

Fiscal 2006 Project Consigned by the Ministry of Environment

Fiscal 2006 CDM/JI Project Study

CDM Project Formulation Study for
Jatropha Biodiesel Development in Tanzania

Summary Report

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Construction Project Consultants, Inc.

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1 Basic Elements concerning Project Implementation

1.1 Background and Outline of the Proposed Project

The proposed project aims to use crude Jatropha oil (CJO) extracted from Jatropha, cultivation of which has been started on a commercial trial basis in the southern part of the Kilimanjaro Mountain Range in the north of Tanzania, in order to produce Jatropha methyl ester (JME) based on trans-esterification with methanol, and to use the resulting Jatropha biodiesel fuel (JME-BDF) as a substitute for diesel fuel. Utilizing BDF produced from Jatropha oil as a substitute for diesel fuel entails reducing consumption of diesel fuel by the amount of BDF, and thereby reducing the quantity of carbon dioxide corresponding to the reduced amount of diesel fuel¹.

Since JME-BDF (diesel-substitute fuel derived from vegetable) is carbon-neutral, combusting it as fuel does not entail the discharge of carbon dioxide, but it is effective in reducing almost all the amount of carbon dioxide that would otherwise be discharged if combusting the substituted fossil fuel. Through operating the BDF manufacturing plant with daily production capacity of 100 tons as envisaged in the project, it will be possible to reduce the annual amount of carbon dioxide emissions by between 75,000~100,000 tons.

The objective of the project is to realize the first commercial-scale plant for biodiesel production in Tanzania so that it may become a model for similar plant throughout the country, and also to realize a CDM undertaking that is based on the production and use of biodiesel. The project is designed and intends to obtain crude Jatropha oil extracted from Jatropha which is cultivated in the northern part of Tanzania by means of an organized growers at commercial level, then, to transport the crude oil by truck or railway to a BDF production plant constructed on the outskirts of Dar es Salaam as mercantile city, to produce JME-BDF and to distribute the Jatropha biodiesel produced in Dar es Salaam.

The project implementing agency will be a special purpose company or foreign joint venture company whichever appropriate for the project established under joint funding from private business entities in Tanzania and Japan. The scope of the proposed project shall cover from the purchase of CJO under a long-term agreement from the entities and organizations that produce it, through the production of biodiesel using trans-esterification technology, and to the sale of the final product to a petroleum products distribution company based on a long-term sale agreement.

1.2 Outline of the Host Country

The official name of Tanzania is the United Republic of Tanzania referring to the mainland portion on the African continent and Zanzibar, which is located in the Indian Ocean. The population of

¹ The amount of carbon dioxide emitted in the combustion of 1 liter of diesel fuel is 3,000 grams.

Tanzania is approximately 37,400,000 (2006), and the annual population growth rate is approximately 1.8%. The population is composed of 126 tribal groups including Bantsu Skuma, Makonde, Chaga and Haya, however, none of the tribal conflicts and political disparities so commonly seen in western Africa occur here. The breakdown of religions among mainland people is 30% Christian, 35% Moslem and 35% local religions, whereas 99% of the population of Zanzibar is Moslem.

The system of government is a republic based on British Common Law, and the diet is a unicameral system. The head of state is President Jakaya Mrisho Kikwetwe (appointed to office on December 21, 2005). The prime minister is Edward Lowassa.

Tanzania is one of the world's poorest nations. The economy is overwhelmingly dependent on agriculture, which accounts for approximately 43% of gross national product. However, Tanzania is not blessed with good terrain or climate; accordingly, cultivated land only accounts for 4% of the national land area and irrigated land only amounts to 1,840 km². Main agricultural products are cloves, copra, maize, bananas, cassava, rice and beans, and cash crops are coffee, cotton and tobacco, etc. Industry has traditionally centered on processed agricultural products (sisal, tobacco, etc.). The GDP is approximately US\$11.6 billion and per capita GDP is approximately US\$320. The recent economic growth rate is good at 6.3%, however, price inflation has been 4.0% and the population growth rate 1.8%.

The population engaging with agriculture accounts for approximately 80% of the total working force (approximately 20 million). This indicates that agriculture forms the backbone of the Tanzanian economy. In particular, agriculture in Tanzania as covered in the development strategy is currently faced with a lot of problems. In particular, the following three issues are salient: (1) low agricultural productivity; (2) lack of coordination capability and poor implementation capability among agricultural stakeholders, and (3) inadequate agricultural facilities and infrastructure

The Government of Tanzania sets the goals as for energy policies and directions: (1) development of domestic energy sources; (2) setting of economic energy prices; (3) improvement in the security and safety of energy; (4) improvement in energy efficiency; (5) avoidance of cutting forest trees; (5) development of human resources, and so forth.

The Ministry of Energy and Minerals formulated the Energy Policy of Tanzania in April 1992 and revised this in 2000. The goal of revised energy policy is to secure the reliable and accessible supply and utilization of energy by sustainable means. Moreover, this policy contains the following three visions and mission objectives:

- (1) To realize economic growth by sustainable and environmentally friendly methods, thereby improve the standard of living across the country;
- (2) To build an environment capable of supply safe, reliable, efficient and cost-efficient energy

services; and

- (3) To contribute to socioeconomic development from the long-term viewpoint of poverty eradication.

The Ministry of Energy and Minerals is the administrative agency in charge of energy in Tanzania. And, the Vice President's Office, Division of Environment is the designated national authority (DNA) for the CDM in Tanzania.

1.3 Policies and Current Conditions of CDM/JI in the Host Country (Acceptance Criteria and DNA Establishment Situation, etc.)

Tanzania ratified the United Nations Framework Convention on Climate Change (UNFCCC) on April 17, 1996 and the Kyoto Protocol on August 26, 2002. The history of acceptance of the CDM are as follows:

Ratification of the UNFCCC: April 17, 1996

Ratification of the Kyoto Protocol: August 26, 2002

Registration of the designated national authority (DNA): December 12, 2004

The current CDM designated national authority is the Vice President's Office, Division of Environment.

1.4 Contributions to Sustainable Development and Transfer of Technology in the Host Country by the Proposed Project

The following benefits or merits can be pointed to as contributions that will make to sustainable development in Tanzania as a result of the proposed project being realized:

- Reduction of greenhouse gas (carbon dioxide, SO_x, NO_x, etc.) emissions and reduction of diesel oil consumption and import of diesel oil products through blending bio-fuels made from Jatropha oil, etc. with diesel fuel;
- Preparation of various bills for actualizing biodiesel energy activities currently being promoted by the government;
- Local development through development of Jatropha farmland and incidental infrastructure such as roads, etc.;
- Creation of local job opportunities for local farmers through construction and operation of a biodiesel plant and development and running of Jatropha farms;
- Increase in incomes arising from securing of work opportunities for local farmers as a result of plant construction and operation and local development, etc.
- Acquisition and dissemination of know-how and skills from local university agricultural departments, related agencies and consultants based on cultivation of Jatropha;
- Acquisition of new technology and cash income opportunities for regional farmers through dissemination of Jatropha cultivation know-how and technology, etc.
- Improvement of air pollution in the cities of Tanzania; and
- Potential for new foreign currency revenue from emission trading arising from

incorporation into the CDM.

Concerning the form of cultivation of Jatropha, it is desirable to realize a combination of large-scale plantations and small-scale farming over a widespread area, however, it will be necessary to compile the cultivation system and the accompanying development system upon first grasping the current conditions of farmland development, capital required for cultivation, necessary funds, costs of fertilization, labor costs and existing credit systems, etc. Concerning the method of producing crude Jatropha oil too, it will be necessary to formulate the optimum approach reflecting farming information on cultivation sites, terrain, the road network, production systems, productivity, type of land ownership and the current condition of agricultural cooperatives, etc.

In Europe, systems have been established for the commercial production of biodiesel made from rapeseed oil and waste cooking oil, etc. Moreover, some European companies are conducting the trial manufacture of biodiesel made from Jatropha. In future it will be necessary to transfer know-how and technology regarding the extraction of oil from Jatropha seeds and the maintenance, control and operation of refining plant equipment, and it may be possible to transfer technology from Europe and dispatch trainees to Europe to take part in technical training and education.

1.5 Implementation Setup of the Study

Construction Project Consultants, Inc. implemented the actualization study for the proposed project with cooperation from the Association of African Economy & Development., the Japan Weather Association, the Highway Landscape Conservation Association and Tokyo University.

2 Project Implementation Plan

2.1 Particulars of the Project

The proposed project envisages to producing biodiesel using crude Jatropha oil (CJO) extracted from Jatropha seeds, which is planned to be cultivated in a large scale in Tanzania, through trans-esterification process with methanol. The biodiesel production plant as the main component of the project is planned to be located in Dar es Salaam, which is the largest diesel consuming area in Tanzania.

2.2 Setting of the Project Boundary and Baseline and Demonstration of Additionality

(i) Baseline Scenario

Utilizing the baseline methodology that was submitted to the UNFCCC on January 16, 2006 and is currently undergoing approval procedure (NM0108rev: Production of biodiesel from perennial non-edible oil crops for use as fuel), the baseline scenario assuming the case where this CDM

activity is not implemented will be identified with respect to both (a) the biodiesel production plant (production) and (b) biodiesel consumers (consumption).

The most realistic scenario in the proposed project is the case where, (a) the biodiesel plant is not constructed and (b) consumers continue to use the fuel they use at present; hence, this shall be the baseline scenario.

(ii) Demonstration of additionality

In this methodology, the CDM Executive Board's "Tool for the demonstration and assessment of additionality (Annex 1, EB16)" was used to identify a project alternative that complies with the law, conduct barrier analysis and common practice analysis and consider the impact of CDM registration, and thereby demonstrate additionality of the project activity.

In the barrier analysis, it was recognized that biodiesel projects in Tanzania are still at the research and development and verification testing stage. Barrier analysis was implemented on investment barriers, technological barriers and barriers due to prevailing practices. As a result, it was primarily demonstrated that the project activity is additional.

(iii) Project boundary

According to the methodology, the project boundary was set as follows.

The spatial scope of the project boundary includes the following:

- The biodiesel production plant comprising the trans-esterification unit;
- Upstream expeller plants supplying oil to the biodiesel plant; and
- Vehicles in which the biodiesel is consumed.

Relevant emission sources within this boundary include the following:

- Fuel and electricity consumed at the biodiesel plant;
- Electricity consumed by upstream expellers; and
- Emissions from combustion of the biodiesel.

Emissions associated with the cultivation of the oil crops are excluded from the project boundary, but are accounted for as leakage. The same applies for the production of methanol, and for transports of oil crops.

Based on the methodology, the following processes are excluded from the project boundary:

- Transport of biodiesel to consumers/retailers;
- Emissions from preparation of other inputs for the biodiesel plant (e.g. emissions from production of methanol); and
- Treatment of byproducts of the biodiesel plant (glycerol, seedcake)

2.3 Greenhouse Gas (GHG) Reduction and Leakage resulting from the Project

(i) Baseline emissions

Baseline emissions were calculated based on the adopted methodology.

E_{BL_y} : Baseline emissions (t CO₂)

M_{JME_y} : Biodiesel produced from Jatropha (pure, before blending) (t)

efm_m : Efficiency multiplier of Jatropha methyl ester and petroleum diesel (mass base) (kg/kg)

EF_{PD} : Carbon content of petroleum diesel (t C/t)*

44/12 : Coefficient for converting carbon content into CO₂ content

For the carbon content of petroleum diesel, national data or the IPCC default value are used.

$$E_{BL_y} = M_{JME_y} \times efm_m \times EF_{PD} \times 44/12$$

$$E_{BL_y} = 97,901 \text{ tCO}_2\text{e /year}$$

(ii) Project emissions

Based on the methodology, GHG emissions in the following processes were totaled in order to calculate project emissions within the project boundary.

E_{P_y} : Project emissions (t CO₂)

$E_{P_fuel_y}$: Generated CO₂ in line with fuel consumption in the biodiesel plant (t CO₂)

$E_{P_elec_y}$: CO₂ emissions in line with electricity consumption in the biodiesel plant (t CO₂)

$E_{P_MeOH_y}$: CO₂ emissions accompanying methanol consumption (t CO₂)

$$E_{P_y} = E_{P_fuel_y} + E_{P_elec_y} + E_{P_MeOH_y}$$

$$E_{P_y} = 2,741 \text{ tCO}_2\text{e /year}$$

(iii) Leakage emissions

Based on the methodology, GHG emissions in the following processes were totaled in order to calculate leakage in the proposed project.

L_y : leakage emissions (t CO₂e)

$L_{transport_y}$: Leakage emissions accompanying transportation of raw materials from suppliers to the biodiesel plant (t CO₂)

L_{meOH_y} : Leakage emissions accompanying production of methanol consumed in the biodiesel plant (t CO₂e)

$L_{Crop_net_y}$: Leakage emissions accompanying Jatropha production (t CO₂e)

$$L_y = L_{transport_y} + L_{meOH_y} + L_{Crop_net_y}$$

$$L_y = 19,943 \text{ tCO}_2\text{e/year}$$

(iv) GHG reduction resulting from project implementation

The GHG emission reductions resulting from project implementation are as follows.

$$ERs = E_{BL_y} - E_{P_y} - L_y = 97,901 - 22,684 = 75,217 \text{ tCO}_2\text{e/year}$$

2.4 Monitoring Plan

The table below represents parameters to be monitored in the proposed project activity, following the new methodology.

Source of data	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
2.1.1	$M_{P_fuel_expel_y}$ Heavy oil consumption for on-site expeller	Plant records (purchase data)	t	m	annually	100%	e	--
2.1.2	$M_{P_fuel_other_y}$ Heavy oil consumption other than for on-site expeller	Plant records (purchase data)	t	m	annually	100%	e	--
2.1.3	EF Carbon content of heavy oil	Fuel supplier or default values	t C / t fuel	e	Once	0%	e	Default values may be derived from IPCC data, ¹ or from national statistics, if available.
2.1.4	$Q_{P_elec_expel_y}$ Electricity consumption for expeller	Plant records (electricity meter)	MWh	m	annually	100%	e	--
2.1.5	$M_{Oil_ester_y}$ Amount of oil esterified	Plant records	t	m or c	annually	100%	e	This is the sum of oil purchased and oil expelled on site. May be calculated from biodiesel output $M_{BD_i_y}$
2.1.6	$M_{Oil_purchase_y}$ Amount of oil purchased	Plant records (purchase data)	t	m	annually	100%	e	--
2.1.7	$M_{Oil_expel_y}$ Amount of oil expelled on-site	Plant records	t	m or c	annually	100%	e	Measured by weighing, or calculated as the difference of $M_{Oil_ester_y}$ and $M_{Oil_purchase_y}$
2.1.8	$Q_{P_elec_other_y}$ Electricity consumption other than for expeller	Plant records (electricity meter)	MWh	m	annually	100%	e	--
2.1.9	EF_{elec} Emission factor for grid electricity	Grid supplier data	t CO ₂ /MWh	c	Once or annually	100%	e	Determined in accordance with ACM002 or AMS 1.D

2.1.10	<i>M_{MeOH}</i> Methanol consumed	Plant record (purchase data)	<i>t</i>	<i>m</i>	annually	100%	<i>e</i>	
2.1.11	<i>EF_{MeOH}</i> Fossil carbon content of methanol	Supplier data	<i>t C/t</i>	<i>c</i>	annually	100%	<i>e</i>	
2.3.1	<i>MJME_y</i> Biodiesel supplied to consumers	Plant records (scale / sales data)	<i>t</i>	<i>m</i>	annually	100%	<i>e</i>	--
2.3.2	<i>NCVJME</i> Net calorific value of biodiesel	Lab analysis	<i>GJ /t</i> <i>biodiesel</i>	<i>m</i>	once at project start	Representative sample	<i>e</i>	--
4.1.1	<i>DCrop_{Tran}</i> <i>sport_y</i> Average transport distance for oil crops (seeds and oil)	Plant records (purchase data)	<i>km</i>	<i>m</i>	annually	100%	<i>e</i>	--
4.1.2	<i>MOil_{ester_y}</i> Oil from <i>Jatropha</i> esterified	Plant records (purchase data)	<i>t</i>	<i>m</i>	annually	100%	<i>e</i>	--

2.5 Environmental Impact and other Indirect Impacts

Concerning approved procedure for environmental and social consideration in Tanzania, the Environment Management Act (2004) requires that an environmental impact assessment (EIA) be carried out. Under this law, all project operators must apply to the National Environmental Management Council (NEMC) to undergo environmental screening and undergo EIA procedure. EIA is broadly divided into the type where only a preliminary EIA is sufficient and the type where a full-scale EIA is required depending on the scale and expected impacts of the project. This classification system is indicated in the Mandatory List of EIA projects contained in the Environmental Impact Assessment Procedure and Guideline 2002, NEMC. A full-scale EIA is required for projects that entail the development of 50 ha or more of natural or semi-natural land, large-scale cultivation of a single crop and construction of oil refining facilities and chemical storage facilities.

2.6 Comments from Stakeholders

Public agencies:

- Vice President's Office: This is a highly interesting project. Please promote it at the current pace. It is a good idea to invite participation from the TPDC. Of course, private sector participation is also welcome. Please keep us informed on this project.
- Ministry of Planning, Economy and Empowerment: We hope the project will be advanced at the present rate. We feel it is important to maintain the cooperative relationship between the public and

private sectors, both inside and outside of Tanzania, in order to realize this project.

- Tanzania Petroleum Development Corporation (TPDC): These are very interesting contents. We will examine our future cooperation in internal discussions. It is necessary to further disseminate the proposed contents. (TPDC willingness to participate in the project has been confirmed by e-mail since returning to Japan).
- Ministry of Energy and Minerals: We hope it is continued at this rate. We consider it the government's role to formulate and advance policy. The biodiesel blending ratio could be 20% rather than 10%. We hope to stay in touch in future.
- Arusha Municipal Council: We are in 100% agreement with the contents. A lot of progress has been made since the survey last September and we hope the work continues at this pace. We hope to stay in touch on this matter in future.

Private sector:

- Rajani Industries Ltd.: We would very much like to invest in this project. We also feel the need to conduct research and study into Jatropha. It is possible to add personnel who are well versed in relations with our company onto the study team. If any data and so on are required, please let us know. We wish to stay in touch on this matter in future.
- Diligent Tanzania Ltd.: Concerning Jatropha cultivation, we agree that it is important for farmers to become organized. Depending on the area, since there is a risk of clashes occurring under certain conditions, it may be necessary to display care when selecting the cultivation sites. We have gained lessons in organizing farmers, and we could offer cooperation.
- Marks Ltd.: We well understand the contents. How may we cooperate as a consultant or partner? Please stay in touch on this matter in the future.
- KAKUTE Ltd.: We can fully understand the contents of the proposal. Now is maybe the time to consider what kind of research will be required in future. Since the timing of harvest and so on differs according to each area, it may be necessary to categorize the features of Jatropha geographically.

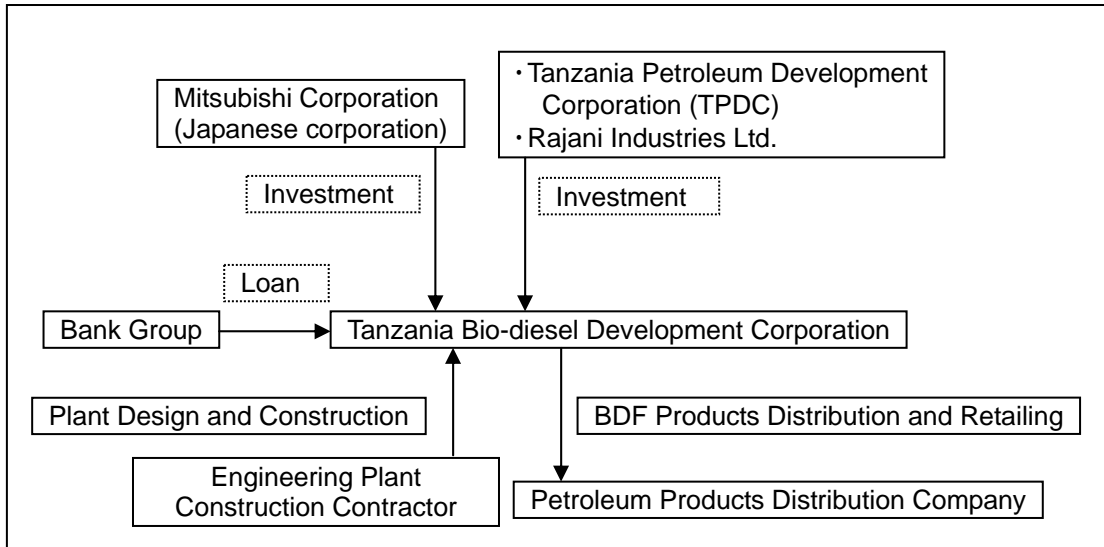
3 Towards Project Realization

3.1 Project Implementation Plan

A special-purpose company or foreign joint venture company to be newly established and registered in Tanzania will carry out the construction of the necessary facilities, purchase of raw materials, production of BDF, sale of products and operation and maintenance of plants as the operator of the proposed project. Concerning the funding of this company, it is scheduled that Mitsubishi Corporation (the Japanese corporation), the Tanzanian state enterprise TPDC, and Rajani Industries Ltd. to provide investment. Regarding the specific funding ratio of both sides and the participation of other partners, these points will be decided through the discussions among the parties following

approval of the project as a CDM activity.

The following figure illustrates the BDF production and distribution plan of the project.



Organizational Structure Plan of the Proposed Project

3.2 Fund Plan for Project Implementation

The amount of initial capital investment for the proposed project is approximately US\$14 million. Out of this, 25% will be equity and 75% will be secured through loans. When determining the division of roles and functions among investors and the detailed implementation plan, concrete examination will be carried out on the introduction and utilization of institutional funding from Japan.

The financial validity of the proposed project is not as good as that of a general commercial direct investment undertaking. If there is no emission trading, the project will not be commercially viable, i.e. financial internal rate of return of the investment project will be less than 8%. Accordingly, efforts should be made to secure funds on loans arranged with the longest terms and lowest interest rates possible. In consideration of this, the following funding sources are considered as probable lenders for the newly established company in this connection:

1. JBIC investment loan or
2. JBIC export loan

However, since the JBIC needs to decide the type of funding and conditions that can be applied to public funding for Tanzania, it will be necessary to have a close working relationship with the JBIC.

3.3 Cost Effectiveness

The cost effectiveness of the proposed project is calculated as 2,120 yen/t-CO₂e according to the following formula.

Initial investment required in the proposed project	US\$14 million
	1.6 billion yen (US\$1 = 115 yen)
Greenhouse gas emission reductions	755,000 t-CO ₂ e
Cost per ton of reduced emissions	
Initial investment / GHG emission reduction (t-CO ₂ e) (10 years)	
1.6 billion yen / 755,000 t-CO ₂ e = 2.120 yen / t-CO ₂ e	

3.4 Prospects and Issues on Project Realization

In order to plan the development of biodiesel made from Jatropha on the national level, it will be necessary to address the following issues. The contents in parentheses indicate points to bear in mind.

1. Cultivation and harvest of Jatropha

- Selection of appropriate sites for Jatropha cultivation (national, regional and local level)
- Strategic placement of seed production facilities (strategic layout taking transportation cost, etc. into account)
- Examination of rational harvesting methods (all harvesting needs to be done by hand; mechanization is difficult)
- Examination of the Jatropha cultivation system and development system (large-scale farms, small-scale farmers and combination of these two types of entities)
- Organization of local Jatropha farmers (a certain degree of promotional activities are needed)
- Establishment of the public funding system for Jatropha farmland development (discussion with the Agricultural Development Bank or alike)

2. Crude Jatropha oil production

- Formulation of the optimum crude Jatropha oil production method (consolidation method)
- Compilation of a strategic placement plan for crude Jatropha oil production points (relation between cultivation sites and consumption areas)
- Formulation of guidelines on establishment of the crude Jatropha oil production plant (the project operator will determine the detailed plans)
- Formulation of guidelines on operation of the crude Jatropha oil production plant (the project operator will determine the detailed plans)
- Establishment of a system for inspecting crude Jatropha oil products
- Provision of equipment for the crude Jatropha oil inspection post
- Promotional and dissemination activities for crude Jatropha oil producers
- Organization of crude Jatropha oil producers

- Establishment of a public funding system for crude Jatropha oil producers (established as part of the local production promotion plan)

3. Jatropha biodiesel production

- Implementation of the detailed technical and financial validity assessment survey on the model BDF production plan
- Formulation of guidelines for the detailed technical and financial validity assessment survey on the model BDF production plan
- Identification of importing and storage method for methanol required for biodiesel production
- Formulation of stipulations and formats for long-term purchasing and selling contracts to be concluded between Jatropha farmers, crude Jatropha oil producers, BDF producers, petroleum product distributors and retailers.
- Establishment of the inspection method and inspection setup for Jatropha biodiesel products
- Preparations for establishment of a national quality determination method for Jatropha biodiesel

4. Provision of infrastructure for production and distribution of raw materials

- Concerning large-scale farming of Jatropha, it may be necessary to construct roads linking farms to trunk roads.
- In some areas it may be necessary to realize electrification, etc.

5. Utilization of by-products out of Jatropha oil production

- If the small-scale farmers manually press oil from Jatropha themselves, Jatropha seedcake will be produced as a by-product. This seedcake can be used for home cooking and lighting as a biomass fuel by simple and economic equipment. It is necessary to formulate a program to promote deforestation prevention activities by means of promoting to use biomass fuels.
- It is also possible to produce medicinal soap from crude Jatropha oil on the cottage industry level. This can be utilized as a tool for mitigating poverty through improving living standards and raising income of rural people.

6. Research and development

- Since Jatropha has not been used for commercial purposes in the past, official data is currently extremely limited and it is necessary to implement detailed research. However, this does not mean that the Jatropha biodiesel project cannot be started until detailed research findings are obtained. Conversely, research findings only take on real meaning after the economic circulation system, in which Jatropha biodiesel is produced and consumed and raw materials are stably purchased, is allowed to work.

7. Transfer of technology

- Campaign activities (farmer development and dissemination activities)
- It is necessary to establish a technical cooperation setup comprising academic experts and

implement training on the ground.

- Transfer of technology is required concerning know-how on maintenance and operation of Jatropha oil extraction and refining equipment.

8. Legislation and the role of the public sector

- It is necessary to sort policy issues (formulation of government policy on production, quality, distribution, etc. concerned to biodiesel production and use).
- It is necessary to determine the appropriate price of biodiesel.

9. Financial systems for securing funds and attracting investors

- After planting Jatropha, a system will be needed to loan to small-scale farmers for at least three years until harvest of Jatropha seeds become available.
- It is necessary to establish financial systems for securing loans and attracting investors for Jatropha oil refining facilities, methanol and crude Jatropha oil storage facilities and means of transportation.
- It is necessary to construct infrastructure (access roads or farm to market road) from farms to trunk roads, thus, under the condition of Tanzania's rural area an ODA funding will be absolutely needed.