

## JARAK: The commoditization of an alternative biofuel crop in Indonesia

### Summary

Jatropha promises much: clean non-fossil diesel fuel, and new income sources in marginal areas that will grow the crop. The promise has already inspired millions of dollars of realized investment in jatropha plantations and many plans for more announced in newspapers, conferences and on the internet. In only a few years an ordinary hedge plant, *jarak pagar* in Indonesian, has been turned into the valuable commodity for energy production: *jatropha curcas*. What caused this rapid process of commoditization? What are the environmental requirements and consequences? How can local producers and laborers benefit from the prospective profits?

World-wide, proponents of jatropha as a source of biofuel claim a high level of social and ecological sustainability for this crop. Indonesian national policy began promoting jatropha in 2006. The research cluster JARAK aims to build a scientific knowledge base by which these claims may be objectively addressed. It will do this by tracing the rise of jatropha as a commercial crop in Indonesia, assessing the assumptions underlying its introduction, investigating the production potentials in Indonesian circumstances, and identifying how legislation, governance and policy concerning jatropha can be supportive for local producers' livelihoods.

The scientific challenge of JARAK is to bridge the current gap between the claims on jatropha and actually existing knowledge that would justify them. The gap is far wider for jatropha than for any of the other biofuel crops in Indonesia, partly because jatropha is a new commercial crop, partly because the set of claims is so far-reaching. More abstractly, JARAK will study how innovations for 'Agriculture beyond Food' induce commoditization, making local producers and laborers core actors in addressing world-wide problems, and in turn exposing them to both livelihood opportunities and threats.

JARAK combines research in three domains: legal environment and governance, socio-economic aspects, and plant production. JARAK research seeks to answer the following questions:

- 1) *What explains the rise of *Jatropha curcas* as a commercial crop for energy production in 'marginal' areas of Indonesia?*
- 2) *To what extent are the claims underlying this introduction well-founded?*
- 3) *How have these claims been transformed into laws and policies, how are they implemented, and to what extent does this process conform to the rule of law?*
- 4) *What are the socio-economic and ecological consequences of the commoditization of jatropha and why do they occur?*
- 5) *How can sustainable jatropha cultivation be achieved and how can potentially negative impacts of this cultivation be mitigated?*

Even though the jatropha initiatives are currently mainly at the planning stage, they are already affecting the targeted production areas. Potential producers are starting to register land titles, politicians are exploring possible cooperation with agribusiness, and the most innovative local entrepreneurs are creating links with potential partners in government and in global markets. Where initial projects have already started local producers have voiced their criticism, because selling prices are low and marketing channels as well as processing facilities are not developed yet. Whether this just reflects initial problems in setting up a new sector, or more structural problems, is not yet clear.

The development of jatropha as a commercial crop in Indonesia is occurring right at this moment. Studies on the commoditization of other crops in the colonial era or more recent past, offer good points of departure for the proposed research. However, complementary to studies on these crops, the introduction of jatropha offers a unique opportunity to study the process while it is happening. JARAK promises to build a policy-relevant knowledge base specific to the Indonesian case. Beyond that, it will contribute to a broader understanding of social and legal techniques being developed to create a bio-based economy.

The cluster comprises two post-docs, four PhDs. The six projects all have their own main focus and simultaneously contribute to answering the other four questions as in the matrix below.

Questions Addressed by project	1. Shaping claims: Explaining rise	2. Validating Claims	3. Regulating commoditization	4. Commoditization's impact	5. Sustainability opportunities
1. Post-doc: information flows	<b>Main question</b>	(in)consistencies	Links with discourses	On ruling paradigms	Political requirements
2. Post-doc: legal environment and governance	contributes	Land available, Governance capacity	<b>Main question</b>	Through laws and policies and their implementation: on restructuring power balances	legal and governance requirements
3. PhD 1: Plant science	contributes	<b>Main question</b>	Regulations concerning plant production	Questions of scale	Technical requirements
4. PhD 2: land, water and environment	contributes	Land available; Environ.friendly; Water available	<b>Main question</b>	environmental damage, Access to natural resources	Enabling and protective regulation
5. PhD 3: labour regimes	contributes	Participation; Employment; Poverty alleviation	Regulations concerning labour	<b>Main question</b>	Employment, Preventing new vulnerabilities
6. PhD 4: co-management	contributes	Local potential, market demand, food competition	(in)formal arrangements For co-management	Questions of scale	<b>Main question</b>

PhD research will be located in areas where jatropha plantations have been planned or are already operative: the relatively dry areas of eastern Indonesia, operational sites in Central Java and Sumbawa, and the logged-over forests in Central Kalimantan. Additionally, JARAK will have six more thematic post-doctoral studies with a focus on historical and comparative research (externally funded by KITLV and IIAS). Fellowships for these post-doc studies will be advertised at [www.kitlv.nl](http://www.kitlv.nl) and [www.iias.nl](http://www.iias.nl).

#### Lead institution:

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**Other Institutions involved:** Royal Netherlands Institute of Southeast Asian and Caribbean Studies (KITLV) and the International Institute for Asian Studies, both in Leiden, The Faculty of Social Science ( Anthropology Department) of Leiden University, Gadjah Mada University (Faculty of Social and Political Sciences) in Yogyakarta, University of Indonesia (Faculty of Social

and Political Sciences) in Jakarta, Wageningen UR's Plant Research International and chair Plant Production Systems, the Agricultural University of Bogor (IPB), and Universitas Parahyangan's Faculty of Law in Bandung.

**Information :**

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**Project descriptions**

**1. Information flows in jatropha commoditization: shaping claims on jatropha in Indonesia**

**Researcher:** Dr.Suraya Afiff, Universitas Indonesia/KITLV Leiden.

This post-doc project will investigate how information about Jatropha is produced, disseminated, reinterpreted, and acted on at many levels, such that it leads to the introduction of jatropha as a commercial crop in specific locations. The general direction of information flow in this case is from the global to the local. Information is, first, produced at the global level by market and policy processes such as rising fossil fuel prices amid growing consumption and declining reserves, an imminent climate crisis, and persistent poverty and hunger. The jatropha plant, also considered an “actor” in actor network theory, offers the prospect of bio-diesel production from marginal land that plays such a hope-giving role in certain policy responses to these multiple crises. At the national level this jatropha information is reinterpreted in the context of sometimes contradictory domestic agendas of reducing the fossil fuel import bill, stimulating industrial development, meeting global CO2 and biodiversity obligations, and relieving poverty. At the local level, government priorities are shaped by national policies but also by local budgetary and political considerations. At the moment, jatropha is mainly a government-sponsored development project. At the same time, government steerage capacity is constrained by growing neo-liberal market pressures. When the price of fossil fuels will once more exceed a certain level, it will trigger share-price rises for large biofuel production and consumption companies. These will play their own role in the production, dissemination, and reinterpretation of Jatropha information at every level, right down to the Indonesian village. Last but not least, local communities, small growers, and medium-scale provincial entrepreneurs all promote their own interests when they reproduce Jatropha information. On the basis of information that has become persuasive, action is taken to invest, for the short- or the long-term, on a small or a large scale, in the new crop. Thus markets for jatropha are created and shaped by information manipulated by many different actors.

*Research questions:*

- How is information identifying jatropha as a biofuel solution produced out of the complex interaction of all these processes?
- Who are the main agents disseminating this information from above and reinterpreting it from below?
- How does jatropha information transform political and economic action (by strengthening some agents while weakening others)?

**2. Translating claims and facts about jatropha into laws and regulations and government policy and practices in Indonesia (A), and Cluster synthesis (B)(see 7)**

**Researcher:** Dr.ir. Jacqueline Vel, Van Vollenhoven Institute, Faculty of Law, Leiden University

Since biofuel has become a priority policy sector, the Indonesian national government supports production targets with enabling legislation, however without providing legal safeguards to ensure that this new sector does not damage social sustainability. The speed of this on-going process causes gaps between the new bio-fuel legislation and 'rule of law' (Tamanaha, 2004). Converting *jarak pagar* into the international commodity *Jatropha* creates 'stakeholders', various types of actors with their own interests who compete over the natural and human resources. What used to be the local population's natural rights then becomes reduced to claims that need to be integrated in or are in confrontation with the laws of state and corporations. This research project follows the links in networks of the *Jatropha* commodity chain to those actors who take decisions and make regulations that are vital for the existence and success of this agro industry. The researcher will start her fieldwork from the primary production level in Sumba (NTT) where she has been conducting research on the rural economy and local politics during the last 25 years, and will also build on PhD projects findings. Previous research has shown that conflicts of interests influence legislation and its implementation, causing laws to be weak, vague or conflicting, which creates a gap between the written law and law in action. New legislation - international conventions, national legislation or district regulations - also provides opportunities for specific actors to further their own interests, and acts a driving force in this commodity chain.

The aims of this post-doc research are: integrating parts of specialist legal fields into a knowledge framework on the legal environment of a specific commodity chain, applying and developing that framework for law and policies concerning the *jatropha* commodity chain in Indonesia: analyse the drafting process, the content, and how they are implemented and interpreted.

*Research questions:*

- How is information identifying *jatropha* as a biofuel solution incorporated in legislation and policy in Indonesia, and what is the content of that legislation and policy?
- Who are the main actors with decisive and regulatory power in the *jatropha* commodity chain?
- How these laws, regulations and policies implemented and what are the effects on the livelihoods of the local population in the production areas?

### **3. Growth, development and production of *Jatropha curcas* in Indonesia**

**Researcher:** Juliana Tjeuw

**Supervisors:** Dr.Ir Maja Slingerland, Dr.ir. Raymond Jongschaap and Prof. Ken Giller, Wageningen UR.

potential of different production systems Although heavily promoted for its many advantageous properties, there is little scientifically-sound information available on the growth, development and production of the *Jatropha curcas* under different environmental circumstances and in different production systems. As it is essentially a wild species lacking clearly distinguished varieties, the use of different *jatropha* accessions gives a wide variety of growth and development patterns, leading to unpredictable growth and yields, and sometimes unwanted situations. This is caused by the complex interactions between Genotype (G) x Environment (E) x Management (M), which must be unravelled to fully understand the production potentials in order to understand the true value and applicability of *jatropha* in different production systems. The different environmental and socio-economic settings determine the (design of) optimal production systems for *jatropha*, and govern the efficiency of resource use (radiation, water, soil

fertility). Aim of this PhD project is the acquirement of those plant parameters that describe growth and development patterns of *jatropha* production systems in Indonesia. The second aim is to optimize seed yield per unit of land and/or unit of labour in specific production systems.

*Research questions:*

1. What are the plant parameters that describe growth and development patterns of *jatropha* production systems in Indonesia?
2. How can seed production be optimized to obtain a predictable production potential with reduced risk?
3. To what extent are the claims concerning production potential of *jatropha* true for circumstances as found in Kalimantan and NTT?

In the proposed PhD-project, the Genotype (G) x Environment (E) x Management (M) interaction will be studied under smallholder farm conditions and in large-scale plantations to elucidate the important growth parameters for *jatropha* in contrasting settings. The production systems studied will vary from:

- a) the collection of seeds from singular wild *jatropha* trees;
- b) the growing of *jatropha* as a live fence around field boundaries;
- c) integrating *jatropha* as an inter-crop with traditional crops; and
- d) more commercial application of *jatropha* in mono-cultures.

To understand crop growth and development, time-series of plant growth and development will be monitored using simple allometric models and analysed by linking to explaining factors including the genetic resource base, climatic growth factors (radiation, temperature, precipitation), growth limiting factors (soil water and fertility) and growth reduction factors (pests and diseases). This will allow us to explore the productive in order to extrapolate and up-scale results to higher integration levels.

Field experiments will be located in commercial plantations and under a variety of smallholder production systems linking to the other PhD projects, most probably in West- and Central Java, Sumbawa and Flores. This will allow integration of the results and evaluation of productive potential across production systems.

#### **4. Claims and facts on land, water and environment: socio-legal issues in *jatropha* cultivation in NTT**

**Researcher:** Loes van Rooijen

**Supervisors:** Prof. Jan Michiel Otto and dr. Jacqueline Vel, at Van Vollenhoven Institute, and Prof. Koerniatmanto Soetaprowiro at UNPAR in Bandung.

*Jatropha* related activities in one region involve a variety of public and private actors in the production area, their networks and their strategies. These actors assess the claims on *jatropha* concerning land, water and environment from their own perspective. They make local level regulation or protest against it, participate in environmental assessment and local politics, create local land market developments and engage in disputes. The substance of disputes and regulations on *jatropha* development concerns questions on its environmental sustainability, whether land for *jatropha* is available or 'marginal', how *jatropha* cultivation can be balanced with food production, rights of labourers and small holders, and how water resources of the local population can be protected. Answers are partly context specific, partly matter of nation-wide regulation.

The aims of this PhD project are to create an overview of old and new laws and policies pertaining to *jatropha* cultivation at the provincial, district and village levels, including customary (non-state) regulation; to indicate gaps in the legal framework regulating the *jatropha* commodity chain up to provincial level; and to contribute to identifying just and

effective resolution mechanisms for disputes around the jatropha chain at regional and local level.

#### *Research questions*

- What are current laws and policies pertaining to jatropha cultivation in two research areas?
- What characterizes the local drafting process that led to this legal framework?
- Does the legal framework conform to the rule of law?
- How are these laws and policies implemented and how do firms, local communities, NGOs and individuals respond to them?
- What are non-state norms and regulations that affect the jatropha commodity chain in the area of field research?
- What kinds of disputes arise and how are they dealt with?

Field research will be conducted in two field sites in the province East Nusa Tenggara, and also in the provincial capital Kupang. A comparative approach provides insight in legal parameters: whether national law and policies related to jatropha work out differently in different places. For questions 1 and 2 the researcher will use the approaches developed in previous VVI research programs (INDIRA, INSELA). The framework for rule of law assessment as developed by Bedner (2004) is used to answer question 3. This part of the research is a desk study that can only be performed after the relevant materials have been gathered during fieldwork. Questions 4-6 concern empirical research using interviews and research on media publications, and desk study of socio-legal and anthropological literature. The research will contribute to identifying just and effective resolution mechanisms for disputes arising around the jatropha chain at regional and local level.

The researcher will work in close collaboration with the postdoc researcher of project 2.

### **5. Labor issues in jatropha cultivation: opportunities and threats for employment and farmers' income**

**Researcher:** Gunawan

**Supervisor:** Dr. Pujo Semedi, Anthropology at UGM Yogyakarta

Kalimantan in the last two decades has been experiencing massive conversion of its forest and swidden agriculture lands to mono-cropped oil palm. In 2006 the mono-crop list was added with jatropha. The conversion is partly justified by assuming it will lead to employment and income for local actors. Are these assertions for jatropha cultivation justified? Experience with the mode of production as applied in Kalimantan's oil palm plantations indicates it is prone to drag labourers to poverty despite high productivity and high prices for their product. Such commoditization makes farmer's and labourer's households dependant on volatile markets (Scott, 1974), sharpen social differentiation among the land holders as well as between them and their landless co-villagers (Hüsken, 1998), proletarianize share tenants into plantation coolies (Semedi, 2006), and requires new forms of labor regime to mobilize array of human labor into an efficient working force (Daniel, Bernstein and Brass, 1992). Local actors are vulnerable when a commodity boom ends due to economic or ecological collapse. The aims of this research are: identification of alternative labour regimes for jatropha production and how they facilitate local empowerment and economic development, and in depth analysis of social consequences of jatropha commoditization.

Initial observation in 2010 clearly tells that actual jatropha cultivation is far from the stage where biofuel can be really produced. Optimists, among farmers, entrepreneurs and observers,

would say, the cultivation is still at the demonstration stage. The pessimists, on the other hand, would say that the project is dying right on the cradle. Considering the fact that there is no large scale jatropha cultivation yet, this project is slightly changed in research object, however maintaining the original research focus on social relations, from labour regime in jatropha cultivation to the social network and connections among players in jatropha cultivation. In this way the research will provide proper understanding how a scheme so neatly planned and greatly launched got stuck in the mud just few meters from the starting line.

Gunawan's research will be in Central and East Java, to perceive this debacle from rural farmers' perspective. Pujo Semedi will work in West Kalimantan to gain a comparative perspective by perceiving jatropha cultivation from palm oil farmers' point of view.

#### *Research Questions:*

- What are the alternative labour regimes for jatropha production in Central Java?
- How do these regimes compare regarding labour rights, income and wages, ownership and vulnerability?
- How does jatropha commoditization create new forms of wealth and poverty in the production area?
- Does it lead to labour migration?
- What are the effects on social differentiation based on gender, ethnicity and generation?

## **6. A model for co-management in jatropha production**

**Researcher:** Henky Widjaja

**Supervisors:** Prof. Gerard Persoon, environmental anthropology, Faculty of Social Science Leiden University, dr. Jacqueline Vel (VVI)

Cultivation of biofuel crops will very likely compete with other forms of land use aimed at the production of food crops or live stock. The large scale promotion of jatropha bears the risk of out-competing these other crops while its future prospects are as yet unclear. Productivity, markets, prices, and the type of trade relations are as yet difficult to predict. Just as in some other cases of other 'miracle crops', distorted markets, disappointing yields, falling prices or powerful agents in the trade chain may eventually lead to frustration among farmers who may feel mistreated by companies, traders or extension workers. The experiences with the requirements for the sustainable production of other commodities (principles and criteria) such as timber (under FSC management) and palm oil (under RSPO management), will be used as a source of comparison and inspiration. Examples of such principles and criteria deal with issues like free, prior and informed consent (FPIC) of involved communities, labour conditions, the pricing system, and the chain-of-custody.

In general, the existing studies on jatropha are more focused either on the technical or the impacts side of the industry. In contrast to the other potential biofuel crops, such as oil palm, maize and sugarcane, there are not many (if not yet any, especially in Indonesia) specific study on the business models and practices in the jatropha production. The research will focus on this issue by giving specific emphasis on the analysis of co-management conditions applied in the models and practices.

It will investigate both exogenous and endogenous process and factors within the applied cooperation/partnership models to explain the resulted impacts.

Furthermore, this research will assess the claim of jatropha's potential contribution to poverty reduction. This research will investigate from the equity and power relationship perspective about whether jatropha production really benefits poverty reduction by contesting the conventional success indicator which is always emphasizing on the increase of outputs and

income rather than to see the allocation process of production factors and the distribution of the profit itself among the actors.

At the end, the aims of this project are to identify the models of co-management in the commercial production of jatropha (*jarak pagar*) in Indonesia by investigating the adoption and application of co-management principles in the study cases. Secondly, the research will analyze the factors that may affect the socio-economic sustainability of the adopted models..

#### *Research questions*

- Who are the actors and what are their drivers? What are the determinant factors in the introduction of jatropha commercialization in the research locations?
- What are the adopted business models? Why are these models selected? Who are the actors involved? What are the enabling factors? How do these models implemented? Why are farmers willing or not willing to participate in these models?
- How do the adopted models meet the criteria of co-management? What are the major characteristics of power relationship in these models? How is the allocation and distribution of the production factors and profit under these models? How do the adopted models address the key issues of access to land, labour use and livelihood (food and income security)?
- What are the key factors for sustainability? How is the issue of sustainability perceived in the study cases?

Field research for this PhD project will be conducted in several sites in South Sulawesi. In this province there are several cases of commercial jatropha cultivation, and the researcher can benefit for his previous experience in this area.

#### **7. Cluster Synthesis (Project 2 B)**

At the end of the program, Jacqueline Vel (Post doc project 2) will write a book in which the overall questions of JARAK will be answered using the findings of all researchers in JARAK. As coordinator of the program she will use draft-chapters of the book to stimulate communication and discussion within the interdisciplinary research teams of JARAK, and with researchers in the other clusters of Agriculture beyond Food.