ECONOMICAL ANALYSIS MODEL IN JATROPHA CURCAS PLANTATION OF RURAL FARMERS IN THAILAND UNDER SHARED BENEFITS BUSINESS WITH INVESTOR

KHUMTHORN NAWALERTPANYA

A Thesis Submitted to the Graduate School of Naresuan University
in Partial Fulfillment of the Requirements
for the Master of Science Degree in Renewable Energy
May 2011

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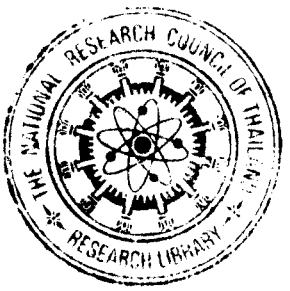

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ABSTRACT

In last decades, the most concerning problems of world populations are the oil depletion and the global warming. Many countries have been encouraging the projects on using new sources of energy, which is more sustainable and environmental neutral in order to promote the CO_2-Reduction. In recent years, biofuel research has been directed mainly to explore plant-based fuels, which is fatty acid methyl esters (FAME) of seed oils and in some cases, animals fats. As previously documented, FAME can be derived from rapeseed, palm, sunflower, soybean, *Jatropha* seeds and other plants. The biodiesel from various sources of seeds are considering if it is edible or non edible, this is a controversial issue till now.

Jatropha Curcas oil is obtained from the seeds of the succulent plant *Jatropha Curcas*, which is able to grow under various climatic conditions and can survive long periods of low water availability and droughts. It is considered as being one of the most promising sources for non fossil fuels. Its chemical composition is optimal for biodiesel applications when used as transesterified FAME due to its high combustion enthalpy, low iodine number (low content of unsaturated fatty acids which are air sensitive and their oxidation and polymerization products reduce the quality of the fuel), and optimal viscosity. Very large producers of biodiesel are South-East Asia

and South America, and also parts of the United States; Malaysia and Indonesia being the leading countries with an annual production of 20 million m^3 together. Soybean and palm oil, transferred into the methyl esters, are still the main sources for biodiesel, animal fat is also considerably important.

There are still a lot of researches to be done about the optimization of *Jatropha* oil for use as fuel, which includes the evaluation of the optimal growing conditions, the technological processing of the raw seed oil into fuel, and the optimization of the plant itself by selective breeding of high-yield species, and genetic engineering. Even though *Jatropha* can withstand sub-optimal growing conditions and is resistant against plant diseases. It was seen that a high yield of high quality oil can often only be obtained when the growing conditions are suitable.

This analysis focused on the investigation of a new system of *Jatropha* plantation for crude oil production under shared benefits business with investor, which could serve a large scale of *Jatropha* crude oil production in Thailand. The business functions between farmers and investor can be divided in 7 steps. Only 3 steps as plantation, harvesting and delivery to collecting center are managed by farmers, other 4 steps as nursery, transport to factory, crude oil production and shipping to end customers by investor. With agreements to support the farmers by providing them know-how and raw materials such as seedlings, fertilizers or pesticides etc., they both would reach the highest return.

The *Jatropha* plantation models are analyzed by plantation scales of 1-1,000 rai (1 rai equals to 1,600 m^2), planting technique of 250 seedlings/rai, various quantity of fertilizer and pesticide, *Jatropha* yielding time of 25 years, various seeds prices and seed yields. All costs and incomes of farmers are considered and economically analyzed with helps of economic tolls as CBR and ROI.

The results shown that, without helps from investor, *Jatropha* plantation in Thailand could be beneficial when plantation scale starts from 5 rai and minimum seeds price at 9 bath/kg, while under shared benefits business at only 6 bath/kg. The shared benefit business makes *Jatropha* cultivation of 20 rai or over by the lowest seeds price of 3 bath/kg also beneficial.

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ABBREVIATIONS

G	=	Gram
kg	=	Kilogram
JCL	=	*Jatropha Curcas Linn*
BCR	=	Benefit Cost Ratio
ROI	=	Return on Investment
PVB	=	Present Value of Benefits
PVC	=	Present Value of Costs
NPV	=	Net Present Value
B	=	Benefit or Gain
C	=	Cost or Expense
i	=	Discount Rate