Assess with them the easiest options for them to increase Jatropha production within their existing farming systems. Discuss with them the present socio-economic conditions and how Jatropha production may influence it. Set up hypotheses with them on what would happen if various realistic results could be achieved. Cancel villages where it is clear that problems will arise for conducting the experiments.

D. Preparation of experiments,

Based on discussions with villagers design the experiments according to the Participatory Technology Development (PTD) methodology adapted to Jatropha production. This requires search for existing materials and the development of a tool kit for implementing the PTD.

E. Conduct, monitor and report on experiments in pilot villages (Xiengkhouang, Vientiane Municipality) according to the PTD methodology. The experiments will explore the following issues:

E1. Search for good plants.

Villagers will be involved in searching and collecting Jatropha plants in their surroundings that have interesting features for oil production. This will increase the gene pool for interesting plants, to be taken up for propagation and for scientific study by research stations, breeding, etc. Also alternatives to Jatropha will be searched among the local plants

E2. Propagation techniques

One of the most pressing issues is the fast and reliable propagation. Nursery techniques and/or direct planting methods applicable in the villages themselves will be explored.

E3. Planting and management

What type of planting techniques and management methods are suitable for:

- Hedges along fields, paths and roads, closures of open rangelands (interactions with livestock management efforts).
- Eroded land (interactions with rehabilitation efforts).
- Succession to forest (interactions with forestry efforts).
- Intercropping (interactions with sloping land agriculture)
- Imperata infested land (interactions with forestry and livestock management)
- Dioxin damaged land (interactions with forestry).
- further types of land yet to be identified by villagers

E4. Ownership

How can ownership of the production be organized in the village, how will it influence the operations? This will be explored for:

- Privately owned land
- Common property land reserved for the usufruct of schools, health posts, etc.
- Common property lands belonging to the village or higher levels
- Implications for gender relationships, land-rights, usufruct rights, etc.
- further types of ownership yet to be identified by villagers

E5. Harvesting and preparation

Which are the best options for harvesting, preparing and storing the seed ready for pressing.

E6. Further issues yet to be identified by the villagers

F. Monitor social and economic effects

Develop and conduct a Socio-Economic Impact Assessment study of the pilot fields and villages. Collect data on production costs, timelines, incomes achieved, labour distribution in time (labour peaks that collide with other agricultural work?) and socially (who does what kind of work in Jatropha production).

G. Documenting.

Collect data and document the results of experiments. Produce photos, video-films, stories and technical brochures that can be used by experienced villagers to explain and demonstrate their success to other villages.

H. Reporting

Write and publish reports on experiments conducted with the villagers. Publish articles, publish on the website, build presentations for workshops and conferences. Take part in such venues.

Expected Outcomes:

- a. Fast and early tests of propagation and planting techniques that can be replicated.
- b. A steady stream of insights and technologies emerging from the PTD work which show how Jatropha production can be profitably undertaken in the villages.
- c. Toolkits and described procedures of the PTD methodology for replication while scaling up in other parts of the country.
- d. 20 villages that have a successful working knowledge of Jatropha production and which are then capable of explaining their procedures to visiting villagers from other villages throughout the province.
- e. A website which tracks the progress of the farmer experiments
- f. Published reports and presentations for workshops and conferences

Institutional setting:

- This is a project of the Jatropha program of LIRE.
- The pilot provinces will be Xiengkhouang Province and Vientiane Municipality, where contacts and/or agreements have already been established. (Also linking with Project No. 1).
- The research stations of NAFRI in Xiengkhouang will be involved for scientific backing of the action research through PTD.
- The provincial extension services PAFES will be approached to provide publicity and communication network for expanding successes from the pilot villages to neighbouring villages.
- Conceptual and procedural backup for conducting the PTD will be sought from consultants with experience in action research with villagers.

Line items for the budget;

1. Preparations and negotiations for launching the project
2. One full time project manager
3. 2 project research assistants for supervising the PTD efforts in the 20 villages.
4. Students to perform various types of studies/surveys in social development, economy, environment, energy, land-rights, and field surveys and interpretation.
5. Consulting for technical and methodological assistance on PTD procedures.
6. One working station at LIRE office, and all backup services from LIRE office.
7. Travel costs for project manager and staff (trips in villages)
8. Materials for experiments and training materials in the villages.
9. Remote sensing data and maps of pilot villages (aerial photos, etc).
10. Operation of website for documenting and tracking the progress of the PTD experiments

11. Publishing reports, brochures, presentations, video films
12. Participating in conferences and meetings; PR and media

Project 5,
(see Overview at the front to understand the setting and crosslinkages)

Hot oil extraction

3 years timeframe

Aims

Explore and develop the most profitable and environmentally sound hot extraction process for Jatropha oil applicable in Laos.

Activities

- A. Conduct hot-pressing abroad with batches of seeds from various sources in Laos. Assess the quality of the oil.
- B. If A turns out to be promising: Assess and pick a suitable press for importing to Laos
- C. Find a suitable industrial partner interested in hot extraction.
- D. Conduct pressing trials with Jatropha seeds of various sources from Laos.
- E. Analyze and assess the quality of the extracted oil and the implications for further processing.
- F. Publish findings.

Expected Outcomes

A set of reports on hot-pressing Jatropha in Laos, with the results of the chemical analysis of the extracted oil and its implications for further processing to usable fuel.

Institutional setting

- This project is part of the Jatropha programme of LIRE
- The institutes of the National University of Laos NUOL are partnered to conduct this project.
- Companies and institutes abroad who work on Jatropha extraction will also be included.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One research assistant to the coordinator of the LIRE program
3. Costs of machinery and its importation and installation
4. Backup services by LIRE.
5. Costs for hot-pressing
6. Costs for lab-testing of hot-extracted residual oils.
7. Publications, presentations at scientific fora, website.

Project 6,
(see Overview at the front to understand the setting and crosslinkages)

Transesterification and producing biodiesel for normal diesel motors.

3 years timeframe

Aims

Explore and demonstrate the viability of producing biodiesel in Laos

Activities

- A. Conduct pilot transesterification with batches of oil from various sources in Laos (coming from projects 8 and 5).
- B. Define the most suitable equipment for larger scale transesterification in Laos, identify reliable sources of methanol.
- C. Find a suitable industrial partner interested in transesterification.
- D. Import and install industrially viable pilot equipment and run trial runs.
- E. Test the resulting fuel (in close cooperation with project No. 9).
- F. Define the commercial parameters and collect the data.
- G. Publish findings.

Expected Outcomes

- a. A report on the operations and results of the industrial pilot plant
- b. A set of commercially relevant data that will allow to build a business plan for a biodiesel plant.

Institutional setting

- This project is part of the Jatropha programme of LIRE
- The institutes of the National University of Laos NUOL are partnered to conduct this project.
- Companies and institutes abroad who work on Jatropha transesterification will also be included.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One project coordinator
3. Costs of machinery and its importation and installation
4. Backup services by LIRE
5. Costs for operating pilot plant, incl. costs for methanol
6. Costs for lab-testing of produced biodiesel
7. Publications, presentations at scientific fora, website.

Project 7,
(see Overview at the front to understand the setting and crosslinkages)

Refinement and producing standard biofuel for modified diesel motors

3 years timeframe

Aims

Explore and demonstrate viability of producing standard biofuel in Laos.

Activities

- A. Conduct pilot refinement with batches of oil from various sources in Laos (coming from projects 8 and 5).
- B. Define the most suitable equipment for larger scale refinement in Laos.
- C. Find a suitable industrial partner interested in refining Jatropha oil to standard biofuel in Laos.
- D. Import and install industrially viable pilot equipment and run trial runs.
- E. Test the resulting fuel (in close cooperation with project No. 9).
- F. Define the commercial parameters and collect the data.
- G. Publish findings.

Expected Outcomes

- a. A report on the operations and results of the industrial pilot refinement plant
- b. A set of commercially relevant data that will allow to build a business plan for a biofuel refinement plant.

Institutional setting

- This project is part of the Jatropha programme of LIRE
- The institutes of the National University of Laos NUOL are partnered to conduct this project
- Companies and institutes abroad who work on Jatropha refinement will also be included.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One project coordinator
3. Costs of machinery and its importation and installation
4. Backup services by LIRE.
5. Costs for operating pilot plant
6. Costs for lab-testing of produced biofuel
7. Publications, presentations at scientific fora, website.

Project 8,
(see Overview at the front to understand the setting and crosslinkages)

Cold extraction to green biofuel

3 years timeframe

Aims:

- Explore and develop how Jatropha seeds produced under village conditions can be processed into acceptable fuel that can be used in the villages, and which does not cost more than diesel that must be imported and transported to the villages.
- Keep as much of the value-adding operations as possible in the villages and rural towns.
- Reduce the need for transportation to a minimum and yet be economically viable.

Activities

- A. Explore existing information about cold pressing of Jatropha seeds and get in contact with press dealers.
- B. Several trials with various Jatropha seeds from Laos in several diverse presses.
- C. Establish which is the most suitable mobile press, which can be transported with a pickup. Furthermore, establish which is the most suitable bigger press for continuous stationary operation at one place (12-24h/day).
- D. Explore best procedures for seed treatment by villagers themselves for an optimal press operation (this means cleaning, damply, peeling etc.)
- E. Several press trials with different press parameters (temperature, pressure, flow rate), to find out the optimal process for achieving acceptable quality oil for filtering.
- F. Explore several filter systems to ensure a clean Jatropha oil fuel.
- G. Analyse the various oil samples from the press and filter trials in a specialized chemical laboratory. The lab will make a comparison with the norm for rape oil (until now, the common norm for vegetable oil used as fuel). In case the oil doesn't pass the quality check, repeat the press/filter trials (Nr. E, F).
- H. Explore the best storage system for Jatropha fuel under village conditions and at central stations. Compare various storage methods and chemical analysis for assessing the deterioration rates.
- I. Establish parameters and procedures for setting up a quality assurance program for decentralized fuel production under rural conditions: "How to ensure correct pressing, filtering and storage?"
- J. Install a laboratory in a suitable institution in Laos, which will be able to test Jatropha oil being produced in Laos. Train staff to operate it.
- K. Explore and estimate - based on the trial results - the commercial parameters of pressing, filtering, storage: Capital investments, operational costs, lifetimes of components, costs of servicing, etc.
- L. Explore logistical methods for a continuous seed flow to the press facility.
- M. Report, document, demonstrate.

Expected outcomes:

- a. At least one viable suite of technology and procedures for pressing and filtering locally produced and prepared Jatropha seeds to acceptable fuel by a mobile unit that can reach villages (ie. the pickup option).

- b. At least one similar suite for a stationary operation in a rural town.
- c. An operating laboratory which can do first testing of oils.
- d. The economic data that will allow to build draft business plans for mobile units and stationary units, including the scales of operation required for achieving economic viability of fuel in the villages (same price or cheaper than price of diesel in the village).
- e. A written and illustrated report with the findings, plus presentations for scientific/economic venues and workshops.
- f. Photographic and film documentation that can be used to illustrate how decentralized fuel production can be economically viable and of acceptable quality.

Institutional setting:

- This project is part of the Jatropha program of LIRE.
- Companies and research institutions specialized in producing and testing fuels from vegetable oils will be included in the project.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One fulltime coordinator and one technical assistant for the 4 types of trials (seed-treatment, pressing, filtering, storage).
3. Consulting from partner companies abroad.
4. One working station at LIRE office, and all services from LIRE office.
5. Rent of rooms for conducting the controlled benchmark trials that will then be replicated under village conditions, incl. electricity.
6. Purchase of various seeds from Laos for conducting the trials.
7. Purchase of at least 4 different oil presses; at least 2 movable, at least one bigger press (5-15kW).
8. Filters (gravity filter, pressure operated filter and centrifuge)
9. Laboratory equipment and trainings
10. Transport and installations for field-tests of equipment under village conditions, incl. staff costs for duration of testing in village.
11. Rent of suitable pickup for testing village operations, incl. technical adaptations for the press.
12. Analysis for the oil samples by a specialized laboratory abroad inclusive postage, tax fees and containers for the oil samples.
13. Reporting, publications, presentations at venues, website, etc.,
14. Film team

Project 9,
(see Overview at the front to understand the setting and crosslinkages)

Motor technology for various applications

3 years timeframe

Aims

- Make motors available in Laos that can reliably use Jatropha-based biofuels coming from direct cold pressing, from refining or from transesterification
- Focus on motors using cold-pressed fuels first, and take up others as and when refining and transesterification becomes operational in Laos.

Activities

A. Identify typical motor operations in rural areas, and the used sizes of motors:

- "Iron buffalo" (Tek teks),
- generator sets,
- pumps,
- tractors and trucks operating on rough feeder roads,
- trucks and busses operating on long-distance roads,
- boats.

Which types of motors are being used for these purposes (manufacturers, etc.)?

B. Identify suitable garages or engineering institutions in Laos which can set up and operate motor-testing stands, and which can refurbish or adapt existing motors to operate with Jatropha oil. Enter into a partnership-agreement with them.

C. Test various types of motors and their adaptations on the motor-testing stands.

Priority are:

- Tek-teks,
- generator sets (power output as low as possible but at least 4 times the Tek-tek operated generators),
- local pickups or trucks
- irrigation pumps

Next priorities are in falling order:

1. Longdistance trucks and busses
2. Boats

D. Based on results of C. begin pilot operations in the villages and towns where the Jatropha growing is being initiated (Project No. 4). Identify and measure economic parameters.

E. Training for technicians and engineers for adapting and servicing motors

F. Explore and define how financial flows for Carbon-reduction can be channelled through this system

G. Document and publish reports, present in conferences and workshops

H. Produce materials for media coverage, presentations, demonstrations.

Expected Outcomes

- a. Sets for adapting the priority types of motors are available
- b. At least one reliable garage/servicestation in Laos is capable of adapting motors and servicing them.
- c. Data for calculating the economics of operating such motors is available.
- d. Published reports and documents on the technologies
- e. Demonstrations and pointers in the Lao media.

Institutional setting

- This project is part of the Jatropha Programme of LIRE
- Partnerships with companies abroad who are specialized in motor technology with biofuels
- Partnerships with companies in Laos that will learn how to adapt and service such motors
- Partnerships with technical institutes in the Lao research and education sectors.

Line items for the budget

1. Preparations and negotiations for launching the project
2. One fulltime coordinator and one technical assistant
3. Consulting from partner companies abroad, including their travels and staying in Laos.
4. Costs of Lao garage/institution for operating the motor test-stand (rent of space, electricity, consumables, etc).
5. Training costs for staff of Lao company
6. One working station at LIRE office, and all services from LIRE office.
7. Purchase, transport and installation of motors for testing, purchase of adaptation kits
8. Fees for local engineering and production of parts for testing, etc.
9. Purchase of Jatropha oil of suitable quality (initially in close cooperation with Project No. 8, later with Projects Nos. 6 and 7).
10. Transport and installations for field-tests of equipment under village conditions, incl. staff costs for duration of testing in village.
11. Reporting, publications, presentations at venues, website, etc.,
12. Film team

Project 10,
(see Overview at the front to understand the setting and crosslinkages)

Profitable use of presscakes

5 years timefrae

Aims

Explore and develop the most profitable and environmentally sound uses of presscakes of Jatropha in the village and/or industry.

Activities

- A. Take samples of Jatropha presscakes from all types of presses and test them on their residual oil content
- B. Attempt hot-extraction of residual oil and test for its properties and potential uses
- C. Define and conduct a set of trials for making use of presscakes, ranging from fertilizer on the fields to bricks for burning to feed. Take poisonous properties of Jatropha into account.
- D. Explore and describe the commercial values of various derived products and their potential for increasing value in village economies and in industry.
- E. Publish findings.

Expected Outcomes

A set of reports on uses of Jatropha presscake-products and their commercial values, based on real experiments made in Laos.

Institutional setting

- This project is part of the Jatropha programme of LIRE
- The institutes of the National University of Laos NUOL are partnered to conduct this project. Also close collaboration with Project Nos. 6,7,8.

Line items for the budget

- 1. Preparations and negotiations for launching the project
- 2. One research assistant to the coordinator of Project No. 8.
- 3. Backup services by LIRE.
- 4. Costs for hot-pressing
- 5. Costs for lab-testing of hot-extracted residual oils.
- 6. Calorific testing for brick fuel, etc.
- 7. Tests in villages (in close collaboration with project No. 4)
- 8. Tests in Lao industry as and when appropriate.
- 9. Travel costs for field trips of staff.
- 10. Publications, presentations at scientific fora, website.