Combining Technology Transfer with Technology Push

A new Framework applied in Central Kalimantan, Indonesia

Master thesis David Baars

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EXECUTIVE SUMMARY

The University of Groningen, together with partner universities in the Netherlands and in Indonesia, aims to achieve local economic development in Central Kalimantan, Indonesia. To achieve this goal, the involved parties set up a project, called the Mobile Bio-Diesel (MBD) project. This project recently started the development of a new technology, the mobile processing unit. The technology processes Pure Plant Oil (PPO), that stems from an agricultural crop, into bio-diesel and the technology is aimed to be finished in 2013. Although the involved parties have good intentions with the communities in Central Kalimantan, the project is characterized as a technology push project. The reason of this characterizing is the source of interest of the innovators, which is focused on the gathering of scientific knowledge. Moreover, six of the seven sub projects to realize this project focuses on the development of the technology without involvement of customers or information from the application, a typical lab in the woods approach. Above the technology push, the technology development process and technology transfer has influence on this project as well. In this study, a University of Groningen students master thesis, a step-by-step framework is proposed, so that the possibilities of technology transfer in a technology push situation can easily be researched. The framework comprises two theories of Laseur (1989) and Malarairaja and Zwadie (2004), which are related to technology and technology transfer. The proposed framework is based on the general technology process model of Laseur (1989); input (source material), process and output (product). Thereby, the three carrier model of Laseur (1989) and Malarairaja and Zwadie (2004) is integrated in the process part and characteristics of technology push are integrated as well.

In this present study, characteristics of technology push are compared with market pull characteristics. In a technology push project, the application field is unknown, the sales market related uncertainty tends to be high, the time-to-market is unknown and the need for change of customer behavior tends to be high as well. On the other hand, a market pull project has the risk of only looking at needs that are easily identified and tends to lack of being a champion or true believer. Therefore, a market pull is not necessarily always better than technology push, combining this two creates a wishful situation. The proposed framework is applied to the current situation in Central Kalimantan and thereby creates insight in the application field and the combination of technology push and market pull in a technology push project.

Based on extensive desk research, seventeen qualitative semi-structured interviews with people involved in the project, NGO employees, business people, governmental employees and by observing the area and local citizens in Central Kalimantan, the framework is applied step-by-step. Firstly, the input part, which is directly related to source material. The unknown application area (accessibility for local people, economic attractiveness, intercropping possibilities) and the unfamiliarity of local people with the source material (availability) are four criteria that are in need to be reduced for creating a combination of technology push and market pull. The source material for the MBD technology is an energy crop, but the type of crop is not yet chosen. Three energy crops has been taken into account;

palm oil, jatropha and rubber. Unfortunately, according to this research, non of the crops meet the requirements perfectly. However, the use of rubber as a source material would be most obvious. A rubber nut is currently useless and could be parallel used next to the standard rubber process, having a positive influence on the intercropping possibilities of the crop. Rubber plantations are widespread available in the area and exclusively owned by local people. Unfortunately limited negative information is found about the economic attractiveness of this crop, what causes that not all the requirements are met for this crop.

Secondly, the application of the three carriers model (material, capacity and design transfer) results in a detailed analysis of the process part in Central Kalimantan. The material transfer is focused on the requirement of a decent infrastructure to make a mobile small scale technology possible. The plans of the government to increase the quality and the current state of the external infrastructure, make the infrastructure sufficient enough for material transfer with a mobile small scale technology. The transfer of capacity is linked to the different stakeholders in the franchise model, with a focus on the manager and the producer. Producers, in this project farmers, are in a high amount available, since the main source of income in the area is agriculture. However, managers are much harder to find, due to the low level of education, the very low business mindedness of the people and lack of motivation and willingness to change. The lack of managers could cause a problem for the transfer of capacity. The design transfer is the last component of the process part of the framework, but not included in this research The technology of the project is easy in use and the several requirements of the capacity transfer makes the design transfer unnecessary in this stage.

Thirdly, the last part of the proposed framework, the output stage, is related to the product. A main problem field of a technology push project is the unawareness of the prospected customers and their needs. The research towards the need is split in two; the use of technology to produce energy mobile on local scale (bio diesel) and to the use the technology for new economic activities or expending available economic activities. Unfortunately, the chance that the bio diesel could successfully replace the fossil fuel is very limited, due to the fact that it is not generating an advantage for the people. The price of fossil fuel tends to be very low and fossil fuel is available in almost every village. Next to this replacement of the comparable products, problem fields in the area are researched as well. The MBD project is in favor of the possibility of generating electricity with bio diesel. However, this research shows a wide-spread availability of electricity in the area and an acceptable quality of the network and is therefore not a need of the people. In contradiction to an increase of the agriculture irrigation system. A combination of the MBD project and an electronic water pump could increase the irrigation system and make local economic development possible.

Finally, recommendations concerning the technology transfer of the MBD project towards Central Kalimantan are offered. Although some of technical requirements are met, many requirements failed and it therefore seems doubtful that, with a transfer of this technology towards this application area, Local Economic Development will be achieved.

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Before writing this master thesis for my master Business Development, lots of graduated master student told me that writing a master thesis is most of the time a boring and frustrating process. Although they were right in some sense, in general I experienced it as a wonderful experience. The reason is my stay of two months in Indonesia, but also the help of some special people for who I owe my sincere thanks.

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Last, but definitely not at least, I would like to thank my research partner and girlfriend Margriet van Kammen. You have given me the possibility to join this project and to conduct this research in Indonesia. Without you I most likely would be involved in a much less exiting study project and spend my days bored in the library in stead of in this wonderful country. I experienced doing research in a country abroad, as an experience with ups and downs. Thankfully, you were always there to help me with the down sides, but also to share the good times with me.

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LIST OF ACRONYMS

ABF	Agriculture Beyond Food
BAPPEDA	Provincial Development Planning Agency
BAPPENAS	National Development Planning Agency
CIMTROP	Co-operation in Sustainable Management of Tropical Peatland
EMRP	Ex-Mega Rice Project
ITB	Institut Teknologi Bandung
LED	Local Economic Development
LERD	Local Economic Research Development
MBD	Mobile Bio-Diesel
NESO	Netherlands Education Support Offices
NGO	Non-governmental Organization
NPD	New Product Development
PODES	Potensi Desa; Statistics on socio-economic conditions per village
PPO	Pure Plant Oil
STI	Science, Technology, and Innovation
UoG	University of Groningen

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1. INTRODUCTION

"Today three out of every four of the world's poor live in rural areas and there will be no success in the war on poverty, unless we take the fight to where those people live". This statement of the World Bank (2003) describes briefly and very clear the starting point for this research.

At this moment a program to increase economic activities in Indonesia, called the Mobile Bio-Diesel (MBD) program, is going on in Indonesia. The MBD program is part of a large scale project in Indonesia, the Agriculture Beyond Food (ABF). The ABF project, founded in 2008, was started to fight for food security, food an health, energy supply, stewardship and climate change in Indonesia. This is a collaboration Indonesian Universities and Dutch Universities. The MBD program is focused on the use of agriculture, other than for food. The program wants to convert agricultural products into bio-diesel. Therefore the University of Groningen (UoG), which is an important stakeholder of the program, recently started the development of a new technology in their department of chemistry. This technology, called the "mobile processing unit", processes Pure Plant Oil (PPO), that stems from an agricultural crop, into bio-diesel. Although the process is not revolutionary, two other aspects of the technology are. First of all, the technology is planned to be on a truck and can, due the mobility, serve the smaller, rural villages to produce their own bio-diesel. Secondly, the agricultural used as an input material has to be locally available and can therefore be a new source material used for producing bio diesel.

Seven sub projects should make finalizing of the MBD program possible in 2013. Each sub project consist of a specific topic and goal. One sub project relates to the choice of an agricultural crop and another sub project is focused on the choice to make the technology mobile small scale, fixed based small scale or fixed base large scale. Although the board of the program is in favor of small scale-mobile, the technical possibilities and the situation in the rural areas has to be taken into account. Each sub project is concerned with the development of the new technology, only project number 7 is concerned with the final implementation of the technology in the rural areas. This part, called the Local Economic Research Development (LERD) project, describes the characteristics of the implementation area and develop an action plan based on these characteristics. One characteristic is the investigation of the needs of the people in this area. The technology is aiming to produce bio-diesel and this could be used in different devises. According to the board of the MBD program, these rural areas often do not have or limited access to water and electricity. Moreover, sometimes the electricity supply is limited to several hours and this could therefore be a need for the people in this area. Furthermore, the board of MBD program claims that the bigger cities of Indonesia have access to electricity all day, but the rural areas far away from these cities lack access to electricity. This assumption need further research, which will be done in the LERD project.

The board of the program has chosen to investigate the implementation possibilities of this new technology in areas in Central Kalimantan (Borneo) in Indonesia. The choice for Indonesia is obvious, because the developers are both Dutch and Indonesian people and the ABF project is developed for Indonesia. The choice for Central Kalimantan is based on several reasons. It is the largest Island of Indonesia, but in percentage there live the lowest amount of people per square meter. Central Kalimantan is mostly forest and there are a huge amount of rural villages. In the past years there have been a couple of projects in this area to improve the economic activities, unfortunately they failed. For instance the Ex Mega-Rice Project (EMRP), which aimed to turn one million hectares of unproductive and sparsely populated peat swamp forest into rice paddies in an effort to alleviate Indonesia's growing food shortage. The government made a large investment in constructing irrigation canals and removing trees. The project did not succeed and was eventually abandoned after causing considerable damage to the environment. Based on these experiences, the board of the program want to develop this area and its province Central Kalimantan.

According to the World Bank (2008), Science, Technology, and Innovation (STI) capacity building is an absolute necessity for developing countries, if they hope to prosper in the global economy and if world leaders expect globalization to foster sustainable development and to reduce poverty. This together with the program plans, make this new technology in theory a good solution for the economic development in rural areas in Central Kalimantan. However, though the good intentions of the board of the MBD project in Central Kalimantan, the program is really scientific focused. Moreover, the motivations of the innovators is investigating the possibilities of making this technology work and is therefore less based on the needs of the people. According to van den Ende and Dolfsma (2005) and Herstatt and Lettl (2000).this program could therefore be described as a technology push. Herstatt and Lettl (2000) describes that potential market applications for a technology push strategy are essentially unknown, whereas the knowledge about the areas of need in a market pull situation can be directly taken as a starting point for these potential applications and that technology push innovation projects generally possess higher market uncertainty. As mr. W. Laseur explains in an interview, because this project is a technology push project, an insight in technical requirements is necessary to make this project successful. The MBD project is, as described above, now focused on the development of scientific knowledge with the goal to achieve Local Economic Development (LED). However, this thesis shows that technical knowledge need to be added as well. Moreover, these scientific and technology view need to be combined to develop the new way of producing bio fuel. This together increases the chances of achieving the LED goal.

2. RESEARCH DESIGN

A research design refers to the overall structure and orientation of an investigation (Yeung, 1995). In this chapter, the research objective, the main research question, the different sub-questions, and the research demarcations will be delineated. According to de Leeuw (2000) these different components together form the problem statement. Subsequently, the methods used and the required data to answer these questions will be explained.

2.1 Problem Statement

2.1.1 Research Objective and Main Research Question

As already mentioned in the introduction, this study is based on several closely related objectives. That is, (1) developing a framework containing technical requirements which are necessary to make technology transfer in a technology push situation possible and (2) the application of the framework for the MBD project in Central Kalimantan. Accordingly, the main research question of this present research is: *To what extent does the current situation in Central Kalimantan meet the technical requirements to make technology transfer of the MBD project in a technology push situation possible?*

2.1.2 Sub-questions

Three different sub-questions are developed in order to eventually answer the main research question.

Firstly, a framework containing technical requirements is constructed. Besides theories and models about implementation of new technologies, also specific information about technology transfer towards developing countries is inserted. Because this project is facing a technology push, the framework must contain theories of technology push as well. This is combined to a model and lead to the first sub-question: *How to develop a framework containing technical requirements to make technology transfer in a technology push situation possible?*

Before applying the framework to Central Kalimantan, an extensive description of the MBD project is necessary. This is including several topics as: the different parties involved and their specific interests, an elaboration of the technology of the mobile processing unit and the expectation of the local citizens of Central Kalimantan. Next to this, the needs of the MBD program concerning the framework developed in sub-question 1 is also described. Therefore, sub-question 2 is as follows: *What will be the Mobile Bio-Diesel program in Central Kalimantan and what are their needs concerning the developed framework?*

Then, the framework is applied in Central Kalimantan. This application includes researching the current situation and the expected development of the coming years. Each technical requirement is applied and therefore the collected information focuses on the research objectives technology transfer to developing countries and technology push. This part of the research consist the following sub-question: *To what extent does the current situation in Central Kalimantan meet the technical requirements?*

2.1.3 Boundaries of the research

Several boundaries affect the outcome of this specific research. The biggest boundary of my research is geographical. The MBD project focuses on Central Kalimantan, especially the EMRP area. The specific characteristics of this area will be discussed in paragraph 4.1.2. Build on this focus, the scope of my empirical investigation is therefore limited to this EMRP area. Moreover, only a couple of these villages within this area have been visited. Although I believe that these villages provide a good and general picture, due to a careful selection of the cases, I realize that the observations might not be representative for all the different types of villages in the area. Besides that, the MBD project might decide to implement the new technology in the whole Central Kalimantan province instead of only the EMRP area. In that case especially the observations and information might not be representative, since the EMRP area has its own characteristics due to its history. Another boundary is the time frame of study in Indonesia. Since a tourist visa in Indonesia is valid to two months, this is the limited time frame to do the field research and not one day longer. The last boundary is the language spoken. Because I am not capable of speaking the Indonesian language, it was hard to communicate with the local people while visiting the area. A local student acted as translator, he translated the questions and answers in Dayak. Unfortunately, the level of English of this student was moderate and resulted in a loss of information due to the translations.

2.2 Research classification

During the field part in Central Kalimantan, a couple of villages were visited. This, together with information gathered from interviews and data, results in an overall general conclusion of the area. Following Thomas (2004), the strategy of this research is a survey strategy. The survey strategy aims to produce generalizations about populations by collecting information from samples. The survey strategy aims to produce generalizations about populations by collecting information from samples.

2.3 Quality Research Methods

This research is in nature a qualitative research in stead of a quantitative. Because the MBD project can be characterized as a technology push project, a qualitative research is most appropriate (Brem and Voigt, 2009). Qualitative methods are oriented at the discovery of qualities of things, that is, the properties of objects, phenomena, situations, people, meaning and events (Van Aken, 2007). This research method paragraph discusses the units of analysis, case selections and the data collection and analyzing methods, and is thereby in line with the structure of Van Aken (2007).

Unit of analysis

The unit of analysis is the type of object that is the focus of interest. Overall, there is a focus on the MBD project, which is one project of Agriculture Beyond Food project. Moreover, within the MBD project, this research is mostly concerned with the last sub project, the Local Economic Research Development sub project. Thereby, this research is focused on the EMRP area in stead of the whole province of Central Kalimantan, but this is also related to the case selection..

Case selection

The next step is the selection of specific cases that are investigated. The geographical boundary of the MBD project is limited to Central Kalimantan, with a focus on the EMRP area. In the field part of this research, a total of 17 villages were visited. This villages are chosen based on several criteria. At first, the selection of cases is based upon pragmatic grounds like ease to reach and time to reach the village. This results in a list of villages that can be visited. All these villages are already investigated by Potensi Desa (PODES), which provide statistics on socio-economic conditions per village and with the PM2L program. An extensive description of the PM2L program is included in appendix G. Based upon these studies, characteristics are chosen that create an interesting difference between villages. For example the size of the villages. Since it seems that bigger villages are often more developed, relatively big and relatively small villages are selected to investigate this in more depth. Also the main road type in an to the village, the main activity of the local people and the percentage of people using electricity are taken into account. Another example is the status of developed *(maju)* or underdeveloped *(tertinggal)* village (appendix G). Villages with different status are selected to investigate the differences in reality.

Data collection and analyzing methods

In order to collect the necessary data, different methods are used. The first method that is used in order to collect data is the grounded theory approach. The theory refers to a coherent set of concepts and relationships between those concepts that represents a particular aspect of reality. The grounded theory approach aims at the development of concepts and the relationships between this concepts (van Aken, 2007). An extensive literature study resulted in an overview of influences of technology, technology push and technology transfer and these characteristics are combined in the theoretical framework. Moreover, also in order to describe the current situation in Central Kalimantan several scientific articles and reports of NGO's and government institutions are used.

Next to conducting grounded theory approach, primary data is collected as well. A total of seventeen qualitative semi-structured interviews are held with people involved in the project, NGO employees, business people and governmental employees. Next to these people, local citizens were interviewed as well. Please refer to Appendix C for a complete overview of the interviews. Since the goal of the interviews is to get as much information as possible in stead of standardization of answers, semi-structured interview are most applicable. This type of interviewing is chosen in order to create an interactive conversation, in which the interviewer is able to ask more in-depth questions with respect to specific areas of interest. The interview schedule consists of a set of topics about which information is needed and thus follows the semi-structured approach (Thomas, 2004).

2.4 Quality Research Criteria

Research oriented quality criteria relate to the research aspects of the project. The most important quality criteria are controllability, reliability and validity (Van Aken, 2007). A quality criteria can be used to manage the quality of one's own research or can be used to evaluate research done by others. Each quality research criteria will hereby be applied for this research.

Controllability

Controllability is the first quality research criteria. In order to make a research results controllable, researchers have to reveal how the study is executed (Van Aken, 2007). In this study, many semi-structured interviews were held and many villages in the area were visited. The list of interviewees is enclosed in Appendix C and an extensive report of each interview is available on request. The reports of the visits in the area is enclosed in Appendix H. Finally, each source is listed in the reference list and also available on request. All of this to ensure the controllability of this study.

Reliability

If the investigation were to be repeated by different researchers, using the same methods, would the same results be obtained? is an important question to check whether the research is reliable (Thomas, 2004). According to Van Aken (2007) reliability is a criterion that refers to the consistency of the results obtained in research. The information collected with the semi-structured interviews could suffer from a limited reliability. Research results are less reliable when they depend on the person who has conducted the research. There could be a big difference who interviews and concludes, which is clearly the case with semi structured interviews (Van Aken, 2007).

When the same theoretical framework will be applied in the same area in a research in the future it is very unlikely that the same results will be found. It could therefore be argued that the reliability of this research is rather limited. However, by using several different documents and statistics I have tried to ensure reliability.

Validity

To check whether the research produces valid findings, Thomas (2004) explains that it is important to answer two questions, (1) *Does the evidence reflect the reality under investigation?* And (2) *Do the results apply under the specific situation investigated?*. Regarding to the validity of the research, a distinction is drawn between internal and external validity. The first question refers to the internal validity and consists of ensuring the relevance and the internal coherence of the results obtained in the study. On the other hand, the second question refers to external validity, which concerns the possibility of applying the results obtained in the sample to other elements in different time and place situations (Delattre et all, 2009).

The internal validity of this study is sufficient, as applying the framework, the desk research and the semi-structured interviews ensures that a rather relevant, internally coherent and comprehensive overview of the area can be provided. In addition to the semi-structured interviews, the area is visited

to check whether the reality is in line with the findings to produce valid findings. With respect to the external validity of this study, the theoretical framework is developed with a main focus for this specific project, with a technology push and technology transfer to a developing country. However, it should be noted that the theoretical framework possibly can be applied to other technology transfer projects in Indonesia, as well as in other countries and it is therefore possible to use the theoretical framework for other projects with comparable circumstances.

3. DEVELOPMENT OF A THEORETICAL FRAMEWORK

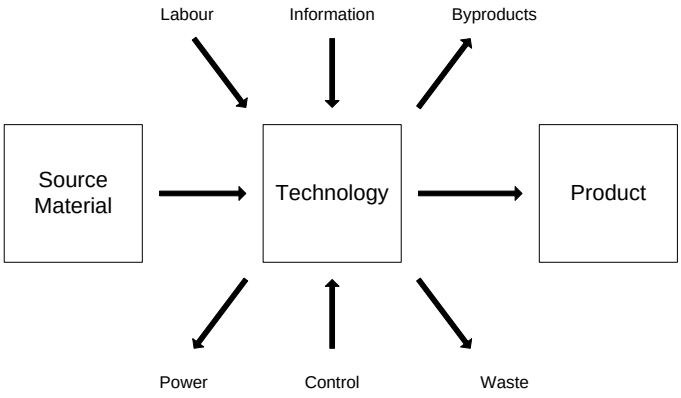
The literature of business development is in various ways related with the development and the implementation of a new product in a market place. However, this research is about the implementation of a new technology in rural areas in a developing country concerning a technology push, but what is the main difference?

This chapter displays the main differences with a standard situation. At first, a couple of definitions of a new technology are compared with definitions of new products. Secondly, the influence of a technology push is contributed. Then the factor of the technology transfer towards a developing country is elaborated. Finally, all these factors are combined in a theoretical framework.

3.1 Technology

The literature of technology shows that the term technology is used in various and often conflicting ways. In early researchers scholars treaded technology as a set of techniques aimed at achieving a productive end goal (Leonardi, 2008). The definition of technology of Laseur (1989) is in line with this statement. Laseur (1989) defines technology as (1989: 11): “Skills and knowledge which are necessary to converse the raw materials and semis into products, which have more value then the source materials”. Figure 1 illustrates a technology process in an industrial firm. The source material could be seen as the input part of the process and the product as the output. Several variables have, next to the technology, influence on the process of adding value on the input part, such as labour, power and information.

FIGURE 1: TECHNOLOGY PROCESS



SOURCE: LASEUR (1989)

The technology is in most situations associated with machines and other material issues. In the more recent studies, researchers treat technologies as material and symbol properties package in some socially recognizable form as hardware and software. According to Hoekman and Javorcik (2006) new technology consists of hardware, machinery and new buildings, and the knowledge or software which to run a plant. However, another recent study differs in the view on technology. Thielst (2007) describes that technology is not a panacea for the skills we lack or for every improvement issue we

encounter. Instead, it is a tool that complements our abilities, allowing us to do more and to become more productive. These definitions show the variety of topics associated with technology. A technology adds value, converse raw materials and semis into products, is a set of techniques, is a tool that complements our abilities and is associated with machines, hardware, software, other material issues, knowledge, skills and is allowing us to do more and to become more productive.

Another point of view for getting more insight in the term technology, is by looking at the development process. The term technology development refers to a special class of development projects where the deliverable is new knowledge, new technology, a special capability or a technological platform (Cooper, 2006). On the other hand, product development refers to the process to drive an idea to the market (Cooper, 1990). The main difference between product- and technology development is that technology development projects are often the foundation or platform of a new product line or an entirely new business. Therefore, the use of traditional methods for non traditional and technical projects could cause damage. Because technology development projects are rare and fragile, forcing this project to a normal process could result in unnecessary work or even kill the initiative on forehand (Cooper, 2006). Comparing a development process with the MBD project, there is a difference in the approach. To clarify this statement, an introduction of a development process is necessary. Most of the development process literature follow the model of the new product development, NPD, of Booz et al (1982) or the Stage-Gate model of Cooper (1990). The NPD model of Booz et al (1982) consist of seven stages, for instance the idea generation stage, screening and evaluation, testing and commercialization. The Stage-Gate model of Cooper (1990) includes several stages and gates, which are decision points to develop a product. This models includes similar stages as the idea generation stage, detailed investigation, testing and validation. Moreover, both models have also the involvement of key users and focus groups in the stages of development process in common. Next to these two models, also many other literature show the importance of the involvement of customers in the development process (Brown and Eisenhardt, 1995). The development of “the mobile processing unit”, the MBD project, differs on this point from the NPD models. Although the developers believe in a need of the people in Central Kalimantan, they are unaware of this need and the focus of this project is on the development of the technology and generating scientific knowledge. Therefore this project can be defined as a technology push in stead of a market pull.

3.2 Technology Push

Herstatt and Lettl (2000) describe technology push as a situation where an emerging technology or a new combination of existing technologies provide the driving force for an innovative product and problem solution in the market place. In a market pull situation, the innovations’ source is a currently inadequate satisfaction of customer needs, which results in new demands for problem-solving. These impulse come from individuals or groups who articulate their subjective demands (Brem and Voigt, 2009). So, the concepts of market pull and technology push refer to either the sources of the innovation, looking at the agent who innovates, or to the motivations for innovators (Van Den Ende

and Dolfsma, 2005). Figure 2 gives an overall insight in the differences between market pull and technology push projects.

FIGURE 2: COMPARING TECHNOLOGY PUSH WITH MARKET PULL

Description/attribute	Technology push	Market pull
1. Technological uncertainty	High	Low
2. R&D expenses	High	Low
3. R&D duration	Long	Short
4. Sales market-related uncertainty	High	Low
5. Time-to-market	Uncertain/unknown	Certain/known
6. R&D customer integration	Difficult	Easy
7. Kinds of market research	Qualitative-discovering	Quantitative-verifying
8. Need for change of customer behavior	Extensive	Minimal

SOURCE: BREM AND VOIGT (2009)

Based on these characteristics, market pull would easily be preferred over technology push. However, a market pull project has the risk of only looking at needs that are easily identified. Moreover, a market project lacks of being a champion or true believer (Burgelman and Sayles, 2004). On the other hand, a technology push project has the risk of only addressing the needs of a atypical user and has the potential for getting locked into one technical solution, a so called lab in the woods approach. Therefore, the question is not which view is right or wrong, but if there is a practicable way to combine both views or even extent them to other related factors (Brem and Voigt, 2009). The combination of these two views can be done by minimizing the four problem of fields technology push and their market-specific characteristics and the problem of technology driven organizations, edited by Herstatt and Lettl (2000).

An unknown application field

Most technology driven organizations develop a technology which will leave the usual target markets and compete at an new application field. The people involved in such a process must posses both the capability and desire to be able to extrapolate from the current market situation as well as bringing into the analysis all potential application functions where the technology could play a role. This often leads to considerable problems for the innovation management. According to Mr. H. Verkuijl, CEO of Mali Biocarburant, a technology push is the implementation of a technology where it is highly unsure if there is a need or if it is financial reliable. His company build a manufacturing in Mali, which converts jatropha in bio-diesel, something what seems to become really successful. Mr. H. Verkuijl implied the importance to get insight in the needs and financial opportunities of the end product and the total project.

Technology driven projects are mostly unsure who the prospective customers are

There is, in a market-push situation, a very detailed knowledge about the customer profile and their needs, something most technology driven projects lack. Moreover, mostly it is in technology driven projects unsure who the prospective customers are (Herstatt and Lettl, 2000). And even if there is an impression of the potential customers, the customers are often not able to articulate their preference with regard to such an abstract technology concept, because they lack experience with the technology's potential applications and is mostly even perceived as uncomfortable.

Conventional research methods often prove to be of little help in removing the inherent uncertainty of technology driven innovations

Most of the technology push projects have to focus on tomorrow's customers and markets and on a radical innovation. This is, in contrast to conventional market research methods such as customer surveys and focus group discussions, much harder to find out. Therefore, a qualitative and discovering research method is much more appropriate (Brem and Voigt, 2009).

Probe and learn is more suited then the stage gate process

Herstatt and Lettl (2000) show that probe and learn is more suited than the stage gate process. According to Lynn et al (1996) probing and learning is the confrontation of the potential customers with prototypes in the very early stages of a project and thereby, through the acquired market knowledge, gain information for the development of the subsequent prototypes. The learning curve that results through the iterative nature of the process successively removes market and technological uncertainty and contributes of the integration of the customer in the development process.

So, in order to achieve a combination of both views an insight in the application area is necessary, just as the prospective customer and researched by qualitative and discovering research method. This is more or less in line with the three fundamental elements for an enduring linkage between technology push and market pull. At first the technology source, where the researcher's personal interests are being adequately considered, combined with existing corporate expertise, and supplemented with continuing the overview of new technological developments. Secondly the market demand, where marketers must do a permanent search, especially in all areas of customer dissatisfaction, and is an ongoing evaluation regarding future potential of new need satisfaction. The last element is the finding of a relevant problem. Relevant problems are initial impulses from internal or external sources for innovation, such as ideas and trends (Brem and Voigt, 2009). In a technology push project the first element is already integrated, the technology source. However, getting insight in the market demand and the finding of a relevant problem is necessary to solve the problem fields of a technology push project.

3.3 Technology Transfer

To sum up, the MBD project differs from a standard product development project, because it is a new technology and it is characterized as a technology push project. However, another important factor makes the MBD project different from a standard product development project, which is the technology transfer towards a developing country.

Different and somewhat conflicting views on technology transfer are found in the literature and they insert many different variables as a result of technology transfer. Devapriya and Ganesan (2002) describe two definitions of Simkoko (1989) and Carrillo (1994):

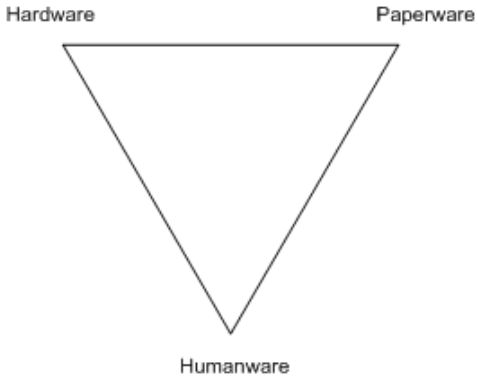
- Technology transfer is the planned conveyance and acquisition of technology knowledge and technique during the implementation of international construction projects (simkoko, 1989).
- Technology transfer is the process whereby knowledge in some form is transferred from a person or organization who possess it, the transferor, to another person or organization who arranges to receive it, the transfee (Carrillo, 1994)

Devapriya and Ganesan (2002) added to these definitions, that technology transfer should not only satisfy the need for advanced technology in selected projects, but also should ideally foster the growth of indigenous technological capacity in developing countries. To investigate this last point these authors developed a theoretical framework where they evaluate the effectiveness of technology transfer in subcontracting arrangements, based on the experience of the foreign party. They include topics as interdependent technology transfer goals, benchmarks for effectiveness of technology transfer and training programs in their model. In conclusion they mention that joint ventures and subcontracting arrangements involving foreign parties can be beneficial. For the effective internal transfer of technology, the design and construction systems employed in internationally managed projects should seek to facilitate the internal transfer of technology and thereby boost domestic construction capabilities. Additionally, next to these complex technical, cultural and socio-economic factors, technology transfer need a consideration of the environment. According to Shahnavaz (2000) depends successful transfer of a technology from a firm on the decisions taken both by the technology supplier and the technology receiver, as well as the dynamic interaction and communication between the two partners. Further, the environment surrounding the technology transfer is another major component in this process. The environment influences the development of particular relationship between the partners. Another point of view towards technology transfer is the viewing point of Gangulli et al (2009). Their research goes into technology transfer of biotechnologies. Technology transfer in biotechnology depends on the transformation of basic research findings into commercial products and requires a strong Intellectual Property rights system to succeed. Important issues are mostly related with policy issues like licensing and patenting of the technology. In conclusion, these definitions provide an inside in the wide range of topics related with technology transfer, from knowledge transfer to cultural and socio-economic factors and from the fostering growth of indigenous technology capacity to policy issues. In addition, technology transfer has a potential learning and innovation affect, but if transfer arrangements are not accompanied by policy initiatives that promote critical learning and are not carried out in the context of evolving national innovation

systems, the full extent of the innovation and growth effects of technology transfer will remain unrealized (Malarairaja and Zwadie, 2004). Such an institutional and cultural context is conspicuous for its absence in many developing countries.

The research of Laseur (1989) towards the investment of technology oversea, concludes that in many cases the successful transfer of technology, in the sense of knowledge and skill is not a simple, incidental process, but requires long-term co-operation before the "western" technology is functioning in a "non-western" environment. Laseur (1989) relates the skills and knowledge technologically with three carriers: the hard ware, paper and human technology. These three carriers are combined in the three carriers model (figure 3). The model is presented graphically by means of a triangular diagram, called the field of the technology carriers. A production system could be presented in this field by a point with coordinates corresponding to the ratio of the three carriers.

FIGURE 3: THREE CARRIERS MODEL



SOURCE: LASEUR (1989)

To some extent the carriers may replace each other. The technology keeps going with somewhat less of one carrier, compensated by a little bit more of the others. For example, in a company where the technology is comfortable to use and easy to learn, training and written documents are less necessary compared to a company with an inconceivable technology. However, the possibilities to substitute one for another are limited. Consequently, each technology is characterized by a certain part of the field of the carriers, named the substitution area. Within the boundaries of the substitution area the carriers are present in such ratios, that the technology is functioning economically. The position and the size of the substitution area in the field of the carriers are determined by the nature of the technology and the conditions of the firm's environment. The position of the substitution area also indicates the organizational structure most suitable for a production system with that particular type of technology.

The three carriers model of Laseur (1989) is more or less identically used by Malarairaja and Zwadie (2004). These authors are mostly interested in the gap between the acts of transfer and the innovation in developing countries, with a case study in Malaysia. Such a gap is a result of the fact that orientation of learning and skill-development strategies in developing countries has large been geared to sustaining rather than challenging or building on the prevailing state of knowledge. According to

these authors it is useful to distinguish three types of technology transfer, which are more or less identical with the three carriers of Laseur (1989): material transfer (hardware), design transfer (paperware) and capacity transfer (humanware). Each type of technology transfer will hereby be described in more detail:

Material transfer

Material transfer is related to the goods; machines and devices, transport and spare parts. Also raw materials, semis and the final products are taken into account (Laseur 1989). Malarairaja and Zwadie (2004) describe the material transfer as the machines and turnkey plants. This part of the technology is easy to transport, which is mainly related to transport and delivery. On the other hand, the time and cost to imitate the hardware is very long and high.

Design transfer

This part of the technology transfer is the transfer of designs in the form of textbooks, manuals, requirements, checklists, procedures, computer software and blueprints (Laseur, 1989; Malarairaja and Zwadie, 2004). This carrier is crucial in routine work, where personnel interpretation or adding's are not necessary, even unwanted, in terms of efficiency. Design transfer can be used for managing lower skilled or unskilled labor. It is possible that the design parts for some way are integrated in the material parts. The imitation and the transport of this part of the technology is rather easy, but difficult in the understanding and reading of these design parts.

Capacity transfer

Capacity transfer involves the transfer of scientific knowledge and technical capacity and capability (Malarairaja and Zwadie, 2004). Capacity transfer is mostly unwritten or even impossible to be written down, specially when there is an involvement of skills. There is a long learning time, it is learning by doing and this part of the technology is mostly impossible to imitate.

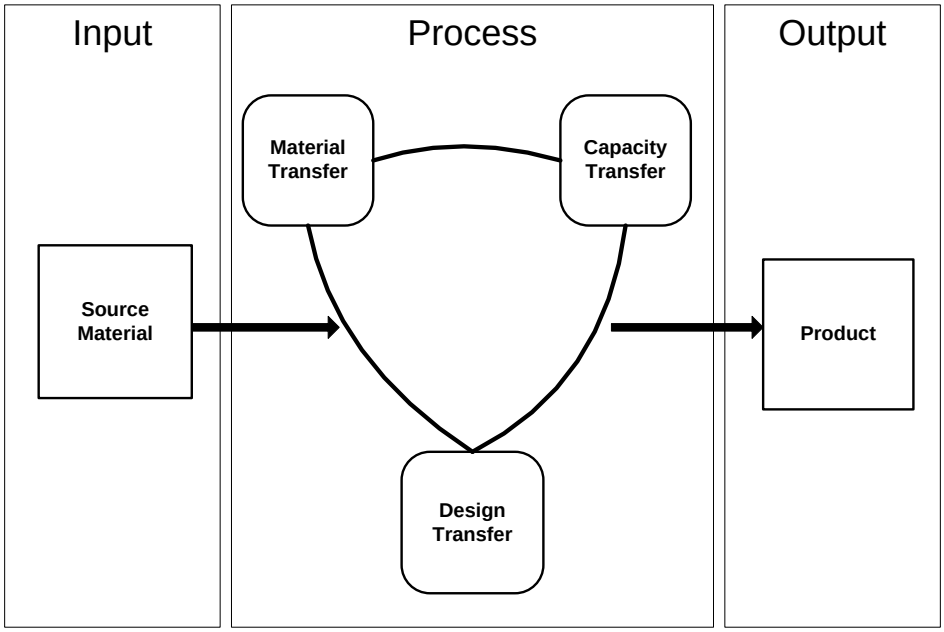
3.4 Theoretical Framework

Although the three carriers model seem to be very applicable for the MBD project, also other characteristics of technology transfer and technology push need to be taken into account. As described in paragraph 3.2, a technology push project can be described as the lab in the woods approach. To overcome this problem, a combination of both the technology push and market pull attributes is necessary and should therefore be included in the theoretical framework. Brem and Voigt (2009) describe a total of eight attributes (figure 2). The attributes of technological uncertainty, R&D expenses, R&D duration and the time-to-market can not be included in this research because it relates in high amount to the technology development part of other sub projects in the MBD project and seems to be indeed high, long and uncertain/unknown. However, the other four attributes can be included in this research. At first the sales market uncertainty, which seems to be high in a technology push project. With an investigation towards the needs (to the product) of the people in the application field, this sales market uncertainty can be reduced. Secondly the R&D customer integration seems to

be difficult in a technology push project. The R&D customer integration is referring to the involvement of customers in the product or technology development process. Although the involvement of real customers is indeed hard for the MBD project, extensive information about this perspective customers makes R&D customer integration in some amount possible. Thirdly, the need for change of customer behavior in a technology push project is extensive. However, by selecting a familiar source material and a familiar product the need for change of customer behavior can be reduced. An extensive study towards the source material and the final product is therefore necessary. Finally, a qualitative-discovering research is most appropriate in a technology push project. Because the MBD project can currently be described as a technology push project, this research type is also chosen for this research (see paragraph 2.3). Next to these attributes, Brem and Voigt (2009) also provide three fundamental elements for an enduring linkage between technology push and market pull. The first element, the technology source, is related to the foundation of the MBD project and the scientific background and is therefore known and not in need of further research. However, the other two elements, the market demand and the finding of a relevant problem are currently unknown and have to be included in the theoretical framework as well. These points of interest relates are also related to technology transfer. Looking at the definition of technology of Carrillo (1994), the transferor is currently known, but the transfee, the person or organization who arranges to receive it, is in a technology push project unknown and in need of further research.

To include these variables in a framework, a combination of the three carriers model (Laseur, 1989; Malarairaja and Zwadie, 2004; figure 3) and the technology process model shown in figure 1 (Laseur, 1989) is chosen. According to Laseur (1989) a model is a way to look to the reality; it organize and systematize the thinking. That is how this framework has to be interpreted.

FIGURE 4: THEORETICAL FRAMEWORK



The theoretical framework, displayed in figure 4, is further described by the structure of the model; input, process and output. Further influences of a technology, technology push and a technology transfer project are added in the following description.

Input

The source material, the input part of the framework, is necessary to make the technology work. The application field related to the input part is unknown and is therefore in need of further research. One of the seven sub projects of the MBD project is to investigate which source material (oil crop) is best applicable to use for the technology. The three most interesting oil crops are rubber, palm oil and jatropha, however, this choice is lacking practical information. The specific situation of each crop in Central Kalimantan is still uncertain, which will be research in this part of the framework. Additionally, the source material is ideally a material where the people are familiar with to reduce the need of change of customer behavior.

Process

The three carriers model of Laseur (1989) is included in the process part of the theoretical framework. This is the part which finally will be transferred to the application field. However, the application field is unknown and is therefore in need of further research. Moreover, the carriers for the specific MBD project are already fulfilled before investigating the application field, which is in line with the technology push characteristic. A description of each carrier of the project in chapter four will form the base for the investigation of the application fields (chapter 5).

Output

The last part of the theoretical framework, the output part, is fully related to the product. As pointed out earlier, in a technology push project the sales market is uncertain and there is not a specific view on who the prospective customers are. Thereby, in the case of the MBD project it is even not sure what the exact outcome/product of the technology is going to be. By researching the market demand and the finding of a relevant problem a product can be found that is a need of the prospective customers.

4. PROJECT DESCRIPTION

The research of the World Bank (2003) found out that nowadays three out of every four of the world's poor live in rural areas. They conclude that there will be no success in the war on poverty unless we take the fight to where those people live. This conclusion resulted in this MBD project which is explained below, mainly based on the "Agriculture beyond Food", Full Proposal September 2008. In this chapter, but continuously in chapter five, the theoretical framework (figure 4) will be the leading model for an extensive description.

4.1 Central Kalimantan

At first a more extensive description of the area where the technology is planned to be implemented will be given, Central Kalimantan, also known as Kalimantan Tengah. The province of Central Kalimantan is chosen based on several reasons. First of all, the island of Kalimantan is the largest island of Indonesia, but in percentage there live the lowest amount of people per square meter. Kalimantan is mostly forest and consists of a huge amount of poor, rural villages. Central Kalimantan is a very large province with a total land area of 153 564,50 km² representing 8.04% of the total Indonesian land area. The province is characterized by a very small population density, only 20 people per square kilometer and consists of 1432 different villages with over 500 000 households. In Central Kalimantan, almost 60% of the one million working people are active in the agriculture, fishery, forestry or hunting sector. Please take a look at appendix B with regard to the boundaries of the Central Kalimantan region.

4.1.1 Ex-Mega Rice Project

In the past years there have been a couple of projects in this area to improve the economic activities in Central Kalimantan, unfortunately some of them failed. A good example is the Ex-Mega Rice Project (EMRP), from 1995 onwards, was to turn one million hectares of unproductive and sparsely populated peat swamp forest into rice paddies in an effort to alleviate Indonesia's growing food shortage. The government has invested heavily in constructing irrigation canals and removing trees. However, the land proved to be unsuitable for rice cultivation, due to improperly peat land preparation. Currently about 110.000 ha of this area is planted with rice, but with a low return due to poor land and water management. This resulted in deforestation and a serious land degradation, so the project failed. Due to the serious damage to the environment of the mega-rice project and the negative consequences for the local people living in this area, the MBD project is preferred to be implemented in this specific area. Therefore, this research is focused on the EMRP area with regard to the empirical study.

4.1.2 Ex-Mega Rice Project Area

To define the EMRP area in detail, I use the boundaries as mentioned in the Master Plan for the Rehabilitation and Revitalisation of the EMRP Area (2008). According to the Master Plan, the EMRP area falls within the boundaries of four districts of Central Kalimantan province: Kapuas, Pulang Pisau,

Barito Selatan and Palangka Raya. A geographic map is included in appendix D. The EMRP area is home to over 450.000 people - a mix of Dayaks (which constitute the dominant ethnic group), and lesser numbers of Banjarese, Javanese, Madurese, Sundanese, Batak and Bugis. In total there are 227 villages located in the EMRP area, see figure 5. Recent developments in the area have been dominated by the EMRP and are characterized by the construction of canals. Construction of these canals was accompanied with extensive clearance of forest and other land cover, leaving a degraded peatland landscape with a high fire risk.

FIGURE 5: AREA, POPULATION AND ADMINISTRATION IN EMRP AREA (2000)

District	Area of EMRP (ha)	Sub-districts	Villages	Population	Households
Palangka Raya	65775	2	9	18448	4623
Kapuas	716465	10	139	296662	79207
Barito Selatan	261115	3	18	34786	9186
Pulang Pisau	727730	7	61	104036	27495
Total	**1771085**	**22**	**227**	**453932**	**120511**

SOURCE: PODES 2008

4.1.3 Differences in villages in the EMRP area

The governor of Central Kalimantan has developed a program to increase the facilities in villages that needed it the most, the PM2L program. For an extensive description, please take a look at appendix G. In short, based on 15 variables a village gets the status of *tertinggal* (underdeveloped) or *maju* (developed). Villages that are *tertinggal* will be included in the PM2L program, their needs are determined and within 5 years the developments should be finished and the village should have reached the status of *maju*. This could for example include an investment in infrastructure, electricity access or in education facilities. So, a village could be determined as *tertinggal* or *maju*, but also as traditional or transmigrant. The transmigration villages were part of the transmigrant program. This governmental program wanted Javanese people to set up businesses in Central Kalimantan, specially in the EMRP area, to increase economic development in this area. They subsidized Javanese people to leave their original land and for moving to Central Kalimantan. Thereby the government created new villages for these people and invested heavily in facilities for these transmigration villages.

4.2 MBD Project goals

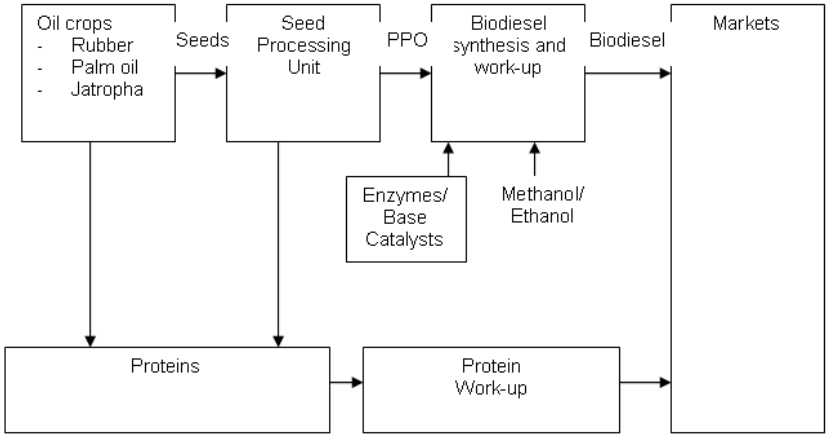
The main goal of the project is to increase the economic activities in the rural areas in Central Kalimantan. To reach this goal, the MBD project concerns the development of a small-scale biodiesel industry and waste products thereof in the Central Kalimantan area. Besides stimulating local economy, this will also prevent further degradation of the environment (especially the peat lands) and reduce the chances of forest fires. Furthermore the project will also benefit Indonesia as a country since it stimulates the transition of Indonesia into a bio-based economy and reduces the Indonesian dependency on fossil resources. However, it has to be mentioned that this is a scientific project and that creating scientific knowledge is an overall goal of the project.

4.3 The technology of the MBD project

The socio-economic development is encouraged by the establishment of a local biodiesel industry using locally produced pure plant oils and protein containing by-products thereof. Furthermore these products, the biodiesel and the protein byproducts, are used to support and generate local productive activities.

An important stakeholder of the project, the university of Groningen, has, in their department of Chemistry, recently started the development of a new technology, which is related to described problem. This new technology, called the “mobile biodiesel processing unit”, can convert oil crops into bio-fuel and can, due the mobility, serve the smaller, rural villages. The technology can be located on a truck and therefore serve more villages (large-scale), few areas (small-scale) or one village (fixed-base small scale). Although the technology is still in the development phase and expected to be finished in a couple of years, the process of how the mobile bio-diesel should work is clear and graphically displayed in figure 6.

FIGURE 6: SCHEMATIC REPRESENTATION RESEARCH PROJECT



To clarify this schematic representation, it will be described in more detail, structured by the structure of the theoretical framework; input, process and output (figure 4).

Input

One of the seven projects is to investigate which oil crop is best applicable to use for the technology. In the project elaboration, three most interesting oil crops are mentioned (rubber, palm oil and jatropha). All three oil crops are growing in areas with a tropical climate, but it is in this phase still unsure which crop has the highest return. The specific situation of each crop in Kalimantan is also still uncertain. An unknown application field is in line with the characteristic of the input part of the theoretical framework. The board of the MBD project is preferring a crop with intercropping possibilities, an economic attractive crop and a crop that is available for local people. These requirements are further examined in chapter 5.1.

Process

The next step is to take the seeds of the chosen crops and process this into Pure Plant Oil (PPO). This process is done by a Seed Processing Unit, which is an easy and standard process. The reaction of PPO, Methanol or ethanol and enzymes will take place in the mobile biodiesel processing unit. This will most likely be a truck, where the technology is located in a container. Although this technology is more difficult than the technology needed to process the seeds, it still can be done by lower educated people. Due of the mobility of the biodiesel processing unit it is possible to reach many small and rural villages. Local residents themselves can take care of the plants, take the seeds of the plants and process this into cans of PPO. The cans of PPO can be stored until the mobile biodiesel processing unit arrives, for instance once a month, where it can be processed into cans of biodiesel.

The three carriers model of Laseur (1989) is included in the process part of the theoretical framework. This is the part which finally will be transferred to the application field. However, the application field is unknown and is therefore in need of further research. Moreover, the carriers for the specific MBD project are already fulfilled before investigating the application field, which is in line with the technology push characteristic. A description of each carrier of the project in chapter four will form the base for the investigation of the application fields.

Output

The final output, the biodiesel, can be used for several destinations. It can be used as diesel for cars, tractors, motor cycles or trucks. Another destination is to sell it on the market, so that a rural village can have economic development. The third, and probably most interesting destination, is to use the biodiesel to generate electricity. By putting the biodiesel into a generator, electricity can be generated. According to the board of the MBD project, the rural areas often lack access to water or electricity all day or this is limited to several hours per day. Although the habitants in the big cities of Indonesia have access to electricity all day, supplied by very large generators with a huge capacity, there are still lots of areas which has no access. These large generators do not reach rural areas far away from big cities and no small generators exist with a smaller capacity meaning that smaller villages in rural areas only have limited access to electricity. This are the assumptions of the board of the project. The output is included in the theoretical framework and is thereby included in the practical research as well.

4.4 Sub projects

The project is divided into seven subprojects. The first six subprojects concern the development of the mobile bio-diesel and other choices concerning the technology. These sub projects contain for example the questions of how to process the seeds, which enzymes are best to be used and how to get the best quality bio-diesel. For a complete overview of the sub projects, please take a look at appendix A. As already mentioned, I am involved in the last subproject being the implementation of the mobile bio-diesel. Each subproject typically has an Indonesian and a Dutch supervisor from different research schools who are responsible for the subproject. The complete MBD project is expected to be finished in 2013.

4.5 Parties

The MBD project is carried out by six universities, three universities in the Netherlands cooperate with three universities in Indonesia. The Dutch universities involved are the University of Wageningen, University of Twente and the University of Groningen. The Indonesian counterparts are the Technology Institute Bandung (ITB), Gadjah Mada University and the University of Palangkaraya. Each subproject (expect the last one) is carried out by four Indonesian PhD students and two postdoctoral fellows (one Dutch and one Indonesian). Furthermore, the involvement of Indonesian and Dutch master students, like me, is possible.

4.6 Local Economic Resources Development (LERD)

This is the title of the seventh subproject and is given specific attention since this is the subproject I am dealing with. This subproject is researched by Dr. Joko Siswanto (ITB) and Dr. B.J.W. Pennink (UoG). The supervisors are professor Dr. L. Karsten (UoG) and Dr. B.J.W. Pennink (UoG) from the Netherlands and Dr. Ir. S.H. Limin (CIMTROP, Palangkaraya) from Indonesia. This subproject started in June 2009 and the expected end date is June 2013.

4.6.1 Objective of LERD

The objective of the LERD approach is to build the economic capacity of a local area, to improve its economic future and the quality of life for all by means of social and economic entrepreneurship capability development. To reach this objective the RuG and ITB have developed a LERD training program (based on the LED framework of the World Bank) at the request of the Bappenas. This program focuses on enhancing competitiveness, increasing sustainable growth and ensuring that growth is inclusive. It offers the possibility for local government, private as well as not-for-profit businesses and local communities to work together to improve local economy. It incorporates local government and private sector functions including regional and environmental planning, business development, infrastructure provision and finance and this will be the framework also in this project

4.6.2 Franchise Model

During the LERD project, suitable business models and franchising systems, will be examined. If it is feasible, a franchise model will be developed as a pilot project. According to dr. Joko Siswanto, the franchise systems work because it can overcome following two problems: first of all the local people often do not have the competences that are needed to manage a business system and secondly, they also do not have the capital that is needed. The system will be created by highly educated people at for example ITB or from the project, and operated by the local people. The villages/communities or a co operation of a couple of villages/communities can be seen as franchisees. The franchise parties are all somehow related to each other. They all have their own input in the franchise system, but lack others. This creates a mutual interdependence. The franchise parties along with their inputs and possible difficulties are described in figure 7.

FIGURE 7: FRANCHISE PARTIES; INPUTS AND DIFFICULTIES

	Producer	Investor	Owner	Manager	Consumer
Who?	Farmers	Bank, donations, grants, private, government	Very related to investor; relatives of university	Young, motivated, local academic with leadership skills	Almost everybody; industrial customers, local customers, export
Input in the franchise system?	Local resource access and skills	Capital	Knowledge, capital	Knowledge, managerial skills, willingness to change	Willingness to buy the product
Possible difficulties?	Quality control knowledge and skills	Discussion about share of wallet	Discussion about share of wallet	If bupati or old conservative leader become manager, problems with integrity and intentions	Export/ quality requirements, need for stable demand, low local consumer knowledge

Besides the parties described above, two other parties can also become part of the system. The first party consists of the technical suppliers. This group could be responsible for the maintenance of the mobile bio-diesel or the supply of electricity generators and seed processing units. The second possible party are the quality control groups. As indicated in figure 7, the farmers might lack the skills of quality control in order to guarantee good qualitative products and to meet the requirements for export purposes. In that case the farmers take care of the cultivation and harvest process and then the quality control can take place by an independent group. However, it is also possible that this process will be done by the consumer.

4.7 MBD project and the theoretical framework

This paragraph links the MBD project with the theoretical framework. The interest of the founders of this MBD project is highly related to the development of scientific knowledge, although the project has good intentions. However, this research adds technical knowledge in the form of technology push and technology transfer and thereby practical information of the application area. A combination of both can perhaps make it possible that a new way to produce energy (mobile for local communities) can be realized. Moreover, this can also be used for economic activities that are currently not yet developed or available economic activities that can be expended. In short, this includes four stages:

1. Developing scientific knowledge
2. Developing technical knowledge
3. Use of technology to produce energy mobile on local scale
4. Use of technology for new economic activities or to expend available economic activities.

This research combines these four stages. The scientific knowledge is the core of the overall project, as well as for this research. Stage 2 is concerned with the gathering of technical information, together with information in the field. All the three phases in the theoretical framework (input, process, output) are included in this stage. Especially the gathered field information is useful for the third stage. The third stage can be linked to the franchise system, described in the previous paragraph. The franchise system is focused on realizing of a new way to produce energy (mobile for local communities) in the application field. With an investigation towards the specific situation in Central Kalimantan, done with the use of the theoretical framework, the franchise system can, if necessary, be adjusted with positive influence on the integration stage. The last stage affects the output stage of the theoretical framework. Although the output stage is also integrated in the second and third stage, the looking for a relevant problem especially concerns with this stage. Placing the LERD approach in this stages, this approach affects both the third and fourth stage. The LERD approach is used to initiate economic activities and within this approach the franchise system can be used to introduce the technology (stage 3). On the long term, the people in the application area need to take care of the whole franchise system. The LERD approach will than be applicable to generate economic development by adding other economic activities to the technology (stage 4).

5. FRAMEWORK IN PRACTICE: CENTRAL KALIMANTAN

After the development of the theoretical framework in chapter 3 and an extensive description of the MBD project in chapter 4, this chapter will put the theoretical framework in practice in the application area Central Kalimantan. This chapter consist of information gathered in interviews in the Netherlands and Indonesia, (governmental) reports, facts and figures and observations in the field. Because the EMRP area, described in chapter 4, is the area visited, this area is described in more detail. The structure of this chapter is in line with the theoretical framework and each paragraph starts with the needs and requirements from the MBD project, followed by an extensive description of the area.

5.1 Input; Source Material

The source material for the technology of the MBD project is an oil crop. Oil crops are crops that can be processed for use as liquid fuels in engines, or to generate electricity or heat. The most important energy crops of today are palm oil, sugar cane, corn, rapeseed which are also known as canola, sunflower, soy and jatropha (Dillen and Murphy, 2009). Liquid fuels made from agricultural commodities are known as bio fuels. Pure plant oils are the most common form of liquid bio fuels and are used for heating, cooking, lighting, transport and power generation. The search for a new energy supply is one of the global problems at the moment, because the world are running out of fossil fuel and the best way to solve this problem is still unknown. However, bio diesel is one of the possible solutions. One of the seven subprojects in the MBD project is to investigate which oil crop is most sufficient to use for the technology. So the final crop is currently not yet decided, but the board of the MBD project pointed out three source materials as the most promising based on a scientific point of view, namely rubber, palm oil and jatropha. However, the scientific point of view is lacking specific research in the application area. Moreover, choosing a source material on a scientific point of view, without investigating the application area, would be a typical lab in the woods and technology push approach. Therefore, the input stage and the related characteristics are very applicable for the MBD project to research the application field and thereby combine the technology push and market pull approach.

As figured in the input stage of the theoretical framework, two characteristics are related to this stage; the unknown application field and the familiarity with the source material (high or low need to change). The three possible crops (rubber, palm oil and Jatropha) are investigated based on these two characteristics. The unknown application field starts with a general investigation and description of the crop. However, within the literature, technical information about these three crops is in a high amount available. The technical description of the crops is in this research limited to a short description of the characteristics. Next to these general information, also the accessibility for local people, financial attractiveness and intercropping possibilities are taken into account by investigating the unknown application. The crop has to be accessible for local people, which is related to the overall goal of the MBD project to increase Local Economic Development. To reach this goal, the crop and area has to

be in local hands in stead of in power of organizations. The financial attractiveness of the crop is mostly connected to the yield of the crop. However, this is not a scientific ground study comparing the ideal situation and the available situation in the application area for each crop and therefore only general conclusions are made about the financial attractiveness. The last point is the intercropping possibility, which are the possibilities that the crop can grow together with another crop. With the intercropping, the area and land can be used for multiple outcomes and other goals as well. Furthermore, the familiarity with the source material can reduce the need to change for local people. This familiarity is researched by investigating the local availability of each of the three crops. Thereby, a crop that is already available, reduces the boundaries for implementation. Moreover, the people have less need of training, related to the need for change.

Each crop is investigated with the use of these points. Combining these findings in the field with the scientific findings, makes a decent decision possible and combines the technology push with the market pull approach. This paragraph consists of research and short conclusions per source material. The conclusion in chapter 6 consist of a comparison of the three source materials; palm oil, jatropha and rubber.

5.1.1 Palm oil

The research to find a sufficient source material based on the market information starts with the oil crop is palm oil. The expansion of the worlds large-scale palm oil plantations started in the ‘80s, primarily in Malaysia and Indonesia. In that time, the palm oil were mainly used for cosmetics and food, but nowadays this is increasingly for bio-diesel. On global scale, palm oil is now the greatest generating crop of bio-diesel. Unfortunately, the high expansion of palm oil plantations has several down sides as well. Numbers of NGOs therefore would like to break down the positive attitude of the palm oil industry. The first and main down side is the fact that, due to the expansion of palm oil plantations, many rainforest is gone and caused a large deforestation on global scale. Secondly, there are according to mr. J.G. Saragih (NGO Sawit Watch) also many socio-cultural problems related to the palm oil industry;

- Socio-cultural destruction
- Break down of traditional livelihoods. Communities that are traditionally living in the rainforest are forced to leave by the palm oil industry
- Break down of food security of millions of people
- Local communities are in bad bargaining position. The government allocate their land for conversion to palm oil for large plantation companies.

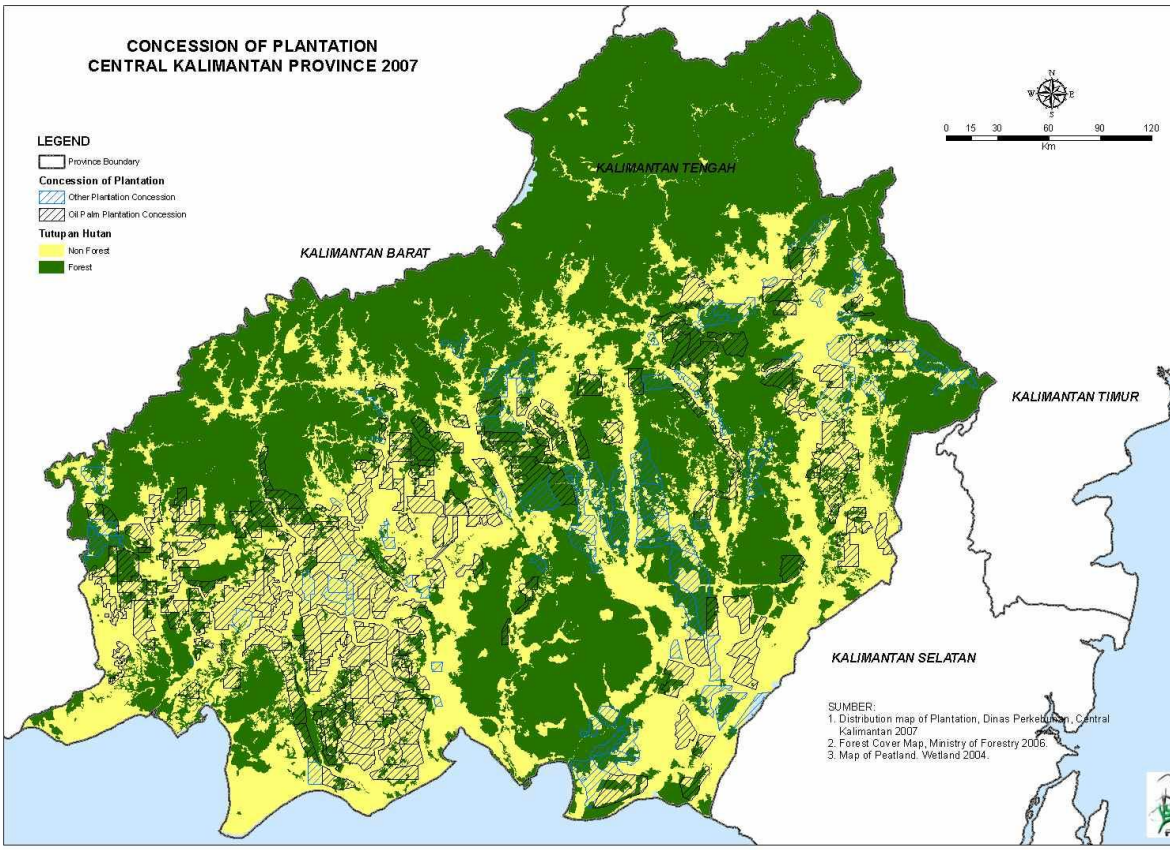
The interviews with several NGOs in Indonesia show that these NGOs are trying to convince the Indonesian government to stop the process of deforestation and the expansion of palm oil plantations. Though the strict regulations formulated by the government for palm oil plantation, for instance a regulation that only peat land under 3 meter may be convert into palm oil plantations, the government is lacking controlling and checking these requirements. The NGOs blame the government for keeping their eyes closed only because of the money. On the other hand, the government blames these NGOs to be influenced (with donations) by huge European companies who want to stop the opportunity of

bio-fuel. These down sides do not form an ideal starting point for setting up this technology in this area with this source material.

Availability

As mentioned before, palm oil is in a high amount available in Indonesia. Moreover, Indonesia is, together with Malaysia and Nigeria, in 2007 responsible for almost 83% of the global palm oil production. The increased local and global demand for palm oil has caused an expansion of 400.000 hectare of palm oil plantations in Indonesia a year. These facts and numbers are provided by mr. J.G. Saragih (NGO Sawit Watch). The area of palm oil plantations in Central Kalimantan is shown in figure 8. It provides a clear overview of the amount and locations of palm oil plantations in Central Kalimantan in 2007.

FIGURE 8: PALM OIL PLANTATIONS IN CENTRAL KALIMANTAN (2007)



SOURCE: FOREST WATCH

The EMRP area borders to Kalimantan Selatan and has, as shown in the figure, several palm oil plantation concessions. The research of Agriculture in the Ex-Mega Rice Project Area in Central Kalimantan (2008), from now on referred to as Agricultural Report 2008, displays a total area of more than 220.000 ha which is permitted to build a palm oil plantation in the EMRP area (figure 9). So, a total of 12,5% of the total EMRP area is palm oil plantation. There are also 7 proposals for local use, which covers 115.000 ha, but these have still not received a final permit.

FIGURE 9: PALM OIL AREA IN EMRP AREA

District	Local Proposal		Location Permits		Business Permit	
	Number	Area (ha)	Number	Area (ha)	Number	Area (ha)
Pulang Pisau	3	60.000	0	0	6	106.000
Kapuas	4	55.000	0	0	8	99.130
Barito Selatan	0	0	0	0	1	15.989
Total	**7**	**115.000**	**0**	**0**	**15**	**221.119**

SOURCE: AGRICULTURAL REPORT 2008

Palm oil would be a good choice for the MBD project, by only taking the availability into account. In whole Central Kalimantan, also in the EMRP area, palm oil plantations are in a high amount available. This also directly affects the familiarity of local people with this crop.

Accessibility

Next to the availability, the accessibility is research as well. According to mr. A.H. Pramono (NGO Aid Environment) it could be hard for the MBD project to use palm oil as a source material, especially based on the accessibility for local people. The reason is that most of the palm oil fields in Central Kalimantan are owned by the big companies. There are some small holders, small farmers who have their own palm oil plantation, in Central Kalimantan, but it is very common that these small holders have contracts with the companies. The small holders have to deliver a certain amount of their palm oil trees to the company and the control is very strict. For a small scale own production, as the MBD project is looking for, could be problematic due to this protection, something confirmed by mr. A. Naptamis (NGO AMAN).

Moreover, the Provincial Development Planning Agency (Bappeda) of Central Kalimantan explains that the governor do not give any permits since 2007. All the local proposals, shown in figure 9, are rejected, which means that the whole palm oil area in the EMRP area is owned by companies and not by local people. Furthermore, it is very hard for the governor to control the business permits. In many occasions the lower governor, called the *bupati*, already have given or still give a business permit to a company and often in exchange for lots of money. During my visit in the EMRP area, a plan for the development of a palm oil plantation in the Kapuas district has been shown. The plan, from the Bupati of Kapuas, and developed in 2008 and covers a total area of 24.000 ha. Lots of logging in this area is going and it is not allowed for people in this area to talk about it, something shown by the strange way of acting by asking the local people about this plan. One palm oil plantation is visited in the district of Kapuas, but due to the strict security it was not possible to take a closer look. To sum up, in the EMRP area there are no palm oil plantations owned by locals and the business permits have a tendency to look corrupt. All this is not in favor of the accessibility of palm oil for local people and the MBD project.

Economic attractiveness

The economic attractiveness is highly related to the yield of the crop. In accordance with mr. J.G. Saragih (NGO Sawit Watch), the high increase of the palm oil industry is caused by the high yield of the crop. In addition, it is possible to harvest a palm oil tree twice a month and the yield per nut are very high (Dillen and Murphy, 2009). However, the oil palm plantations in the EMRP area are mostly found on peat area where soil constraints will affect and limit the growth and yield of oil palm. Low pH (below 4) and low nutrient content are the main constraints in the peat area. Mr. B. Zech (Dutch Embassy) also refers to the low yield of palm oil in the EMRP area and therefore believes that palm oil is not interesting for using as in source material in this area.

Combination with other crops

A main characteristic of the crop palm oil is the impossibility of other crops to grow on a palm oil plantation, so there are no intercropping possibilities for the palm oil crop. This phenomenon, called monoculture, additionally means a biodiversity loss also because it is impossible for animals to live in this area. This is, next to the deforestation and socio-cultural down sides a huge point for NGOs to vote against palm oil.

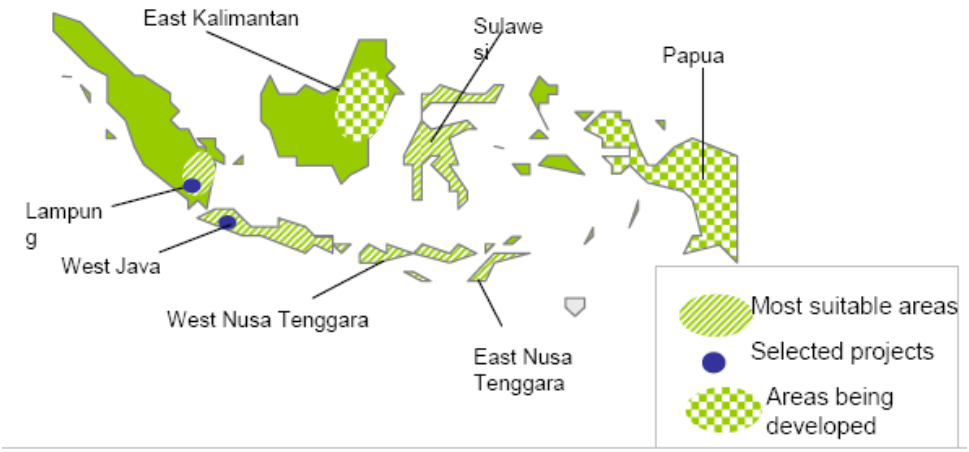
5.1.2 Jatropha

The second investigated crop is Jatropha Curcas, which is the official name of jatropha. Jatropha is a drought-resistant perennial crop that grows well in marginal soils and dry climates. This crop helps to reclaim problematic lands and restore eroded areas. It is a wild species that originated in Central-America, but recently also found in Africa and Asia as well. It is a plant which grows relatively quick (in 2-5 years it's producing oil rich seeds) and is productive for about 50 years. For farmers jatropha offers the opportunity of combining soil conservation with cash-crop production. As it is not a food or forage crop, it plays an important role in deterring cattle, and thereby protects other valuable food or cash crops. For a general overview of the advantages and disadvantages of jatropha, take a look at appendix F.

Availability

According to Gexsi (2008) Indonesia is one of the leading jatropha producers worldwide. The research of Gexsi (2008) indicates Indonesia to be the first country to place significant quantities of jatropha bio fuels on the market. The same research expects that the 75.500 ha jatropha plantations in 2008 will grow to more then 5 million ha in 2015. The National Development Planning Agency (Bepanas) of Indonesia has set a target of 2 million ha to be cultivated with jatropha by 2010.

FIGURE 10: JATROPHA POSSIBILITIES IN INDONESIA



SOURCE: GEXSI (2008)

Figure 10 shows the areas in Indonesia which turned out to be the most suitable areas for jatropha. Following Gexsi (2008), the areas in Papua and East Kalimantan are the areas in Indonesia with jatropha possibilities. However, it is not clear if the other areas, like Central Kalimantan, are by not mentioning an unattractive area. Mr. J.G. Saragih (NGO Sawit Watch) developed two jatropha projects in Indonesia, including one in Central Kalimantan, a couple of years ago. Unfortunately, both projects failed because of yield problem, something described later. According to the interviewees, there are no other jatropha projects or jatropha businesses in Central Kalimantan. During the visit to the EMRP area, I have not seen any jatropha. Also people in the visited village have not heard of the crop before. It can therefore be concluded that the availability and familiarity of the local people in the application area with jatropha is currently very low.

Accessibility

The minimal availability has an direct influence on the accessibility of the crop. Jatropha is originally a wild species and not a domesticated industrial crop. So, in the current situation jatropha is an unfamiliar source for most of the local communities. Thereby, jatropha has a difficult cultivation process (Jongschaap, 2007). So, by choosing jatropha as the input crop, the communities really need to be trained for the cultivation of the plant because of their unfamiliarity and this difficult cultivation process.

Economic attractiveness

Not only the low availability and accessibility, also the low economic attractiveness make many interviewees very skeptic about jatropha. According to H. van der Zeijden (Dutch Embassy) it is very hard to process the nut of the jatropha into Pure Plant Oil and the yield is very low when the soil is less vital. This makes jatropha very expensive, specially when you compare it with palm oil. This low yield was also the main reason of the failed jatropha project in Central Kalimantan, developed by mr. J.G. Saragih (NGO Sawit Watch). In the district of Seruyan, an district in Central Kalimantan not located in the EMRP area, the jatropha was planted as an intercrop, but the farmers were not familiar with the

crop. The yields were turning out to be very low, caused by the harvest times of only two times a year, which is very low if compared to palm oil. Based on the opinion of many interviewees, it can be concluded that jatropha is economic unattractive due to their low yields.

Combination with other crops

Next to these disadvantages, jatropha has a major advantage. The crop is well suited for intercropping. Intercropping makes it possible to plant food or other agriculture next to jatropha. This is not causing a monoculture, so in contradiction with the palm oil. A clear example is the use of jatropha in Mali by the company of Mali Biocarburant. As Hugo Verkuijl, the CEO of this organization, explained that his company plants jatropha in a row, then a couple of rows of food plants and then a row of jatropha again. This processes even increases the production of the food plants, due the protection of the jatropha plants. So, based on only the intercropping possibilities, jatropha would be a good choice to use as a source material for the MBD project.

5.1.3 Rubber

The third and last investigated crop is rubber. In contradiction to jatropha and palm oil, rubber is a crop with an industry which is the compression of the nut. The use of the rubber nuts is currently a new technology. The rubber tree is nowadays used for the liquid rubber, which is located inside in the tree. However, rubber nuts are located at the same tree and these concerns oil. In the current situation, these nuts are thrown away by the farmers or used by children as a toy. Many interviewees are therefore exited in this new possibility. This newness affects the availability of information about the rubber nut, which is very limited. Therefore, the rubber industry is described to get a clear insight of this crop and the possibilities.

The rubber goods industry are generally classified into several groups depending on the type of product as follows (Rahman, N. and Haris, U., 2009)

- Tires and related products
- Engineering rubber goods for industry and automotive
- Latex goods
- General rubber goods like carpets and footwear

In addition, the wood of the rubber tree can be processed into high value products, such as processed wood products, wood floors, components of furniture and other household items. During my visit in the EMRP area, I have taken a closer look at the rubber process, for a clear description take a look at appendix H.

Availability

With a production of 2.9 million tons in 2008 Indonesia is the second largest natural rubber producer in the world (Rahman, N. and Haris, U., 2009). In 2008, the Indonesian rubber consumption was 414 thousand tons accounted 15% of the total production, of which about 65% was consumed by the tire industry. The other 2.4 million tons are exported and 93% of this rubber is exported as Standard Indonesian Rubber (SIR). SIR is still liquid and a major grade requested from the tire industry. The rubber plantations are covering an area of 3.4 million ha in Indonesia, spread over more than 15

provinces. A huge area of Central Kalimantan is planted with rubber. The blue areas in figure 8 are, according to NGO Forest Watch, mostly rubber plantations. Next to this, the Agricultural Report 2008 shows that rubber, with an area of 33,536 ha in the EMRP area in 2007, is a common crop in this area. As shown in figure 11, the rubber plantations are spread all over the four districts in the EMRP area. The largest rubber area is found in sub district Kahayan Hilir with 10.332 hectare, this is more than 30% of the planted area in the EMRP. While visiting this area, it became clear that rubber is indeed in a huge amount available and most of the families income depends on the rubber production. For more details about the area visits, please take a look at appendix H.

In the total EMRP area, 58% of the rubber area is productive. Of the unproductive are, 29% is immature, which means that these trees are younger then 5 years. However, 13% of the trees are documented as unproductive. Unfortunately there is no information available about the affection of this unproductiveness on the rubber nuts. The productivity increase of 0,24 ton per hectare in 2000 to 0,63 ton in 2006, many smallholders in the EMRP area have decided to invest in rubber plantations (Agriculture Report 2008).

FIGURE 11: RUBBER PLANTATIONS IN EMRP AREA (2007)

District / Sub- district	Immature Tree Area (ha)	Mature Tree Area (ha)	Unproductive Tree Area (ha)	Total Area (ha)	Production* (ton)	Yield (kg/ha)	No. House -holds	Average area per house-hold (ha)
Barito Selatan								
Jenamas	29.5	42	5	76.5	39.61	943	60	1.28
Dusun Hilir	68	53.5	7.5	129	50.46	943	108	1.19
Kapuas								
Kapuas Kuala	0	0	0	0	0	0	0	-
Kapuas Timur	809	1827	719	3355	2192.4	1200	2817	1.19
Kapuas Barat	970	1924	516	3410	2308.8	1200	2015	1.69
Kapuas Hilir	78	225	185	488	270	1200	728	0.67
Kapuas Murung	260	920	785	1965	1104	1200	1100	1.79
Basarang	542	359	112	1013	430.8	1200	485	2.09
Pulau Petak	50	50	45	145	60	1200	187	0.78
Mantangai	955	3390	664	5009	4068	1200	3186	1.57
Pulang Pisau								
Kahayan Kuala	40	0	0	40	0	0	40	1.00
Kahayan Hilir	2233	7436	663	10332	5353.92	720	3325	3.11
Maliku	576	45	3	624	32.4	720	423	1.48
Pandih Batu	1423	1839	223	3485	1324.08	720	1237	2.82
Jabiren Raya	1002	1303	320	2625	938.16	720	1142	2.30
Sebangau Kuala	680	0	0	680	0	0	620	1.10
Palangka Raya								
Sebangau	135.8	19.2	4.8	159.8	12	625	153	1.04
Total	**9851.3**	**19432.7**	**4252.3**	**33536.3**	**18184.63**	**13791**	**17626**	**1.90**
Proportion	29%	58%	13%	100%	-	-	-	-

SOURCE: AGRICULTURAL REPORT 2008

Rubber plantation areas are compared to palm oil plantation in less amount available. However, with a total area of more than 33.500 ha in the EMRP, this crop can still be characterized as good available in this area. Moreover, by looking at the number of households that are relying on the rubber farming industries, it can be concluded that the familiarity of the local people with this crop is good.

Accessibility

According to Rahman, N. and Haris, U. (2009), 85% of the total rubber plantations in Indonesia belongs to smallholders occupying more than 2 million households and the rest by large estates owned by private estates and government-owned estate. In the EMRP area, the rubber plantations are exclusively owned by small holders. In 2007, 17.626 households are depending on the rubber industry (The Agricultural Report 2008). Unfortunately, although the plantations are owned by the farmers, the access to the rubber market is very limited. Moreover, the prices of rubber product are volatile and farm gate prices are controlled by a middleman and rubber factories. In addition, the rubber slab can be stored and put on the market by farmers at their convenience, but the cannot take advantage from this due to limited price information and a poor bargaining position. Most important for the MBD project is the fact that most, and all in the EMRP area, of the rubber plantations are owned and thereby accessible by local people.

Economic attractiveness

According to the Agricultural Report 2008 the difference in yield, shown in figure 11, between the districts is related to the water table. In the areas with regular flooding, the yield tend to be lower. Farmers tap rubber every two days and they do this mostly in the morning, so there is time available for other activities as well. In the current situation they use this time for on farm and off farm activities such as working the rice fields, collecting grass for feed, collecting fish, construction work, transportation, and making rattan handicrafts. This time could possibly be used for the collection of rubber nuts.

The yield of the rubber could possibly also have influence on the yield of the rubber nut. Unfortunately, no numbers are found about the yield of the rubber nut. However, one rubber farmer in the Maliku sub-district explained that the rubber nut grows once a year in dry season (see appendix H). This would make the crop less economic attractive, comparing this with for instance palm oil.

Combination with other crops

As explained before, with the use of a rubber tree for the liquid rubber and rubber nut, one tree could have two functions, something that is in line with the intercropping requirement of the MBD project. As mr. J. G. Saragih (NGO Sawit Watch) explains, the only function of the rubber nut is that the children in the villages can play with them, something seen during my visit in this area (appendix H). Mr. A. Naptamis (Credit Union Betang Asi) is CEO of an organization with many rubber farmers as members, explain that these farmers also grow food crops, mainly rice and vegetables for household consumption on their rubber fields. During my visit in the area, the intercropping of rubber with rice is seen on regular bases. Therefore, it is a possibility in the future that one agricultural field is used for

rice, liquid rubber and the rubber nut. These intercropping possibilities are positive for the use of rubber as a source material for the MBD project.
As mentioned before, this paragraph consists of research and short conclusions per source material. The conclusion in chapter 6 consist of a comparison of the three source materials; palm oil, jatropha and rubber.

5.2 Process

Following the theoretical framework, the next step for this research is the process. The process part is very much related to the technology transfer and therefore the three carriers model of Laseur (1989) is included in this part. According to the theoretical framework, the process part has the characteristic of an unknown application field. Each carrier, i.e. material, design and capacity transfer, is therefore researched in the field and described in this paragraph separately. The input for each carrier relates to either the specific situation in the field, the input examined in chapter 4 or additional requirements from the MBD project.

5.2.1 Material transfer

The first carrier is the material transfer. As mentioned in the description in chapter 3, material transfer is related to the goods; machines and devices, transport and spare parts. The MBD project is in favor of producing and transferring a mobile small-scale processing unit. This means that the technology is located on a truck and can, due to the mobility, serve more villages on small scale base. However, there are two other options as well. The other two possibilities are a fixed based for large scale technology or a fixed based for small scale technology. To combine the technology push with a market pull, not only the technical possibilities, but also the situation in the application area should form the base for a final decision for a sufficient technology.
The main requirement, at this stage of the project, from the field to build this decision on is the quality of the infrastructure. To put it simply: The better the quality of the infrastructure, the more likely a mobile processing unit is suited for this project. The Bappeda of Central Kalimantan and the research of Rural Infrastructure Development in the Ex-Mega Rice Project Area in Central Kalimantan (2008), from now on referred to as Infrastructure Report 2008, make a distinction between external and internal infrastructure to describe the current state of the infrastructure. The external infrastructure is the accessibility of a village, so the infrastructure to the village and the infrastructure in the village is the internal infrastructure. The infrastructure is main requirement for the material transfer and is therefore researched by the distinction of external and internal.

External Infrastructure

A simple look at the map of Central Kalimantan gives an insight in the historical external transport. The map shows that in Central Kalimantan, specially in the EMRP area, most villages are situated along the river, because the main transportation in the history of this area was by boat. In 2008, still 80% of all the villages in the EMRP area are accessible by water (figure 12).

FIGURE 12: MAIN ACCESS TO VILLAGES IN EMRP AREA

Main Acces	Over land	Over water	Over Land and Water
Palangka Raya	22,2% (2)	11,1% (1)	66,7% (6)
Kapuas	20,1% (28)	7,2% (10)	72,7% (101)
Barito Selatan	0% (0)	61,1% (11)	38,9% (7)
Pulang Pisau	24,6% (15)	1,6% (1)	73,8% (45)
2008	20%	10%	70%
2005	16%	27%	57%

SOURCE: PODES 2008; INFRASTRUCTURE REPORT 2008

However, in most of the districts in the EMRP area, the transportation takes place by land or by land and water. Currently, 10% of the villages still only have water transport and most of these villages are located in Barito Selatan. Although the Agricultural Report 2008 mentions that villages with only water transport are very small, relating on the amount of people living in this villages, these villages take care of huge area. The average village size in for instance the Kapuas district is 5.100 m2, while the villages with an external infrastructure of only over water in this district have an average size of 18.400m2 (PODES 2008).

The Agricultural Report 2008 indicates a trend of the expanding of the road network, shown in the increase of access over land and water from 57% in 2005 to 70% in 2008 (figure 12). As figure 13 points out, the conditions of the road is increasing. Unfortunately, this is still rather poor compared to other parts of Indonesia. In 2005, close to 74% of the villages in Indonesia has an asphalt access road, but in the EMRP area, this is still 27% in 2008.

FIGURE 13: MAIN ACCES ROAD TO VILLAGES IN EMRP AREA

Main access road	Asphalt	Gravel	Dirt road	No road acces
Palangka Raya	44,4% (4)	11,1% (1)	33,3% (3)	11,1% (1)
Kapuas	30,2% (42)	23% (32)	39,6% (55)	7,2% (10)
Barito Selatan	11,1% (2)	16,7% (3)	11,1% (2)	61,1% (11)
Pulang Pisau	21,3% (13)	27,9% (17)	49,2% (30)	1,6 (1)
2008	27%	23%	40%	10%
2005	19%	9%	45%	27%

SOURCE: PODES 2008; INFRASTRUCTURE REPORT 2008

According to the Bappeda in Central Kalimantan, the government is investing heavily in the quality of the infrastructure in Central Kalimantan. An example of a project is the development of a railway from Muaraluang to Karau Kuala to increase the transportation time in the coal industry. Next to this, the increase of the quality of the external infrastructure is the main focus of the infrastructure investments. This includes a development in the accessibility of the village also by road, instead of only by water and the increase of the main access road type. Figure 12 and figure 13 already showed this development in the previous years and the development will be, according to the Bappeda, continued in the following years.

Next to these numbers, this research also consist of observation findings in the field. It can be concluded that almost every village I have visited was possible to reach by car or truck. However, the quality of the road decreases when the roads are further from bigger villages. Moreover, when the main access road is a gravel or dirt road, it could be hard to reach this village in rainy season. Nevertheless, the road types and conditions seen during my observations in the area, were sometimes in conflict with the database of PODES. This database investigates every village on various variables, like quality of health care, education, source of income and infrastructure, see appendix G for a full description of these variables. According to this database, some visited villages do not have asphalt as the main access road, but have according to my observations a good asphalt road leading to this village. This could be explained by the development of this asphalt road after 2008 or some errors in this database.

Internal infrastructure

Next to the external infrastructure, the development of the internal infrastructure, the roads in the village, has according to the Bappeda less priority for the government. Furthermore, the internal infrastructure can be characterized as under developed (Infrastructure Report 2008). The roads to enter a village and the roads inside the village are mostly very small and made of soil (dirt road) or wood. The transport in the traditional villages are often not more than foot-paths in between the houses. In addition, the villages lack of any road to the agricultural fields, which is a constraint to agricultural development of these areas. The road is mostly just sufficient enough for (motor) bikes, but not wide enough for small trucks or tractors. Many villages were, during my visit, hard to enter by motor cycle and therefore impossible to enter by car or truck. On the other hand, the internal infrastructure of transmigrant villages are mostly much better in these villages than the traditional villages (see paragraph 4.1.3 for the explanation of transmigrant and traditional villages). The roads in transmigration villages have a rectangular grid of at least 3 to 5 m wide and therefore easy accessible by car or truck (Infrastructure Report 2008). However, these village lack, just like traditional villages, a good track to the agricultural area. These differences are also seen during my visit in the area (see appendix H).

In conclusion, villages in the EMRP area are increasingly accessible by road. Also the quality of the roads is increasing and a priority of the government. However, the current quality of these roads is far behind by comparing it with the average road quality in Indonesia. Additionally, the quality of the internal infrastructure is not more than small dirt roads or roads made of wood.

5.2.2 Capacity transfer

Following the theoretical framework, next to the material transfer, the capacity transfer is involved in the process part. The capacity transfer is related to the knowledge and skills of the people, in the way that the involver of the technology is capable to make decisions about the acts which are most required for his part of the process (Laseur, 1989). A characteristic of capacity transfer in general is that there is a long learning time and learning by doing is very important. Providing users with

sufficient and appropriate education and training on the new technology is important for ensuring sustainable adoption (Thielst, 2007). As displayed in the theoretical framework, the capacity transfer is, in a technology push situation, involved with an unknown application field. To go for the combination of technology push and market pull, the MBD project should not assume that employees or working people have (or do not have) the necessary skills to apply the technology to their work before it is even investigated. Therefore, this capacity transfer is included in this research.

According to prof. E. Heeres (executive of the MBD project and professor UoG), the level of knowledge needed for the use of the MBD technology is very low, because the project is aiming to develop the technology so that it is very easy in use. This is in line with the reasoning of Laseur (1989). When the machines and or other hardware are easy in use, less focus is needed on the human and paper ware. Although there are less requirements on education for the process part, dr. J. Siswanto explains that it still will be hard to develop a training program for non-educated people with low competences and skills, since their margin for capacity building is really low. However, another stakeholder of the franchise model, the manager, is much more in need of managerial skills and knowledge (see paragraph 4.6.2). The training program will be specified on two stakeholders from the franchise model, the producers and the managers. Therefore, these two stakeholders form the base for this part of the research.

The producers (farmers) in the MBD project are in need of knowledge of the whole production process (paragraph 4.3). The first step in the process is the production of the input crop and the knowledge of the farmers related to the cultivation process. As paragraph 5.1 shows, familiarity with the crop makes it easier to overcome difficulties in the adaption of the farmer. The second step In the process is the processing of the seeds into PPO, which will be done by seed processing unit. The last step is to process the PPO into biodiesel. According to prof. E. Heeres this process can be characterized as very basic. Furthermore, no education is necessary for this stakeholder of the franchise model and having skills and agricultural knowledge is most important. The other stakeholder involved in the training program is the manager. Dr. J. Siswanto explains that the manager need to oversee the whole process and make business out of it. The manager therefore need general education, managerial skills, business mindedness and has willingness to change. Especially the willingness to change relates to the preference of a young and motivated manager. Based on the description of the two stakeholders the following knowledge and skills characteristics are the requirements for the MBD project to be investigated in the EMRP area:

- *Work and businesses*; related to both the producer and the manager. A research to the amount of farmers in the area is indicating the availability of necessary agricultural skills and knowledge. The amount of businesses direct indicates the business mindedness of local people and thereof potential managers.
- *Education level;* included for the requirement of the manager by having general education
- *Motivation and willingness to change;* related to the manager

Work and businesses

Work and business in the EMRP is almost completely about just one thing; agriculture. In more than 98% of the villages in the EMRP area, the main source of income is agriculture (PODES 2008). Food crops (e.g. rice, coconut, vegetables and fruit), fish and non-food crops (e.g. rubber and rattan) are the most important examples of agricultural income in this area. Explained in the research of improving livelihoods in the Ex-Mega Rice Project Area in Central Kalimantan (2008), from now on called the Livelihoods Reports 2008, many farmers (56,5% of all the farmers) do not sell their produce and only 22% of the farmers sell more than half of their produce. Only a roughly two-third of those who sell their produce, considers that they generate a profit. So, a huge amount of farmers do not create a sustainable income based on their agricultural work. Moreover, although the numbers of families dependent on agriculture is incredibly high, an increasingly picture of a diversification of livelihood strategies away from agriculture to off farm income generating activities (the Agricultural Report 2008). Permanent or seasonal off farm employment is normally associated with a (temporary) migration towards urban centers such as Banjarmasin (South Kalimantan) and Palangka Raya. In addition, the PM2L program (extensive described in appendix G) points out that the government of Central Kalimantan believes that for the stimulation of local economic development it is better to have other income sources than agriculture. However, the Agricultural Report 2008 shows that agricultural growth can reduce poverty. This is shown by an increasing food demand from urban centers in the EMRP area. The agricultural growth can reduce urban poverty by lowering food costs and reducing rates of migration towards urban centers. Furthermore, agricultural development can provide an impulse to poverty reduction in rural areas and accelerate economic growth via on- and off-farm employment.

During my visit to the area, I noticed a difference between the different types of villages (paragraph 4.1.3). Most people in the traditional villages depends on their agricultural income. The main income of these villages mostly relies on the production of rice or rubber. Other business activities are limited to very small shops families mostly have next to agricultural activities. Although in the other type of villages, the transmigration villages, the main source of income is also from agriculture, other sources of income are also visible. For example in two transmigration villages a wood production factory for doors and window frames are seen. In another a small transportation industry for meat cows is seen, which transport cows from rural areas towards the cities. These types of businesses are only visible in the transmigration villages, not in the traditional villages (see appendix H).

In conclusion, most of the families in the EMRP area depends on their agricultural income. So, agricultural knowledge and skills are available. However, there are different views on the facts whether the dependency on agriculture is good for LED. Thereby, other businesses are very limited in the EMRP area. The only limited other industries than agriculture are seen in the transmigration villages. Therefore it can be doubted that the people in the area are business minded.

Education level

Next to this business mindedness, the level of education is related to the manager as well. In Indonesia the school system is as follows: primary school, secondary school, high school and than university. As the Livelihood Report 2008 describes, the education level of the adult population in the EMRP area is very low and limited to (several years) of primary school education. In the current situation, the primary school facilities are widespread over the area and most children complete primary school education. Every visited village, even the smallest, have a primary school. The quality of the school buildings can be characterized as good and very similar in most villages. Whether the children continue their education depends on the family income, distance to junior secondary and high school and the policy of the district government towards education (Livelihood Report 2008). However, new regulations has been introduced because many schools are in the current situation lacking quality (Bappeda Central Kalimantan). Almost all schools cope with a teacher shortage and many teachers with their low salaries have no civil servant status and do not live in the villages. This causes regular absence of the teacher and the need for extra jobs for additional incomes (Livelihood Report 2008). The lack of quality is also experienced during my visit of the area. A school visited in Maliku has a English teacher who can not speak English at all. Although it is maybe not representative, it underpinned the findings of the Livelihood Report 2008. The Bappeda explains that a new regulation is introduced about a special salary for teachers who want to stay in a remote/rural area for a fixed amount of time. This could possibly increase the quality of the teachers and thereof the quality of the school.

Next to the general high school, another type of high school exists called vocational school. A vocational school is at the same level as the high school, but are more specialized to a certain field as for instance tourism, business or economics. According to the Bappeda of Central Kalimantan, these students are prepared to start working immediately after they have finished their study, since they have specialized skills. This in contrast to students attending general high school, who often continue studying at college or university in order to specialize. This could be an opportunity for the MBD project, because they are in favor of a young manager with managerial knowledge and skills. The EMRP area has in total nine vocational schools of which seven are situated in Kapuas district. Palangkaraya and Pulang Pisau both have one (PODES 2008).

Motivation and willingness to change

The motivation and willingness to change is researched by investigating other related projects in the same area and their successes or difficulties. Additionally, the motivation and willingness to change is checked during my observations in the area. At first a project of the Bappenas in 2007, which included a goal which is comparable with the goal of the MBD project. The Bappenas wanted to increase their bio diesel industry in different regions in Indonesia and also in Central Kalimantan. The Bappenas therefore included the lower government on regional level to develop business plans with the local people. Comparable with the MBD project, this had the main goal of achieving local economic development. However, this project did not worked not work out well. Only one region developed a plan and this proposed plan was not appropriate to make realization possible. According to drs. MA. E.

Purwanto, a staff member of the Bappenas, the motivation and willingness to change towards this bio diesel project was the important factor by failing this project. In addition, he explains that local people do not see the opportunity and are satisfied with their way of living.

The second related project is a fishermen project in Sulawesi of dr. J. Siswanto a couple of years ago. As he explains, the project had given the fishermen new boats and new equipment which increased the productivity. The people could catch much more fish in the same time and this could positively influence local economic development. However, instead of working the same hours and get more revenue, the fishermen just worked less until they reached the same revenue. Although the fishermen were happy to work less hours per day, this was not the idea of economic development. Again, now explained by dr. J. Siswanto, most of the people living in rural areas live in a very basic manner and they accept their way of living and do not want to change.

Unfortunately, the people seen and spoken during my visit were in line with these examples. Although some people were working on their agricultural land, most people just sat in front of their houses and did nothing. Some people slept, others just hung around with their family or friends. A reason could be the high temperatures, but the way of living did not differ during my morning or mid day visits. In addition, some people were asked for their future plans and if they are in favor of change. A man answered that this all depends on the plans of the government, which do not show real motivation. Others mentioned that they live with the day and are not thinking about tomorrow. Besides, they are happy that they have food and some luxury goods. These observations, which is mainly related to a cultural barrier, could cause a minimal attendance for the MBD project. The motivation and willingness to change differs in the different type of villages. As described earlier, transmigration villages expand several other businesses than the traditional agricultural business in Central Kalimantan. They have an other cultural background because they have seen the living and businesses in Java and it could be that the cultural barrier is smaller with these people. Dr. J. Siswanto mentions the possibility to overcome the cultural barrier with traditional people by opening the eyes of the people with exposing them to other cities or districts.

5.2.3 Design transfer

The third carrier of the three carrier model included in the theoretical framework is the design transfer. The design transfer is the part of the technology that is described in textbooks, manuals, requirements, checklists, procedures, computer software and blueprints. Moreover, the design transfer can be used for managing lower skilled or unskilled labor. On the other hand, when the technology is very easy in use, less extended design transfer is necessary (Laseur, 1989).

Although the design transfer is one of the three main factors in the three carriers model of Laseur (1989), it is not applicable in the sense of the MBD project. As explained in the theoretical chapter, the three carriers to provides a focus point to make technology transfer possible. This project will develop a hardware which will be very easy in use. So there is a minimal need of knowledge and no need for a descriptive part. According to dr. J. Siswanto, the people will be trained with the learning by doing

concept in stead of written documents. The learning by doing approach considers that each worker acquires certain technological expertise by interacting with each other during the production process. This expertise, in turn, is shared with the other workers of the same type and becomes useful for working with the complementary type of intermediate goods (Afonso and Leite, 2010). The conclusion in chapter 6 will give more insight in the usefulness of the design transfer in the theoretical framework, because this is not the aim of this framework in practice chapter.

5.3 Output; the product

The final part of the theoretical framework is the output stage. This paragraph is about the product which is the result of the process of the source material. As displayed in the theoretical framework, in a technology push project, the needs of the consumers or people are unknown. This unawareness is directly related to a high sales market uncertainty. For the combination of technology push and market pull, a research towards the market demand and the finding of a relevant problem is necessary. Technology push projects demand explorative and anticipative market research methods that are designed to determine current customer needs and that is the type of research I have used during this research (Herstatt and Lettl, 2000).

As described in paragraph 4.7, four stage could be determined in this project. The output part of the framework and thereby the product is related to the third and fourth stage. The third stage, the use of technology to produce energy mobile on local scale, relates to the product bio diesel. Bio diesel could be described as the core product and outcome of the MBD technology. This bio diesel is aimed to be used for cars, trucks and cars and the assumed reasons for using the bio diesel is that this is currently unavailable in the area, it has better quality or is much cheaper than the current fuel. However, these assumptions are not yet researched by the MBD project and therefore included in this research. Next to this, the fourth stage is aiming to use the technology for new economic activities or to expend available economic activities. This is related to the previous described possibilities for electricity generation. Additionally, a relevant problem is in need to be found where this technology can be a solution for.

5.3.1 The use of technology to produce energy mobile on local scale

The bio diesel could be a replacement for fossil fuel. The most common types of fossil fuel is gasoline and kerosene. There could be a couple of reasons for local people to replace the current product for the new product. The product is economic more attractive then the current product, due to the price. Another reason could be the availability. If the product is not or less available, the bio diesel could have an advantage due to the

FIGURE 14: FOSSIL FUEL IN VILLAGES

local produce. Additionally, an insight in the amount and reason for using fuel provides a more detailed overview in their needs. The last factor is the quality of the fuel if better or less than the bio diesel. However, this is a business study and figures are numbers for the quality are therefore not included.

At first the availability of fossil fuel is researched. Related to the availability is the difference in selling the fossil fuel. The gas stations, comparable to the gas stations in Europe, are only located in the bigger cities. Next to these gas stations, fossil fuel is sold in small shops and these shops are widespread over the EMRP area. These shops often sells fossil fuel as a by product and the fuel is stored is stored in glass liter bottles (figure 14). These bottles are filled at the gas stations in the bigger cities and sold in the smaller villages and even in the bigger cities as well. All the visited villages possesses that kind of little fuel shops. Although each shop stores just a couple of liters, it is according to the shop owners enough for the supply and needs for the local people of each village. It can therefore be concluded that fossil fuel is available the whole EMRP area.

Also the price of the fossil fuel is related to the type of shops and the distance to bigger cities. An increase in distance of a village to a bigger cities with a gas station has an increasing influence on the fuel price. The document of the Bappeda of Central Kalimantan, Kalimantan Tengah in figures 2009, shows that the average price in 2008 for kerosene in a bigger city in the EMRP area is RP 3.833,- (close to €0,32) which is in an increase of 10% compared to 2007. The price in Palangka Raya in 2010 for fossil fuel is RP 4.500 (€0,38) at the gas station. During the visits, the highest price seen is Rp 6.000,- (€0,51). Unfortunately there are currently no prices available of a liter bio diesel from the MBD technology. However, some conclusion can be made based on the prices of the fossil fuel. According to mr. J.G. Saragih (NGO Sawit Watch) it is very hard for bio fuel to compete with fossil fuel. He explains that on average the cost price of a liter bio-fuel is Rp 7.000,- (€0,60), which is much higher than the price of fossil fuel. In the current situation, the Indonesian government subsidize the fossil fuel to keep the price as low as possible. With this subsidy, it is very hard for bio diesel to compete with fossil fuel. Besides, the highest price seen in the field is 'just' 34% higher than the price at a gas station. Competing with this low margin of a gas station price is probably hard.

The final criteria is the use of the product. People in the villages in the EMRP area make use of two types of fuel; wood and kerosene (see figure 15).

FIGURE 15: FUEL MOSTLY USED IN VILLAGES

	Villages	Kerosene	Wood
Palangka Raya	9	55,5%	44,4%
Kapuas	139	24,5%	75,5%
Barito Selatan	18	22,2%	77,8%
Pulang Pisau	61	16,4%	83,6%
2008	227	23%	77%

SOURCE: PODES 2008

The PM2L program, see appendix G, describes that villages which are using kerosene in stead of wood are more economic developed and this is therefore a part of their development program. Their statement that less developed villages are using less kerosene and more wood is confirmed during my visits in the EMRP area (appendix H) Kerosene is mostly used for cooking, motorized vehicles and for boats. A motor cycle is by far the most used motorized vehicle in Central Kalimantan (Kalimantan Tengah in figures 2009). With a total of 238.163 motor cycles in 2008, which is more than 90% of all the motorized vehicles, it is overwhelming compared to cars (2%) and trucks (4%). Moreover, these numbers also include the bigger cities in the province, were it is more common to have a car. In addition, these ratio's are also seen during the site visits. In almost every visited village a motor cycles was the only way of transportation. This could be explained by the infrastructure, described in paragraph 5.2. Simply said, it is impossible for most of the villages in the EMRP area to go into the village by car or truck caused by the bad internal infrastructure or due to the fact that the village is only accessible by water.

Motorized vehicles used for agriculture are limited to trucks used for transportation of cows and wood. The processing on the agricultural land mostly happens traditionally with by hands. Although the most villages in the EMRP area are located along the river, the amount of boats were much less than expected in the visited villages (appendix H).

In conclusion, based on the market demand of the local people towards bio diesel, the use of bio diesel as a product in the EMRP area has not much potential. This is caused by the high availability of fossil fuel, the price of fossil fuel which seems to be very low and the limited use of fossil fuel for the motor cycle or cooking.

5.3.2 The use of the technology for new economic activities or to expend available economic activities

Next to the use of the technology for energy generation, this part of the research is aiming on researching the possibilities for using the technology for new economic activities or to expend available economic activities. This is related to the possibilities for electricity generation and the founding of a relevant problem where this technology can be a solution for.

In most of the meetings with people involved in the MBD project, the possibility to generate electricity with bio diesel (with the use of a generator) and the expected electricity need of the local people, was announced on regular basis. According to these people, the families living in the application area are lacking access to electricity and the access could improve the livelihood of these families. However, these conclusions were not build on a research and therefore included in this research. In the EMRP area, two types of electricity are found, PLN electricity and non PLN electricity. PLN electricity is supplied by a electricity network. Non PLN electricity is electricity generated with a generator. Figure 16 shows the amount of families with PLN and non PLN electricity in the EMRP area.

FIGURE 16: AMOUNT OF FAMILIES WITH ELECTRICITY

	Families with PLN electricity	Families with Non PLN electricities	% of families with electricity
Palangka Raya	3926	156	88%
Kapuas	41471	2668	56%
Barito Selatan	4728	2244	76%
Pulang Pisau	16907	953	65%
2008	67032	6021	61%

SOURCE: PODES 2008

In total, 61% of the families have access to electricity in the EMRP area and most families are connected to the electricity network (PLN). Specially in Barito Selatan, the percentage of families using non PLN is quite high. As explained by the Bappeda of Central Kalimantan, the amount of families using PLN electricity is related to distance to big cities. The further a village is from a big city, the more families using non PLN electricity. Although it is in some village limited to a small amount of families, most villages in the EMRP area have access to electricity, see figure 17.

FIGURE 17: % OF FAMILIES WITH ELECTRICITY PER VILLAGE PER QUARTILE

	villages <25% families	villages <50% families	villages <75% families	villages =>75% families
Palangka Raya	11,1% (1)	0% (0)	11,1% (1)	77,8% (7)
Kapuas*	36,7% (51)	25,17% (35)	20,9% (29)	17,3% (24)
Barito Selatan**	33,3% (6)	5,6% (1)	11,1% (2)	50% (9)
Pulang Pisau***	8,2% (5)	19,7% (12)	34,4% (21)	37,7% (23)
2008	28%	21%	23%	28%

* Kapuas: in 28 villages, no family has electricity and in 9 villages 100% of the families have internet

** Barito Selatan: in 3 villages 100% of the families have electricity

*** Pulang PIsau: in 2 village, no family has electricity and in 5 villages 100% of the families have electricity

SOURCE: PODES 2008

The electricity network (PLN) supply reaches to 64% of the villages. while others may have local arrangements and/or privately owned generators (Master Plan 2008). In just 17 villages in the whole EMRP area all the families in the village in possession of electricity. The PLN electricity is supplied by a big wire linking each village. Within the village, this wire splits in several directions towards the houses. Each electricity connected household has its own wire going through their house. Every village visited holds electricity, even a village which PODES 2008 determined as a village without electricity. Most families in the visited area have many electric devises as well, like a television, fridge and rice cooker (see for further details appendix H). According to the local people spoken during my visit, the price per month differs from Rp 30.000,- (€2,50) to Rp 150.000,- (€12,75), something what depends on the amount of electricity used. However, the quality of the network could be determined as bad. On regular base, villages are facing a power cut and have no electricity for a couple of hours. To overcome this moments, many families have a battery or a little generator. Based on these numbers and observations, the conclusions up front from the people involved in the MBD project about the electricity supply were not in line with the reality.

Next to the electricity possibilities, the technology can possibly be used for other destinations as well. The research to other possibilities and needs than the electricity possibility was hard. Due to a translation problem and the culture of the people, it is difficult to underpin the real needs of the people. Answers of people asked for their needs are: "*That depends on the plans of the government"* and *"I am living with the day and happy to have food and some luxury goods"* (appendix H) This could be seen as a cultural barrier, as described in paragraph 5.2.2. On the other hand, these people are possibly unaware of the technological possibilities, a very common problem with technologies developed wit a technology push (Herstatt and Lettl, 2000). Observations make it possible to clarify possibilities. An opportunity seen is related to one of the main characteristics of the EMRP. As described in paragraph 4.1, the huge amount of peat land in this area is linked with a bad irrigation system what effects especially rice. According to rice farmers, the harvest possibilities of the rice field in this area is limited to once or twice a year. Compared with for instance Java, the harvesting frequency is three to four times a year and this difference is related to the better ground and irrigation system. In addition, an improvement of the hydraulic infrastructure in the EMRP area could make control of the irrigation system possible (Masterplan 2008). This could, according to the farmer, increase the harvest possibilities to three times a year. The control of the irrigation system could be done by an electric water pump. This water pump is currently not available in the area and is very much related to the specific situation in the EMRP area and could therefore be described as a relevant problem and a market demand. Moreover, a combination with the electric water pump and the MBD technology is possible, because the bio diesel could be used as an input material for the electric water pump. Besides, as described in paragraph 5.1, a huge part of the EMRP is rice and the main income of many families is related to the rice revenue. An increase of the harvest frequency will automatically increase their financial position and therefore lead to local economic development.

6. CONCLUSION

After an extensive literature review, the description of the MBD project and the empirical part an answer to the main research question can be formulated in this conclusion. The main research question of this research is:

To what extent does the current situation in Central Kalimantan meet the technical requirements to make technology transfer of the MBD project in a technology push situation possible?

For the formulation of the answer each part of the framework (input, process and output) will be applied individually. Subsequently, a general view on this research question is generated. This conclusion will end with a possible adjustment of the framework.

At first the input part of the theoretical framework, where the source material is included. Two characteristics are related to this stage; the unknown application field and the familiarity with the source material (high or low need to change). The three possible crops (rubber, palm oil and jatropha) are investigated based on these two characteristics. The unknown application field starts with a general investigation and description of the crop. Next to these general information, also the accessibility for local people, financial attractiveness and intercropping possibilities are taken into account by investigating the unknown application. Furthermore, the familiarity with the source material can reduce the need to change for local people. This familiarity is researched by investigating the local availability of each of the three crops. Unfortunately, non of the crops meet the requirements of the MBD project perfectly. At first jatropha, the crop that according to this research are not available in this region. This affects the availability, the accessibility and the knowledge of the people about this product. Moreover, most interviewees were not positive about the economic attractiveness of this crop. On the other hand, availability of palm oil in the application area is no problem. The palm oil plantations are taking near by 12,5% of the whole EMRP area. Also the economic attractiveness is very positive for this energy crop. Unfortunately, this economic attractiveness causes that all the palm oil plantations are owned by big companies. This has negative influence on the accessibility of this crop. Moreover, intercropping is impossible with this energy crop and this has a negative influence on the environment. The third crop, rubber, differs from the previous two crop. A rubber nut is currently useless and could be parallel used next to the standard rubber process, having a positive influence on the intercropping possibilities of the crops. Rubber plantations are widespread available in the EMRP area and exclusively owned by local people. Unfortunately limited negative information is found about the economic attractiveness of this crop, what causes that not all the requirements are met for this crop. In conclusion, there is no crop that meets all the requirements of the MBD project. However, the rubber nut is, based on these requirements, the most in line with the goal of the MBD project to achieve local economic development due to the accessibility and availability of this new energy crop.

Secondly, the extent of how the situation in the application field meet the requirements of the process part of the MBD project is researched. Material transfer, capacity transfer and design transfer are included in this process part. The material transfer is focused on the requirement of a decent infrastructure to make a mobile small scale technology possible. Most of the villages live along the river, since historically the main transport was by boat. Nowadays, the government is investing heavily to realize an accessibility of a village by car as well as by boat. Also the quality of the external infrastructure is increasing and can be described as sufficient enough for a truck. Although, there has to be noted that the weather and the distance to big cities has negative influence on the quality of the external infrastructure. Moreover, the internal infrastructure can be described as bad. The amount of villages with the possibility to drive into the village by car or truck is very limited. Most roads are not broad enough or made from wood or bad soil. Also the agricultural fields have a limited accessibility by car or truck. However, the possibility to reach a village by car or truck, due to the quality of the external infrastructure, and the governmental plans to increase this quality, I conclude that the infrastructure is sufficient enough to make material transfer with a mobile small scale technology possible.
The transfer of capacity is linked to the different stakeholders in the franchise model, with a focus on the manager and the producer. The work and business of the people living in this area is very limited to agriculture. Most of the families depend on agricultural income. Producers, in this project farmers, are in high amount available. Unfortunately, the amount of managers or business minded people in the EMRP area is limited. Furthermore, the businesses are limited to small retail shops. Only within the transmigrant villages some small industries are seen and these people from Java seem to be more business minded. This could lead to a conclusion that managers are mostly located in transmigrant villages. However, these examples are too limited and should be investigated more. The education level necessary for the producer is very limited, however the manager has higher requirements. In the EMRP area, almost every village has one or more primary schools. Unfortunately, higher education is much more limited. Moreover, business schools are limited to nine schools in the whole EMRP area. However, these vocational schools are probably very interesting since these students are young and trained to create business and fits therefore perfectly in the requirements of the stakeholder manager.
A third requirement affecting the capacity transfer is the motivation and willingness to change. During my research, a couple of comparable projects were examined. These projects failed mostly because of the lack of motivation and willingness to change of the local people. In addition, things seen and heard during the field study were in line with the conclusions of the other projects. People are working on their agricultural lands or are doing nothing at all. Moreover, these people depend their future plans on governmental plans or are living with the day. This requirement could cause a problem for the transfer of capacity. Finally, the design transfer is the last component of the process part of the framework. However, the design transfer is not a part of the requirements of the MBD projects. The technology of the project is easy in use and the several requirements of the capacity transfer makes the design transfer unnecessary in this stage.

The last part of the framework, the output stage, is related to the product. To combine technology push with a market pull, an insight in needs of the prospected customers is necessary. The research

towards the need is split in two; the use of technology to produce energy mobile on local scale (bio diesel) and to the use the technology for new economic activities or expending available economic activities. Because bio diesel is a new product, the research towards this product type is very much related on fossil fuel. Unfortunately, the chance that the bio diesel could successfully replace the fossil fuel is very limited, due to the fact that it is not generating an advantage for the people. The price of fossil fuel tends to be very low, mostly because the government is subsidizing fossil fuel. Moreover, fossil fuel is available in almost every village. Although the distance to bigger cities has a negative influence on the price, it is very doubtful that bio diesel would generate an economic advantage. Thereby, the use of fossil fuel is limited for cooking and for filling the engine of the scooter. Therefore, the demand to fossil fuel is minimal in most parts of the EMRP area. Next to this, the use the technology for new economic activities or expending available economic activities is researched as well. First the possibility to combine the bio diesel with the generation of electricity with the use of an generator. Although many members of the MBD project believe in this possibility, based on this research, a negative recommendation has to be made. There are according to the governmental database a just a few villages without electricity, but the field study shows that one of these villages currently do have access to electricity and therefore show that the current electricity access is even higher than the database reflects. Though finding other related needs next to the generation of electricity has been hard, the characteristics of the EMRP area resulted in a possibility. The irrigation system of EMRP area is damaged due to the EMRP project. Controlling this irrigation process is, according to a farmer, possible with an electronic water pump. This electronic water pump, motorized by fuel, could cause an increase in harvest times of rice from two to three times a year. Such an increase would really mean an economic development in that area. A combination of the MBD project with an increase in irrigation systems should however be further investigated before applying it to this area. However, based on the needs of the people, this could be a successful opportunity.

So, after applying each part of the model separately, now an overall view is generated to answer the research question. A technology push project is in general unaware of the application field and is unaware of the customers needs. With the use of the theoretical framework, an insight in these two problem fields are generated. Several requirements of the MBD projects are met in the field, such as the requirements of material transfer and some of the capacity transfer. And though not all the requirements of a source material are met, rubber has the possibility after further investigation to become a sufficient source material. However, the motivation and willingness to change and the bio diesel need of the people are two requirements that are not met in the field. Requirements that are in a huge amount related to the overall goal of the MBD project to achieve Local Economic Development. It is, based on these conclusion, doubtful that with a transfer of this technology towards this application area Local Economic Development will be achieved.

Finally, the theoretical framework will be reflected and if necessary redesigned. The framework is based on the two main characteristics of the MBD project, the technology transfer and technology push. This research is therefore focusing on mostly technical requirements. Next to these technical

requirements there are other factors as well influencing whether this project will achieve Local Economic Development. For example socio economic factors like social capital and decision making power. My research partner Margriet van Kammen investigated these factors and her research therefore complements this research.

In the specific research for the MBD project, there were no requirements of design transfer. This could be resulting in leaving out this part of the model. Moreover, it is even possible to conclude that the technology transfer theory of Laseur is outdated, since it is developed in 1989. The design transfer is in his theory determined as the technology transfer in the form of textbooks, manuals, requirements, checklists, procedures, computer software and blueprints. Maybe is the theory of learning by doing more appropriate for technology transfer nowadays, something future research has to point out. However, the fact that it is not included in this research could also be the result of the project stage where this research is conducted in. The project is currently in the starting point and the decision of using for instance a textbook or blueprint could changed and be a result in a later stage. For other projects with comparable characteristics this could be positively chosen while applying this framework. Therefore, I have to conclude that no adjustments on the developed framework are necessary and that this framework is in my belief applicable for other projects with comparable characteristics!

7. DISCUSSION

At first I would like to mention that it was very hard to start this thesis with a researchable subject. The project is currently still in the starting phase and therefore lots of topics have to be researched. At the beginning I wanted to develop a complete new business model with all the topics involved, as for instance finance and business strategies. This was too broad and impossible to research within the timeframe. After the understanding of the project determining as a technology push a focus was found. The combination of the technology push and technology transfer affected just enough topics that it was researchable within the timeframe.

Secondly I would like to mention that the time to understand the project was very long. I am a business student and to understand chemical processes was hard and took lots of time. Also the interviews in the first weeks in Indonesia were mainly focused on getting more insight in the technical part of the project, mostly caused by the scientific background of most people involved in the MBD project, physics and chemistry. Above this, the project was changing while conducting the research. In the first meeting, the technology was planned to be mobile on a truck, the input material would be jatropha and has as main goal to generate electricity. After a while, each point was less sure or different. The technology could be fixed as well as mobile, different types of input materials are possible and the technology is not focused only on the generation of electricity.

Another point is concerning the input part of the framework. This research is focused on three energy crops; jatropha, palm oil and rubber, because these were, according to the project, the only three interesting energy crop for this technology. During my field research I also found other possibilities, as for instance Nypa (a wild crop growing along the river and also have nuts concerning oil). So, the research is focused on requirements given by the project, but therefore other possibilities are not included.

Another thing is that most people interviewed were involved with the project, something that could be biasing. However, though these people were involved in the project, the interviews were always subjective and the people involved in the project were positively subjective. Above this, I have tried to include other opinions, outside the MBD project, as well. I therefore interviewed different people of the Bappenas and Bappeda and several NGO's. These parties also have knowledge about development projects and bio diesel project in Central Kalimantan.

8. LIMITATIONS

The theoretical framework, together with the empirical part, are focused on the technical requirements of technology push project, combined with technology transfer. Although every part gets attention in this research, some parts of the framework are in need of further research. At first a more detailed study towards the input materials is needed. This detailed study should insists an extensive ground study for understanding which crop grows better on the specific soil in the application area. Moreover, a technical study towards the returns and the quality of the oil of a rubber seed compared to a jatropha is necessary to build a final decision on. These studies are not included in this research, because this research is focusing on a business perspective, in stead of a chemistry perspective. Secondly, one of the conclusions of this research is the lack motivation and willingness to change of people living in the application area. This lead to the conclusion that it might be hard to transfer this technology towards this area. However, perhaps with a further research a possibility of how to deal with this problem could solve this barrier, for instance by getting more insight in the learning by doing perspective. Looking at the investigation of the needs of the people living in the application area, this is mainly based on numbers found and observations done. Although I believe that the conclusion is in line with the reality, the information is a bit limited. An extensive study towards this needs could figure as a topic of a research. In this research lots of different topics and requirements are involved and therefore could lack of a very detailed investigation of each topic individually. Also the time limitation is affecting this very detailed investigation.

As stated in the conclusion, the design transfer was not part of the investigation of this specific research. The MBD project want to make use of the learning by doing approach in stead of the transfer of designs. The learning by doing approach could be more appropriate nowadays, since the theory of Laseur is from 1989. However, before leaving out the design transfer, further research is necessary towards this topic is necessary.

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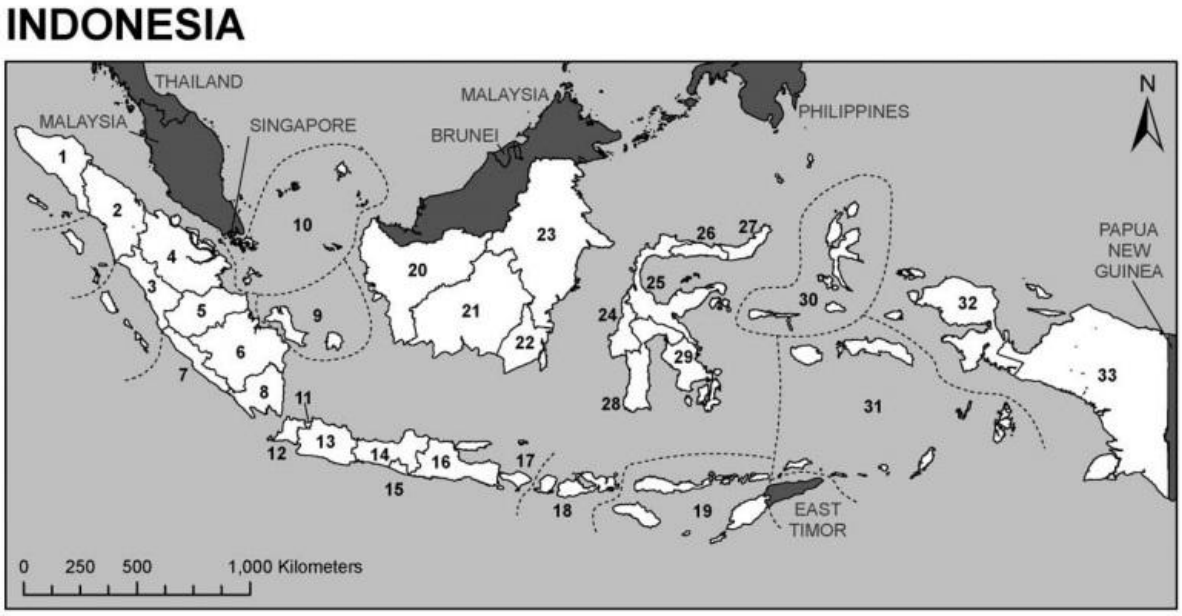
APPENDIX A: MBD SUBPROJECTS

A: The 7 Subprojects

1. Techno-economic evaluation on seed processing technology.
2. Exploratory experimental studies on biodiesel synthesis in mobile production units using CCS equipment.
3. Techno-economic evaluations of biodiesel synthesis in mobile production units using CCS equipment.
4. Development of technology for biodiesel production using locally produced enzymes.
5. Optimal planning and control of mobile processing technology with multiple inputs and outputs.
6. Isolation and valorization of peptides and amino acids from the rubber tree, oil palm and Jatropha Curcas plant.
7. LERD, establishment of a framework and concrete action plan for all stakeholders involved in the introduction of new technology including local government planners, small entrepreneurs and NGO's and creating a conducive environment.

APPENDIX B: MAP INDONESIA



1	Nanggroe Aceh Darussalam	12	Banten	23	East Kalimantan
2	North Sumatera	13	West Java	24	West Sulawesi
3	West Sumatera	14	Central Java	25	Central Sulawesi
4	Riau	15	DI Yogyakarta	26	Gorontalo
5	Jambi	16	East Java	27	North Sulawesi
6	South Sumatera	17	Bali	28	South Sulawesi
7	Bengkulu	18	West Nusa Tenggara	29	Southeast Sulawesi
8	Lampung	19	East Nusa Tenggara	30	North Maluku
9	Bangka Belitung	20	West Kalimantan	31	Maluku
10	Riau Islands	21	Central Kalimantan	32	West Papua
11	DKI Jakarta	22	South Kalimantan	33	Papua

APPENDIX C: LIST OF INTERVIEWEES

Name	Company	Function	Date
Mr. Hugo Verkuijl	Mali Biocarburant	Director Mali Biocarburant	11 March 2010
Mr. Wim Laseur	RuG	Writer of the book: Technologie investeren overzee, an intensive studie in Indonesia	18 March 2010
Ms. Roos Nijpels	Cordaid	Department 'Ondernemen'	30 March 2010
Prof. Erik Heeres	RuG	Overall project manager and supervisor of the Netherlands	6 April 2010
Dr. Joko Siswanto	ITB	Researcher subproject 7: LERD	20+22 April 2010
Dr. Ir. Heru Purbuyo	ITB	LERD training coordinator at research center on Environment, Infrastructure, and Regional Development	22 April 2010
Dr. Robert Manurung	ITB	Co-project manager and supervisor for Indonesia	Several times
Mr. Jefri Gideon Saragih	Sawit Watch	Head of Department Campaign and Public Education	26 April 2010
Mr. Wirendro Sumargo	Forest Watch Indonesia	Executive Director	26 April 2010
Drs. MA. Edy Purwanto	Bappenas	Senior Planner (National Development Planning Agency)	3 May 2010
Dhr. Arnold van der Zanden, Dhr. Hans van der Zijden, Dhr. Benjamin Zech	Embassy of the Kingdom of the Netherlands	1.First Secretary, Education 2.Counselor for Agriculture Nature and Food Quality 3. First Secretary, Environment	4 May 2010
Mr. Abdon Nababan	AMAN; Indigenous Peoples Alliance of the Archipelago	Secretary General	5 May 2010
Mr. Albertus Hadi Pramono	Aid Environment	Consultant Aid Environment Asia	6 May 2010
Mr. Ambu Naptamis	1.AMAN 2.LDP; Lembaga Dayak Panarung 3.Credit Union Betang Asi	1. Chairman of the board in CK 2. Director 3. Secretary	10 May 2010
Several people, several departments	Bappeda Central Kalimantan	Several departments: Education, Infrastrcuture, Economy and citizenship	17 May 2010

The full interviews are available on request

APPENDIX D: EMRP AREA

APPENDIX E: VILLAGES IN THE EMRP AREA

District	Subdistrict	Village	Total male population	Total female population	Total population	Number of Families
PALANGKA RAYA	PAHANDUT	TUMBANG RUNGAN	277	296	573	144
PALANGKA RAYA	PAHANDUT	TANJUNG PINANG	1205	1137	2342	575
PALANGKA RAYA	PAHANDUT	PAHANDUT SEBERANG	1596	1504	3100	815
PALANGKA RAYA	SEBANGAU	SABARU	1293	1217	2510	504
PALANGKA RAYA	SEBANGAU	KALAMPANGAN	1515	1497	3012	855
PALANGKA RAYA	SEBANGAU	KAMELOH BARU	337	317	654	164
PALANGKA RAYA	SEBANGAU	BERENG BENGKEL	515	525	1040	266
PALANGKA RAYA	SEBANGAU	KERENG BANGKIRAI	2641	2361	5002	1242
PALANGKA RAYA	SEBANGAU	DANAU TUNDAI	113	102	215	58
KAPUAS	KAPUAS KUALA	CEMARA LABAT	1142	1163	2305	639
KAPUAS	KAPUAS KUALA	PALAMPAI	348	359	707	215
KAPUAS	KAPUAS KUALA	SUNGAI TERAS	1537	1520	3057	854
KAPUAS	KAPUAS KUALA	LUPAK DALAM	2802	2794	5596	1513
KAPUAS	KAPUAS KUALA	TAMBAN BARU SELATAN	658	700	1358	379
KAPUAS	KAPUAS KUALA	BATANJUNG	1214	1168	2382	666
KAPUAS	KAPUAS KUALA	TAMBAN BARU	1109	1093	2202	580
KAPUAS	KAPUAS KUALA	TAMBAN BARU TENGAH	1776	1789	3565	842
KAPUAS	KAPUAS KUALA	BANDAR RAYA	1633	1605	3238	838
KAPUAS	KAPUAS KUALA	WARNA SARI	1490	1402	2892	860
KAPUAS	KAPUAS KUALA	TAMBAN LUPAK	793	777	1570	492
KAPUAS	KAPUAS KUALA	TAMBAN BARU MEKAR	826	796	1622	491
KAPUAS	KAPUAS KUALA	SIDOREJO	773	763	1536	470
KAPUAS	KAPUAS KUALA	LUPAK TIMUR	606	586	1192	335
KAPUAS	KAPUAS TIMUR	ANJIR SERAPAT TIMUR	1652	1660	3312	1087
KAPUAS	KAPUAS TIMUR	ANJIR SERAPAT TENGAH	3176	3330	6506	1676
KAPUAS	KAPUAS TIMUR	ANJIR SERAPAT BARAT	1929	1947	3876	951
KAPUAS	KAPUAS TIMUR	ANJIR SERAPAT BARU	708	642	1350	395
KAPUAS	KAPUAS TIMUR	ANJIR MAMBULAU TIMUR	1629	1519	3148	889
KAPUAS	KAPUAS TIMUR	ANJIR MAMBULAU TENGAH	1126	1165	2291	526
KAPUAS	KAPUAS TIMUR	ANJIR MAMBULAU BARAT	1442	1389	2831	760
KAPUAS	SELAT	TERUSAN RAYA	3587	3490	7077	1668
KAPUAS	SELAT	TERUSAN MULYA	1235	1153	2388	682
KAPUAS	SELAT	TERUSAN KARYA	1230	1194	2424	672
KAPUAS	SELAT	TERUSAN MAKMUR	930	883	1813	521
KAPUAS	SELAT	TAMBAN LUAR	1830	1728	3558	1036
KAPUAS	SELAT	HANDEL JANGKIT	2053	2062	4115	1080
KAPUAS	SELAT	PULAU KUPANG	3609	3449	7058	1692
KAPUAS	SELAT	SEI LUNUK	1894	1812	3706	973
KAPUAS	SELAT	PULAU MAMBULAU	1680	1592	3272	930
KAPUAS	SELAT	MURUNG KERAMAT	3250	3086	6336	1791
KAPUAS	SELAT	SELAT HILIR	4524	4601	9125	2467

District	Subdistrict	Village	Total male population	Total female population	Total population	Number of Families
KAPUAS	SELAT	SELAT TENGAH	7811	8114	15925	4338
KAPUAS	SELAT	SELAT HULU	5783	5932	11715	3058
KAPUAS	SELAT	SELAT DALAM	2949	3011	5960	1616
KAPUAS	SELAT	PULAU TELO	2133	1979	4112	1054
KAPUAS	BASARANG	PANGKALAN REKAN	1098	1077	2175	569
KAPUAS	BASARANG	BASARANG	1284	1138	2422	576
KAPUAS	BASARANG	MALUEN	960	897	1857	485
KAPUAS	BASARANG	BASUNGKAI	490	487	977	249
KAPUAS	BASARANG	LUNUK RAMBA	452	405	857	249
KAPUAS	BASARANG	BATUAH	558	531	1089	302
KAPUAS	BASARANG	TAMBUN RAYA	974	931	1905	538
KAPUAS	BASARANG	PANGKALAN SARI	928	930	1858	527
KAPUAS	BASARANG	BUNGAI JAYA	820	953	1773	482
KAPUAS	BASARANG	BASARANG JAYA	578	588	1166	309
KAPUAS	BASARANG	PANARUNG	272	274	546	155
KAPUAS	BASARANG	TARUNG MANUAH	215	230	445	117
KAPUAS	BASARANG	BATU NINDAN	554	544	1098	302
KAPUAS	KAPUAS HILIR	HAMPATUNG	913	888	1801	539
KAPUAS	KAPUAS HILIR	DAHIRANG	573	618	1191	320
KAPUAS	KAPUAS HILIR	BARIMBA	897	871	1768	507
KAPUAS	KAPUAS HILIR	SEI PASAH	671	580	1251	330
KAPUAS	KAPUAS HILIR	BAKUNGIN	592	585	1177	349
KAPUAS	KAPUAS HILIR	SEI ASAM	1012	909	1921	526
KAPUAS	PULAU PETAK	TELUK PALINGET	1388	1347	2735	789
KAPUAS	PULAU PETAK	BUNGA MAWAR	1330	1340	2670	697
KAPUAS	PULAU PETAK	SEI TATAS	1481	1431	2912	846
KAPUAS	PULAU PETAK	NARAHAN	1248	1279	2527	658
KAPUAS	PULAU PETAK	PALANGKAI	469	502	971	302
KAPUAS	PULAU PETAK	HANDIWUNG	1335	1349	2684	678
KAPUAS	PULAU PETAK	ANJIR PALAMBANG	1558	1525	3083	705
KAPUAS	KAPUAS MURUNG	PALINGKAU BARU	1704	1670	3374	892
KAPUAS	KAPUAS MURUNG	UPT PALINGKAU SP1	511	479	990	241
KAPUAS	KAPUAS MURUNG	PALINGKAU LAMA	3824	3967	7791	1922
KAPUAS	KAPUAS MURUNG	UPT PALINGKAU SP2	348	326	674	185
KAPUAS	KAPUAS MURUNG	UPT PALINGKAU SP3	486	389	875	190
KAPUAS	KAPUAS MURUNG	TAJEPAN	1427	1443	2870	789
KAPUAS	KAPUAS MURUNG	MAMPAI	1594	1645	3239	887
KAPUAS	KAPUAS MURUNG	MUARA DADAHUP	1030	1065	2095	530
KAPUAS	KAPUAS MURUNG	DADAHUP	1492	1065	2557	783
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A1 (BINA JAYA)	782	751	1533	535
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A2	692	582	1274	364
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A4 (HARAPAN BARU)	678	657	1335	384

District	Subdistrict	Village	Total male population	Total female population	Total population	Number of Families
KAPUAS	KAPUAS MURUNG	(UPT DADAHUP A5) BENTUK JAYA	724	680	1404	415
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A6	141	167	308	97
KAPUAS	KAPUAS MURUNG	UPT DADAHUP B1	585	534	1119	343
KAPUAS	KAPUAS MURUNG	UPT DADAHUP B2 (SUMBER AGUNG)	625	531	1156	536
KAPUAS	KAPUAS MURUNG	UPT DADAHUP B3	342	353	695	197
KAPUAS	KAPUAS MURUNG	UPT DADAHUP B4	269	292	561	158
KAPUAS	KAPUAS MURUNG	UPT DADAHUP F2	233	191	424	119
KAPUAS	KAPUAS MURUNG	UPT DADAHUP F5	329	262	591	160
KAPUAS	KAPUAS MURUNG	UPT DADAHUP G1	657	665	1322	315
KAPUAS	KAPUAS MURUNG	UPT DADAHUP G2	388	380	768	209
KAPUAS	KAPUAS MURUNG	UPT DADAHUP G3	396	388	784	214
KAPUAS	KAPUAS MURUNG	UPT DADAHUP G4	392	418	810	217
KAPUAS	KAPUAS MURUNG	UPT DADAHUP G5	465	457	922	269
KAPUAS	KAPUAS MURUNG	BELAWANG	272	329	601	149
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A8	96	111	207	79
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A9	253	258	511	159
KAPUAS	KAPUAS MURUNG	PALANGKAU LAMA	258	254	512	167
KAPUAS	KAPUAS MURUNG	UPT DADAHUP A7	467	509	976	298
KAPUAS	KAPUAS MURUNG	PALANGKAU BARU	363	386	749	209
KAPUAS	KAPUAS MURUNG	UPT DADAHUP C1	398	405	803	208
KAPUAS	KAPUAS MURUNG	UPT DADAHUP C2	278	294	572	185
KAPUAS	KAPUAS MURUNG	UPT DADAHUP C3	384	412	796	201
KAPUAS	KAPUAS MURUNG	UPT DADAHUP C4	141	168	309	89
KAPUAS	KAPUAS MURUNG	TAMBAK BAJAI	211	237	448	131
KAPUAS	KAPUAS BARAT	SEI KAYU	1366	1222	2588	614
KAPUAS	KAPUAS BARAT	SAKA MANGKAHAI	2141	2152	4293	1037
KAPUAS	KAPUAS BARAT	MANDOMAI	1976	1932	3908	1056
KAPUAS	KAPUAS BARAT	ANJIR KALAMPAN	1104	1046	2150	608
KAPUAS	KAPUAS BARAT	PANTAI	817	928	1745	393
KAPUAS	KAPUAS BARAT	SAKA TAMIANG	853	870	1723	475
KAPUAS	KAPUAS BARAT	PENDA KETAPI	560	525	1085	303
KAPUAS	KAPUAS BARAT	TELUK HIRI	174	147	321	81
KAPUAS	KAPUAS BARAT	SEI DUSUN	653	606	1259	317
KAPUAS	KAPUAS BARAT	BASUTA RAYA	250	207	457	134
KAPUAS	MANTANGAI	MANUSUP	1341	1445	2786	696
KAPUAS	MANTANGAI	UPT LAMUNTI A 1	894	857	1751	350
KAPUAS	MANTANGAI	UPT LAMUNTI C 1	431	493	924	198
KAPUAS	MANTANGAI	UPT LAMUNTI C 3	749	787	1536	336
KAPUAS	MANTANGAI	SEI KAPAR	451	430	881	224
KAPUAS	MANTANGAI	TARANTANG	951	932	1883	482
KAPUAS	MANTANGAI	LAMUNTI	292	280	572	162
KAPUAS	MANTANGAI	UPT LAMUNTI A 2	298	291	589	203
KAPUAS	MANTANGAI	UPT LAMUNTI B 1	543	537	1080	299

District	Subdistrict	Village	Total male population	Total female population	Total population	Number of Families
KAPUAS	MANTANGAI	UPT LAMUNTI C 2	343	374	717	193
KAPUAS	MANTANGAI	UPT LAMUNTI C 4	206	180	386	119
KAPUAS	MANTANGAI	PULAU KALADAN	1051	1067	2118	556
KAPUAS	MANTANGAI	UPT LAMUNTI A 3	246	238	484	128
KAPUAS	MANTANGAI	UPT LAMUNTI A 4	284	301	585	141
KAPUAS	MANTANGAI	UPT LAMUNTI B 2	272	257	529	145
KAPUAS	MANTANGAI	UPT LAMUNTI B 3	467	500	967	176
KAPUAS	MANTANGAI	UPT LAMUNTI B 4	177	145	322	80
KAPUAS	MANTANGAI	MANTANGAI HILIR	1887	1938	3825	943
KAPUAS	MANTANGAI	UPT LAMUNTI A 5	156	158	314	82
KAPUAS	MANTANGAI	UPT LAMUNTI B 5	290	403	693	157
KAPUAS	MANTANGAI	MANTANGAI TENGAH	918	882	1800	467
KAPUAS	MANTANGAI	MANTANGAI HULU	986	858	1844	467
KAPUAS	MANTANGAI	KALUMPANG	542	493	1035	284
KAPUAS	MANTANGAI	SEI AHAS	401	433	834	208
KAPUAS	MANTANGAI	KATUNJUNG	438	592	1030	270
KAPUAS	MANTANGAI	LAHEI MANGKUTUP	1214	1156	2370	576
KAPUAS	MANTANGAI	TUMBANG MUROI	875	874	1749	438
KAPUAS	MANTANGAI	DANAU RAWAH	2045	1965	4010	1086
KAPUAS	TIMPAH	PETAK PUTI	555	585	1140	346
KAPUAS	TIMPAH	ARUK	327	256	583	149
KAPUAS	TIMPAH	LAWANG KAJANG	836	1026	1862	260
BARITO SELATAN	JENAMAS	TABATAN JAYA	51	65	116	28
BARITO SELATAN	JENAMAS	TAMPULANG	675	672	1347	371
BARITO SELATAN	JENAMAS	RANTAU BAHUANG	679	692	1371	404
BARITO SELATAN	JENAMAS	RANTAU KUJANG	1803	1916	3719	1110
BARITO SELATAN	JENAMAS	RANGGA ILUNG	1328	1343	2671	674
BARITO SELATAN	DUSUN HILIR	SUNGAI JAYA	885	783	1668	454
BARITO SELATAN	DUSUN HILIR	MAHAJANDAU	612	534	1146	296
BARITO SELATAN	DUSUN HILIR	MENGKATIP	2035	1835	3870	1094
BARITO SELATAN	DUSUN HILIR	KALANIS	1146	1132	2278	607
BARITO SELATAN	DUSUN HILIR	TELUK TIMBAU	535	531	1066	307
BARITO SELATAN	DUSUN HILIR	BATILAP	433	405	838	235
BARITO SELATAN	DUSUN HILIR	BATAMPANG	785	773	1558	423
BARITO SELATAN	KARAU KUALA	SELAT BARU	165	185	350	60
BARITO SELATAN	KARAU KUALA	BANGKUANG	2354	2255	4609	943
BARITO SELATAN	KARAU KUALA	TELUK BETUNG	609	603	1212	301
BARITO SELATAN	KARAU KUALA	BABAI	2558	2561	5119	1419
BARITO SELATAN	KARAU KUALA	Taliuk	737	786	1523	355
BARITO SELATAN	KARAU KUALA	TELUK SAMPUDAU	160	165	325	105
PULANG PISAU	KAHAYAN KUALA	CEMATAN	651	617	1268	359
PULANG PISAU	KAHAYAN KUALA	PAPUYU III SEI PUDAK	1273	1223	2496	595

District	Subdistrict	Village	Total male population	Total female population	Total population	Number of Families
PULANG PISAU	KAHAYAN KUALA	KIAPAK	461	428	889	248
PULANG PISAU	KAHAYAN KUALA	PAPUYU II / BARUNAI	512	467	979	252
PULANG PISAU	KAHAYAN KUALA	PAPUYU I / PASANAN	1127	1028	2155	513
PULANG PISAU	KAHAYAN KUALA	SEI RUNGUN	657	673	1330	319
PULANG PISAU	KAHAYAN KUALA	BAHAUR HILIR	1436	1369	2805	790
PULANG PISAU	KAHAYAN KUALA	BAHAUR TENGAH	1462	1424	2886	702
PULANG PISAU	KAHAYAN KUALA	BAHAUR HULU	2038	2005	4043	1066
PULANG PISAU	SEBANGAU KUALA	MEKAR JAYA	693	664	1357	336
PULANG PISAU	SEBANGAU KUALA	SEBANGAU PERMAI	723	612	1335	354
PULANG PISAU	SEBANGAU KUALA	SEBANGAU JAYA	333	292	625	163
PULANG PISAU	SEBANGAU KUALA	SEBANGAU MULIA	605	544	1149	301
PULANG PISAU	SEBANGAU KUALA	PADURAN SABANGAU	437	371	808	212
PULANG PISAU	PANDIH BATU	DANDANG	1177	1097	2274	369
PULANG PISAU	PANDIH BATU	TALIO	519	678	1197	400
PULANG PISAU	PANDIH BATU	GADABUNG	743	733	1476	411
PULANG PISAU	PANDIH BATU	BELANTI SIAM	1160	1080	2240	615
PULANG PISAU	PANDIH BATU	PANGKOH HILIR	404	389	793	217
PULANG PISAU	PANDIH BATU	TALIO MUARA	1182	1101	2283	606
PULANG PISAU	PANDIH BATU	TALIO HULU	1120	976	2096	606
PULANG PISAU	PANDIH BATU	PANGKOH SARI	626	361	987	319
PULANG PISAU	PANDIH BATU	KANTAN MUARA	860	781	1641	407
PULANG PISAU	PANDIH BATU	PANGKOH HULU	637	651	1288	267
PULANG PISAU	PANDIH BATU	SANGGANG	504	401	905	243
PULANG PISAU	PANDIH BATU	PANTIK	303	309	612	238
PULANG PISAU	PANDIH BATU	MULIA SARI	873	808	1681	493
PULANG PISAU	PANDIH BATU	KANTAN DALAM	795	743	1538	421
PULANG PISAU	MALIKU	G A N D A N G	1202	1077	2279	710
PULANG PISAU	MALIKU	GARANTUNG	1524	1394	2918	816
PULANG PISAU	MALIKU	MALIKU BARU	1698	1580	3278	972
PULANG PISAU	MALIKU	BADIRIH	550	465	1015	356
PULANG PISAU	MALIKU	TAHAI JAYA	1146	1351	2497	691
PULANG PISAU	MALIKU	TAHAI BARU	938	916	1854	508
PULANG PISAU	MALIKU	KANAMIT	994	881	1875	476
PULANG PISAU	MALIKU	PURWODADI	1047	969	2016	521
PULANG PISAU	MALIKU	WONOAGUNG	1168	1192	2360	397
PULANG PISAU	MALIKU	KANAMIT BARAT	923	869	1792	482
PULANG PISAU	MALIKU	SEI BARU TEWU	247	261	508	130
PULANG PISAU	MALIKU	SIDODADI	608	489	1097	262
PULANG PISAU	MALIKU	KANAMIT JAYA	564	467	1031	250
PULANG PISAU	KAHAYAN HILIR	BUNTOI	1372	1279	2651	772
PULANG PISAU	KAHAYAN HILIR	MINTIN	1550	1489	3039	895
PULANG PISAU	KAHAYAN HILIR	MANTAREN II	1165	1083	2248	714
PULANG PISAU	KAHAYAN HILIR	MANTAREN I	880	765	1645	414

District	Subdistrict	Village	Total male population	Total female population	Total population	Number of Families
PULANG PISAU	KAHAYAN HILIR	PULANG PISAU	3261	3183	6444	1819
PULANG PISAU	KAHAYAN HILIR	ANJIR PULANG PISAU	1664	1789	3453	818
PULANG PISAU	KAHAYAN HILIR	GOHONG	910	850	1760	522
PULANG PISAU	KAHAYAN HILIR	UPT ANJIR PULANG PISAU	817	794	1611	389
PULANG PISAU	JABIREN RAYA	GARONG	520	510	1030	250
PULANG PISAU	JABIREN RAYA	HENDA	374	311	685	169
PULANG PISAU	JABIREN RAYA	SIMPUR	272	219	491	117
PULANG PISAU	JABIREN RAYA	SAKA KAJANG	464	528	992	223
PULANG PISAU	JABIREN RAYA	JABIREN	1375	1141	2516	589
PULANG PISAU	JABIREN RAYA	PILANG	683	736	1419	315
PULANG PISAU	JABIREN RAYA	TUMBANG NUSA	526	478	1004	269
PULANG PISAU	KAHAYAN TENGAH	PETUK LITI	283	267	550	138
PULANG PISAU	KAHAYAN TENGAH	BUKIT LITI	384	352	736	181
PULANG PISAU	KAHAYAN TENGAH	BUKIT RAWI	506	500	1006	228
PULANG PISAU	KAHAYAN TENGAH	TUWUNG	285	256	541	127
PULANG PISAU	KAHAYAN TENGAH	SIGI	334	225	559	153

APPENDIX F: JATROPHA (DIS)-ADVANTAGES

Advantages	Risks and Challenges
- Jatropha yields a **high-quality oil** which is well suited for use in the transport and energy sector. - Jatropha has a high **yield potential** of more than 2 tons of oil per hectare per year. - Jatropha can grow on **poor soils** that are not suitable for food production; it is suited for the rehabilitation of waste lands. - It grows, among others, in **semi-arid regions** not suited for oil palms. - Jatropha requires significantly **less water** than oil palms (approx. 1/10). - Jatropha seeds do not have to be processed immediately (unlike palm); therefore **remote areas** can be included in the production schemes. - Jatropha can be planted as a hedge around fields or on unused land and offers **smallholders** an opportunity to create additional revenues. - Jatropha is well suited for **intercropping**, in particular during the first years while the trees are small. - Jatropha oil can be **used locally** to fuel vehicles, diesel generators, lamps or cooking stoves without a transesterification into biodiesel.	- Jatropha is a **wild species**, not a domesticated industrial crop. - **Yield expectations** are very uncertain due to inhomogeneous results and the lack of improved seed material; research on Jatropha and plant breeding has just started. - Jatropha will not produce good yields in poor conditions; there are **trade-offs** between rehabilitation of wastelands and maximisation of oil production. - Harvesting is very **labour-intensive** and may jeopardise the economic viability. - **Pests and diseases** are a problem for Jatropha as they are for any other crop, particularly in monoculture. - **Large-scale production** schemes may heavily distort local social and eco-systems. - Jatropha contains **toxic substances**. So far, no technologies exist to remove these, and hence the seed cake currently cannot be used as fodder for animals.

Source: GEXSI: Global Market Study on Jatropha

APPENDIX G: PM2L PROGRAM

A new program, since 2008, developed by the Bappeda is the PM2L program. This program aims to develop and build villages, based upon a tailor-made approach. The governor has set up this program, so it is for Central Kalimantan specifically. Once in 10 year they will investigate the status of each village in Central Kalimantan based on the PODES database. They give a score based on 15 variables.

	Variable	Classification	Score
1	Main road type in village	• Asphalt • Stones, hard road • Land	3 2 1
2	Main activity of local people	• Agriculture • Non agriculture	3 4
3	Educational facilities	• Primary school • Secondary school • High school	2 3 4
4	Health facilities	• No facilities • (Community) health center • Other facilities than health center	2 3 4
5	Health workers	• Midwifes • Paramedicals • Doctors	1 2 3
6	Communication facilities	• No facilities • Post office OR public phone • Post office AND public phone	2 3 4
7	Population density per km2	• < 100 • 100-300 • > 300	1 3 4
8	Drinking water source	• Clean water source • A well • Raining water	3 2 1
9	Fuel source for cooking	• Gas/electricity • Wood or other	4 2
10	Percentage of people using electricity	• < 5 • 5-15 • 15-70 • > 70	1 2 3 4
11	Percentage of people living from agriculture	• < 65.0 • 65.0-80.0 • 80.0-87.5 • > 87.5	4 3 2 1
12	Economic situation	• Very poor • Poor • Ok • Rich	1 2 3 4
13	Ease to reach health facilities	• Easy • Quite easy • Hard • Very hard	4 3 2 1
14	Ease to reach a market	• Easy • Quite easy • Hard	4 3 2
15	Ease to reach shops	• Easy • Hard	3 2

Total score: 27-32= far behind, 33-37=behind, 38-42=developed, >42=very developed.

Every village gets a total score based on these variables and gets the status *maju* (then no help is needed, the village is already advanced) or *tertinggal*. Villages that are *tertinggal* will be included in the PM2L program, their needs are determined and within 5 years the developments should be finished and the village should have reached the status of *maju*. This could for example include an investment in infrastructure, electricity access or in education facilities. From 2008 till 2011, pilot studies only in 3 villages per district have been performed. Because this was successful, they continue the program for all villages that are *tertinggal*. The minimum score is 26 and the maximum score is 44. Villages with a score of 36 or higher are *maju*. The average score in Central Kalimantan is 35, so on average the villages in Central Kalimantan are *tertinggal*. The average score in the EMRP area is 34, so these villages are less developed than the average in Central Kalimantan. 136 villages have the status of *tertinggal*, that is 60% of the total amount of villages in this area!

APPENDIX H: OBSERVATION REPORTS

Summary

During 6 days, 17 villages are visited. These villages are all located in the EMRP area and are in three of the four districts in this area and located in 7 different sub-districts (total is 22). The villages visited are the following:

Palangka Raya: Kereng Bangkirai, Kalampangan
Pulang Pisau: Badirih, Maliku, Kanamit, Bahaur , Dandang, Talio, Pangkoh, Buntoi
Kapuas: Dadahup village, Dadahup A1, Dadahup A2, Dadahup G5, Mandomai, Pantai, Anjir

A extensive description of each village can be read in observation report 1 to 7. This is a summary of the observations and some conclusions based on these observations.

Agriculture / Input Crops

The main income of the visited villages is agriculture. Some crops are used for local consumption, others are sold to a company. No machineries are used for the process, people work tradition with their hand. Next to agriculture some villages live from fishery. Although most of the villages are located next to the river, the fishery industry was smaller then expected. Industry is in very small amount available. Mostly little retail shops, but in the “larger” villages like Pangkoh, Bahaur and Mandomai there is on small scale industry visible, for example wood production.

Rubber

Rubber plantations are located all over the visited area. The biggest plantations are found along the road of Buntoi – Bahaur and Kapuas – Pulang Pisau. The rubber trees are planted in rows and between the rows there is a space near to four meter. Near Anjir the trees are planted very close and according our guide this has negative influence of the quality of the trees. Some plantations have very young trees, others are very old.

The rubber process is as follows:

- The farmer cuts the tree early in the morning, white rubber comes out the tree in a little stream and is captured in a coconut shell
- Around 11:00 the farmer collects the rubber and process this with vinegar.
- The rubber gets hard and is captured in proportions of 50 kg.
- A middle man checks the quality, weights the rubber and buy the rubber from the farmer for +/- Rp7.000 per kg. The middle man sells it to a company (profit of 700 Rp per kg) which exports the rubber mostly to China were it will be processed into products like tires.

This process repeats every other day. According to a farmer in Kanamit the nuts of a rubber tree grows once a year and only in dry season. He does not use the nuts. Sometimes a new plant is

growing out of the nuts and then he takes and replant it on his land. Some children use the nuts as a toy, something we have seen in a house in Dadahup A2.

Palm oil

During the site visits, we have seen just one palm oil plantation, which was located near to Anjir. This is caused because not many plantations are located in the visited area and the plantations are mostly far from the road and villages. The plantation is owned by a company named PT. Fajar Mas Indah and the security was too strict to take a closer look. Although we thought it was a big plantation, our guide explained it was just a small one. Some people in the area have palm oil trees for themselves, but this is not more than two or trees and therefore not enough for the MBD. In the Dudahup area a plan of the Bupati shown by a local person. Although our guide was acting strange and would not translate the content of the plan, the pictures made the content clear enough. The timeframe was 2008-2013 and the mission of the plan was to increase the agriculture in the area. There was a map of the EMRP area with block A till E and a map of the near area: “the Kelapa Sawit area” (The palm oil Area). The area was around 24.000 ha and there was also a big amount of money Rp 200.000.000. According to our interpretations and observations this is a plan of a company and Bupati to make the area a palm oil area. Along our way to Dadahup we have seen many logging. And it is, according to our guide, not allowed to talk about this to us. So, we believe that the people are under pressure of the government.

Jatropha

In the visited area we have not seen Jatropha. Also the people were not familiar with the crop.

Other Crops

The two major available crops in the visited area, next to rubber and palm oil, are rice and coconuts. Coconut trees are located spread over the whole visited area, but the only coconut plantations seen are along the road between Pangkoh and Bahaur. They make sugar of the coconut and sell the oil. Complete coconuts are also sold to Palangka Raya were it is used for drinking. Rice fields are located in the whole visited area. They use it for own consumption and/or selling to companies. Sometimes the rice is intercropped with rubber- or coconut trees. The are some little Cassava plantations located near Maliku.

Infrastructure

External infrastructure

The external infrastructure, so the roads to the village, was much better than expected. Many roads are made from asphalt, some with white stripes in the middle. The distance to big villages influence the quality of the road (further away, less quality), something seen in the road from Buntoi to Bahaur. Some villages are not accessible by road in rainy season, for example Dadahup A1 & A2. Some roads are made from soil and holes are fixed with wood from trees.

Internal infrastructure

The roads in the villages (internal infrastructure) differs much from the external infrastructure. Some villages, like Anjir and Kereng Bangkiray, are located along the main road and the infrastructure is therefore good. Bahaur and Dadahup have a good infrastructure and are easy accessible by car. But many other villages we have seen are not accessible by car. Small roads made of soil or wood can only be driven by motor cycle and bicycle. Also the roads to agricultural land are very small.

Education

Every village visited has its at least one elementary school. Most often, the smallest (and least developed) villages do not have a secondary school or high school. Children living in the small villages go to the nearest secondary/high school, which is generally located in the capital of the sub district. We think education is in general well accessible for most children, since they have a lot of bicycles in order to reach the schools. For example, children living in Bandirih take their bicycles on the ferry to go to secondary/high school in Maliku.

With regard to the costs, elementary and secondary school (the first 9 years of education) are free of tuition. This decreases the barrier for school enrollment and has resulted in high levels of enrollment. According to the high school we visited, a lot of costs are also subsidized by government, which also decreases this barrier. Students indicated however that continuing to university depended for a large degree on the ability to pay the tuition fee and also the housing, since universities are more far away (Palankaraya, Benjarmasin, Kapuas). From a university student we heard that for one year the tuition fee is 2 Million Rupee (€ 165,-).

Since the government had a special program that started a couple of years ago, lack of teachers is not really a problem. Some schools have special housing facilities for teachers who moved to the area especially to teach. However, we question the quality of the teachers. Speaking to an English teacher in English did not at all work out. She did not understand us and her English did not make sense to us, so we let our guide be the interpreter.

Health Facilities

Around 50% of the villages has its own community health center for basic health services. People can get medicines here, which are free within opening hours. We talked to the nurse in Badirih and she mentioned that she moved here 4 years ago after signing a contract with the government for at least 10 years. She mentions that she can also take care of pregnant women. She also indicates that the problem with local people is that a lot of times they are ill, they do not go to the community health center, because they rely on traditional medicines. If the illness is more serious, people have to go the Maliku with the ferry. However, this is not so far. If they cannot help them there and really need special treatment, they are taken to the hospital in Pulang Pisau. Actually this is the procedure for all villages we visited. The community health centers are often small and basic, but can offer help and give medicines. The health centers we visited in Kalampangan was really great, with several different departments, like doctors, dentists, midwives and also place to stay overnight.

To conclude, we think that health services are well arranged in the basics. However, if quick help is needed for a more severe and difficult disease, it gets difficult. Getting somebody to the hospital can take up to 4 hours in the worst case.

PM2L Program

For an extensive description of the PM2L program, please take a look at appendix G. Seven of the sixteen visited villages has the status of *tertinggal*. Bases upon the database of PODES 2008 and the observations, we can conclude that villages with the status *tertinggal* are characterized by a bad infrastructure to or within the village or have difficulties accessing high education or health services. The government is really busy to improve these villages by building the needed facilities in the coming 5 years.

Conclusion

Technical

From the 3 input crops, oil of rubber is definitely the best option for the MBD project. The nuts are not used and the EMRP area is characterized by a lot of rubber plantations. If lucky, the farmers are also member of a rubber union and can be easily contacted. With regard to the infrastructure, all main roads are quite good consisting of asphalt or amplified and can easily be used by a truck. However, to really reach the center of some villages, the truck can use a small road, which is not made for trucks but might be possible to use. Another option we thought of is to place the truck of the main road, which can also easily be reached by the local people by scooter or bicycle, and process the diesel there.

Needs

We do not really think diesel is something these villages really need. All villages have access to electricity (most use PLN, other Non PLN), food, tv etc and are ok with their way of living. Also access to education and health services is a lot better than expected and the government is really busy developing the villages. The most people have their own scooter and use benzene (=gasoline). Benzene is quite cheap, 6.000 Rp per liter, because it is subsidized by the government. Cars also run on benzene, however trucks and boats have a diesel engine. The local use and benefits of producing their own diesel really depends on the applicability of the diesel. Can the diesel also be used for cooking, instead of kerosene? Can the diesel be used instead of benzene, for cars and scooters? If yes, it would save them some money if the costs per liter is below 6.000 Rp. However, is this really economic development?

We share the opinion that most of these villages are better helped by other things such as building a plant for rubber processing or giving them an irrigation machine for the rice fields, which can really make a big difference.

How to make the MBD program successful

We do not think that if these local people are asked to provide a business plan for local diesel production. The Bappenas tried this before, but got almost no response. Firstly, this can be because

they are willing to but they have limited knowledge. Secondly, some villages with limited economic activity just rely on the government and do not take any initiative themselves. They just wait till the government has a new plan for them and do what they are told. Therefore we think local people should be trained and explained about biodiesel before they are asked to hand in a business plan. Also, for the less economically developed villages, we think you really need “to take their hand” and just tell them what they have to do and let them operate, since we do not expect them to take any initiative.

Observation Report 1: Kereng Bangkirai, 14-05-2010

Kereng Bangkirai is a small village close to Palangkaraya, about 10 kilometer. It is easy accessible by car, motorcycle or even taxi since the main road is made from asphalt. The taxi buses from Palangkaraya also serve this area. The side roads are small and not easily accessible by car. However, most people live on the main street here. The houses are quite big and look nice. The main structure is made of wood, but most roofs are from TATA plates. Some are from wood.

Businesses

- The main source of income is fishery. People fish in the peat land river as well as the wetland near the road. The fish is sold to local people as well as people from Palangkaraya.
- Besides fish they also sell a special kind of wood. This wood needs to be dried and then it has to be further processed in order to produce the circular mosquito protection products that have to be lighted. This is sold to Palangkaraya and Benjarmasin.
- Cassava is also made by local people, but this is mainly for local use. Just like the small gardening sites we saw.
- Gasoline and solar is being sold. This is bought by benzene stations and packaged in 1 or 2 liter bottles. The price of solar for one liter is 5.000 Rp, at the most benzene stations it is 4.500 Rp. So their profit is 500 Rp per liter at maximum.
- There is one quite big supermarket. Besides that, a lot of small local shops exists selling noodle soups, chips, candy and water for example. These supplies are delivered at the shop by the brand itself one in a while.

Transportation

A lot of scooters, only a few cars we have seen. Also a lot of bicycles!

Facilities

- A community health center.
- A primary school in the center of the village. Junior high school is located about 2km outside the center, but easy to reach by asphalt roads. Both schools look quite big. For the junior high they even have houses for the teachers. Senior high school is more far away, about 10km.
- They have a Muslim Center, since most people are Muslim.
- Most houses have normal electricity and a lot of houses have TVs.
- Public street lightning (lantaarn palen) is present, but only limited.

Photo Report

Main road

Side road

Electricity Network

Community Health Center

Supermarket

Selling Solar/Gasoline

Wood sold as mosquito protection

Cassava

Gardening

Small local shop

Fishery

Motorcycles

Primary school

Junior high school

Library

Classroom

Buildings of Junior High School

Houses for Teachers

Sports facilities

Observation Report 2: Kalampangan, 14-05-2010

Kalampangan is a small village close to Palangkaraya, and about a 15 minutes drive from Kereng Bangkirai. The village was established in 1980 by 500 families of transmigrants. The village is located on the dome of the peat land between Kahayan and Sabangau rivers. It is easy accessible by car, motorcycle or even taxi since the main road is made from asphalt and is in a really good condition. It even has the white stripes in the middle to divide the lanes!! The side roads are small and consist of 'kiezelstenen'. Most communities live in these side roads. On the main road there are mostly people that have quite big gardening land, such as corn, cassava, kind of potato, cucumber etc. We have not been into the side streets, only on the main road and to the health center (which is not a community health center but a real health center) and to the junior high and vocational school. The houses on the main road are quite big and look nice. The main structure is made of wood, but most roofs are from TATA plates. Some are from wood. We even saw a 'zonnepaneel'.

Businesses

- The main source of income is farming/gardening. Corn, cassava, cucumber, etc. They do not use machinery to harvest, only their hands! Gardening takes place on peat land. However, before being able to do this, the peat land has to be burned in order to rise the PH and make the land less acid ('zuur'). The success of farmers' cultivation is totally determined by using ash as the main fertilizer. However, the production process of ash increases CO2 emission.
  The products are also sold to Palangkaraya and Benjarmasin. It seems to be the case that each region has its owns specific gardening crops, that's why they even sell to people from Benjarmasin, which is about a 4 hour drive. Those people come to Kalampangan once in a while to buy loads of the vegetables/fruits in a time.
- A lot of small local shops exists selling noodle soups, chips, candy and water for example. These supplies are delivered at the shop by the brand itself one in a while.

Transportation

A lot of scooters and bicycles. Only a few cars.

Facilities

- A health center, with dentist, doctor, midwife, baby care, vaccination etc. Even place to stay overnight and also an intensive care for critical patients.
- Primary school, junior high, senior high and a vocational school that specializes in farming and has 60 students at this moment. We have visited the junior high school and the vocational school, which are situated next to each other and share some facilities like sports fields.
- Cooperation. If we understood it right, this cooperation is some sort of bank/credit union, in which students can save their money and also borrow money from.

Photo Report

Main road

Side road

Gardening; *Corn*

Fruit

Health Center

Oxigen defice at intensive care

Ambulances

Generator

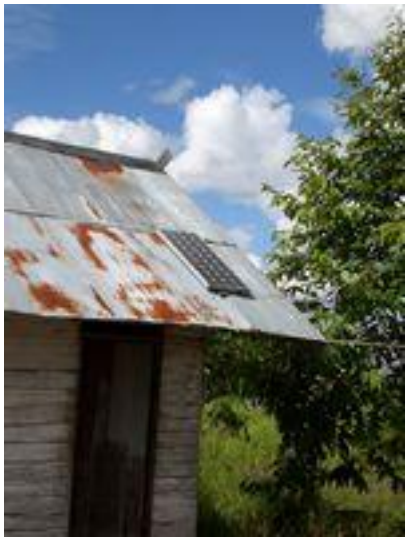
Dentist

Doctor

Junior High School & Vocational School (Farming)

Cooperation

Zonnepaneel



Rubber tree next to the main road (only 1)

Observation Report 3: Badirih, Maliku & Kanamit, 20-05-2010

Badirih

Badirih is a small Dayak village and reachable from Maliku by a small ferry. It is also possible from the road between Pulang Pisau and Kapuas, but with a small road and just by motorcycle. The roads in the city are mainly made of wood and soil. The houses of the people are in the water, and sometimes under water (We have seen a kitchen in the water).

Businesses

- Most of the businesses are very local. So there are little local shops, little rice production, little wood production, local fishery, chickens, all for their own small community.
- With dogs they are hunting on pigs, but also for small production
- For luxury goods they take the ferry to Maliku, where they go the market.

Local transport

Within this villages there are very little amount bikes, more bicycles. No cars! Many small boats and a ferry.

Facilities

- In the house there are many luxury goods, like refrigerator, stereo, tv, rice cooker. Also many plates and glasses.
- There is one elementary school, and for the other types of schools they go with the bicycle and ferry to Maliku. The teachers of the elementary school are from the village, the school is very small since there are 100 families living in this village.
- They have a little community health centre. The nurse went to (and is) nursery school in Palangka Raya four years ago. She signed a contract from the government to stay in Badarih for at least ten years. She did not really have a choice, her husband still live in Palangka Raya. The government paid her house (integrated with healthcentre). The opening hours are from 7:00 till 12:00 and the medicines and help is free during opening hours, since she is paid by the government. If help is needed on another time, people have to pay. The facilities were very limited, if she can't help them, they go to health centre in Maliku. She also serves pregnant women.
- People don't have an own toilet, but use the river.

Maliku

Maliku is a quite big village and develop compared to other villages in its region. The village is divided in different parts. It is a transmigration village. The road to Maliku from Buntoi is easy accessible by car and is mostly asphalt.

Businesses

- The main business is agriculture. Many rubber and cassava, corn, bananas, vegetables in the surrounding area.
- There are many shops in this village. A hairdresser, tailor, restaurants, motorcycle retailshop and a post office. A couple of shops are using advertising.
- Also cows are sold from Maliku and Talio to Palangka Raya. The business chain is as follows: The farmer sells his cows to a middle man (the guys we have spoken to are from Java). This middle man transports it to palangka Raya. There it will be killed and prepared for the food business. The profit for transferring and killing is around 1.000.000 Rp per cow.
- We have also seen a small wood processing company which makes doors and windows.
- Several bird houses are being build. Many workers are there. However, we do not know if these are local people or people from the company.

Transportation

Many scooters and also cars.

Facilities

- Doctor
- Post office
- Health centre (quit big)
- Several elementary schools, junior high school and a senior high school. We visited the senior high school and talked with teachers and students. However, none of the teachers could speak English, including the English teacher. This school has 350 students, who are all living n the close area and go there mostly by scooter. The teachers are also from outside the region, for instance Kapuas. They moved here and some of them are living in special teacher houses next to the school. We have talked to two classes (1st and second class). Hearing and talking in English was quite hard for them and it was hard for them to ask questions. The response on the question if they wanted to go to the university was that they did not know, also because of the money.
- Electricity is also available and the same as in other villages used for luxury goods and sometimes for small businesses.

Kanamit

Kanamit is a village with a small city centre. Most of the people are Dayak people, but also some people moved here ten years ago with a big group from Benjarmasin for merchandising. Kanamit is located between Buntoi and Maliku and that road Is very good, but the road inside the village is not so good and not accessible by car.

Businesses

- A couple of small shops, like mini market, clothe stores and also stores for small luxury goods. The owner of a little shop told that many families owning a shop are also working in agriculture.
- Many people live from rubber, there are many rubber plantations in this area. We have spoken to a farmer. He starts the rubber process around 7:00 in the morning, he cuts one or two small holes in the tree. The rubber comes out the tree and they catch this with a coconut shell. After cutting all the threes he waits and around 11:00 he puts all the rubber in a bucket. After that he process the crude rubber with vinegar. After that he keeps the rubber wet and wait for the middle man who buys this rubber. He told that the nuts are only there in dry reason. They don't do anything with the nuts. Sometimes they are lucky and there grows a new tree out of the nut. They takes this little plant to somewhere else where they plant it.
- People from Kanamit work in palm oil plantations. These plantations are located 50 km outside the village and is only accessible by Klotok. The plantations are owned by big companies.

Transportation

Many scooters, some cars with houses outside the city centre.

Facilities

- Electricity is also available and the same as in other villages used for luxury goods and sometimes for small businesses. The owner of a shop told the price of electricity. She has to pay 120.000 Rp per month. According to her, some families pay more, but there are also people who just pay 30.000 Rp per month.
- Other facilities are there, but we have not seen them.

Photo Report

Rubber plantation on main road *(Kanamit)*

Tapping of rubber before collecting *(Kanamit)*

Small road to Kanamit village

Cow transportation to Palangkaraya *(Maliku)*

General high school *(Maliku)*

Hairdresser*(Maliku)*

Restaurant *(Maliku)*

Building of bird houses *(Maliku)*

Wood processing business *(Maliku)*

Main road in Maliku village

Side road in Maliku village

Rice fields + Banana *(Maliku)*

Ferry to Bandirih

Road along (or in) the river *(Bandirih)*

House on water *(Bandirih)*

Living room from house visited *(Bandirih)*

Refrigerator, rice cookers in house *(Bandirih)*

Local boats *(Bandirih)*

Baby, koelkast, etc *(Bandirih)*

Kitchen under water *(Bandirih)*

Community Health Center *(Bandirih)*

Community Health Center Facilities *(Bandirih)*

Observation Report 4: Bahaur , Dandang & Talio, Pangkoh, 19-05-2010

Bahaur

The road from Buntoi to Bahaur is in beginning really good, mostly asphalt. The road after Pangkoh is mainly soil and sometimes not good, many holes. In rainy season this part of the road to Bahaur, from Buntoi, gets really bad, since it is mainly made of soil. On the road there are many rubber plantations, but also rice and coconut plantations. The sideways to villages and agricultural land is in bad condition. There are just a few oil shops outside the villages. Lots of canals are visible due to the EMRP. Bahaur is a quite big city and close to the sea. The city has three main areas, Bahaur Hulu, Bahaur Tengah and Bahaur Hilir. Most people live along the river. Their houses can be reached by small roads, but are accessible by car.

Businesses

- The main source of income is selling rubber.
- The second main source of income is rice paddies. This is mainly for local use, but is also sold to Kapuas and Benjarmasin for example.
- Production of boats, but only for local use.
- Production of baskets, from something like palm oil tree, but different, grows in the water.
- Every day there is a small local market, which sells eggs, dry fish, clothes and also luxury goods like shampoo and accessories.
- A lot of bird ('wallet') houses are built by companies from outside of the village who buy land from locals. The nests are worth a lot of money.
- Small retail of bensin/solar. Price of bensin: 6.000 Rupiah per liter. They buy it in Pulang Pisau and transfer it by scooter (ferry).

Local transport

A lot of scooters, some bicycles and also a few cars. There are just a few boats, mostly used for local transport or to reach their plantations.

Facilities

- A lot of small local shops, where it is also possible to eat.
- Couple of primary school, a junior school and a high school. Easy accessible. All schools look alike, since it are mostly public schools. Also a health centre, but under water ☺
- Most houses have normal electricity, which is used for TV, light, vans, refrigerators, rice cookers and sometimes computers. A restaurant owner told that he has to pay 150.000 Rp per month for electricity
- They also have a political party and a Muslim center.

Dandang & Talio

Dandang and Talio are both very small villages located on the road from Pankoh to Bahaur. The main people that live in here are indigenous Dayak people. They live along the river, just like in Bahaur. This place is only accessible by scooter or bicycle. Some people live along the main road. We have not seen Dandang, but heard it was the case. Between Dandang and Talio they are building a harbor! This to facilitate export. To serve the other villages, mainly small boats like klotoks will be used for supply/demand of the harbor. Just as in most villages in we have seen, the people are doing almost nothing. Hanging around, watch tv or sleeping. A little amount of the people is working, mostly on agriculture.

Businesses

- The main businesses are the selling of rubber and the use of rice for themselves. The rice cannot be sold very good, since the rice is acid due to the peat land.
- They also have cocos trees and sell pigs. Lots of Casave plantations are located along the road between Dadang and Talio.
- Although they live next to the river, they don't sell fish. If they fish, they use an accu/generator to kill the fish. This is much more efficient than traditional fishing with 'hengels'. They catch a lot, and consequently dry them, in order to conserve without refrigerator. But we have heard that they don't fish for business because there are not many fish in the river anymore.

Transportation

Some scooters and more bicycles. No cars!

Facilities

- These villages are more poor than Bahaur and Pankoh. Our guide mentions that this is caused by the fact that they are indigenous Dayak people that like to live from the forest etc.
- Although they have a very simple life, they have electricity and use this for light, stereo, television.

Pankoh

Pankoh is separated into 3 different parts; 1, 2 & 3 according to them. It is mainly a transmigrant village. There is quite a big distance between part 1, 2 & 3. In contrast to Bahaur. Part 1 (south) is mainly along the main road and a lot of businesses can be seen. Normally, you only see people working in the forest. The houses in part 1 are also bigger, more luxury.

Businesses

- In 1, they produced doors and 'vensters'. They get also glass from Maliku. They also have small shops, + eating (with advertisements). Moreover, cows and other animals are hold. We have seen the first truck used for business here.
- In 2, we have also seen local shops. The owner of the shops by the products mostly on the boat and the market. If he buys at the boat, the owner doesn't need to pay immediately. He gives the money if he sold the products, good relationship.
- In 3, there is a small bus terminal. However, we question if these buses are used….
- The main source of business for Pankoh 1,2,3 is coconut trees. They make sugar and sell the coconut oil. They also sell complete coconuts to Palangka Raya and there it is used for drinking
- Small fuel retail shops. These are mostly integrated with other businesses, like local shops.

Transportation

The main transportation is with scooter, but also some cars, trucks and taxi buses (these were very old).

Facilities

- The road between Bahaur and Pangkoh is mainly soil and not so good, but the road between Butnoi and Pangkoh is really good, mostly asphalt. The road between Pangkoh 1,2,3 is soil. The side roads are also in bad condition.
- Most houses have electricity, used for luxury goods. Also for the production of the doors and 'vensters' they use electricity.

Photo Report

Main road Pangkoh - Bahaur

Many canals along the road

Intercropping Coconut – Rice *(Pangkoh –Bahaur)*

Rubber *(Buntoi – Pangkoh)*

Main road *(Bahaur)*

Along the river & fishery *(Bahaur)*

Wood and TV sattelite *(Bahaur)*

Boat production *(Bahaur)*

Computer services/ facilities *(Bahaur)*

Local people in little shop *(Pangkoh)*

Goats *(Pangkoh)*

House with little truck *(Pangkoh)*

Main road & truck for wood transportation *(Pangkoh)*

Wood processing *(Pangkoh)*

Toilet in river *(Talio)*

Small road to Talio

Pig *(Talio)*

Houses on the river *(Talio)*

Toilet *(Dandang)*

Road to Dandang

Coconut plantations *(Dandang)*

Observation Report 5: Buntoi , 18-05 tm 20-05

Buntoi is a small Dayak village close on the way of Palangkaraya to Pulang Pusau and is located between Palangkaraya and Kapuas&Benjarmasin. The village is located near the Kahayan river. The village is easy accessible by car, since the main road is made of asphalt. However most people live in these side roads, along the river. The side roads are very small and in bad condition. With the motorcycle you can also reach the village by ferry. The houses are all build on 'palen' and quite big. Most roofs are from TATA or wood. Cooking is (mainly) done by means of wood.

Businesses

- The main source of income is selling rubber. We have seen some small plantations, but in this area there seems to be a lot of rubber. The nuts are not used, this could be an opportunity. The farmers sell the rubber to a middle-man, who consequently transports and sells it to Indonesian companies, who export it mainly to China for further process. The farmer sells on average for 7.000 Rupiah per kg. What we heard was that the middle-men, who only buys and resells, gets a profit of 700 Rupiah per kg, if good quality.
- The second main source of income is rice paddies. This is mainly for local use, but is also sold to Kapuas and Benjarmasin for example.
- It surprised us that they do not have a lot of fishery…..! The river is very very big!
- It was hard to find small local shops selling noodle soups, chips, candy and water for example, as well as a place to eat. Once a week, a small ship will stay at the village for one day that brings new supplies for shops as well as the families. This ship travels from village to village.
- Every day there is a small local market, which sells eggs, dry fish, clothes and also luxury goods like shampoo and accessories. Once in a week there is a big traditional market, selling fruits and vegetables etc.
- Small retail of bensin/solar.

Transportation

A lot of scooters and no (just one) cars, this is mainly caused by the fact that the houses where people live cannot be reached by cars. There are just a few boats, mostly used for transportation of rubber, goods or people (ferry). Not only used in the big river, but also to the agricultural fields.

Facilities

- Primary school and junior high are located in Buntoi. We have seen two primary schools, one was in the village and the other near to the main road (just outside of the village).
- We have stayed for three days in Buntoi. The house were we slept was quite big, with all the facilities inside (TV, Refrigerator, Rice Cooker, Stereo, Accu in case the electricity goes out and even a computer). This was representative for houses in Buntoi. In the three days the electricity was off for several hours, something what is normal in this village.

Photo Report

Main road

Side road

Ferry

Water supply for the house

Shared Toilet

Cooking

Rubber Process: *Small rubber plantation* *Tapping of rubber* *Unused seeds*



Rubber as it is sold by farmer

Middle man weights the rubber he wants to buy

Primary school 1

Primary school 2

Boat Market

Longhouse *(original housing Dayak)*

Houses on water *(also killing monkey)*

Electricity supply

Wood storage

Local market

Own shower in house

Own toilet in house

Kitchen part 1, wood

Kitchen part 2,

Observation Report 6: Dadahup , 22-05-2010

Dadahup village

The road from Kapuas to Dadahup is really good, mostly asphalt with a line in the middle. At the end to really reach Dadahup village the road is less goad, very small with many holes. Between Kapuas and Dadahup there are many rice fields, bigger and more then we have seen before. There are also some rubber and coconut plantations. We also have seen many logging along the road. We saw big trucks picking up the cut trees. A couple of villages are located along this road, like Palingkau and Tajepan. These villages have, according to PODES 2008, all a *maju* status. So these villages are not in need of further development and this is in our believe caused by their location along this road. Many shops for food, car reparations and selling of products.

Dadahup is the main village, but has many (+/- 20) small surrounding villages called Dadahup A1,A2,B1,B4 etc. Dadahup village is a *maju* village and the other Dadahups are called a *tertinggal* village, so not developed and in need of development. Most people in Dadahup village live along the river. The roads in the village are mostly soil and wood.

Businesses

- The main source of income is rice.
- There are a couple of small shops, a few places to eat.
- A couple of women are making products and souvenirs of Rotan.

Transportation

A lot of scooters, some bicycles and also a few cars. There are just a few boats, mostly used for local transport.

Facilities

- Most of the houses have electricity. They use it for luxury goods.
- Once a week there is a big market were people from outside the village come to sell their stuff. The other Dadahup villages (like A1 and A2) come also to Dadahup village to buy products on this market
- There are many schools and health facilities, but we have not seen them

Dadahup A1

Dadahup A1 is also a *maju* village. It is very small and according our Klotok driver only accessible by Klotok. Normally it is possible to reach the village by scooter, but due to the wetter this road was broken. The canals to this village were 12 years old and in good condition, probably made in the EMRP time. Dadahup A1 is a transmigration village, but mostly local people.

Businesses

- The main business is rice.
- A local man showed our translator (Endo) a plan, a PowerPoint presentation on paper from the Bupati of Kapuas. He explained the subject of this plan to Endo, but he did not want to translate it to us. Endo was acting strange and was referring to the letter of Cimtrop and that is was not possible to get documents or explanations from local people. We have seen the document and it was about Sawit (palm oil). Although we did not have a translation of Endo, the goal of the paper was quite clear. The mission was to increase the agriculture in the area. There was a map of the EMRP area with block A till E. On another page there was a map of the close area, the Kelapa Sawit area. The area was around 24.000 ha and there was also a big amount of money Rp 200.000.000. The plan was for 5 years, 2008-2013. According to our interpretations and observations this is a plan of a company and Bupati to make the area a Palm oil area. Along our way to Dadahup we have seen many logging. And it is, according to Endo, not allowed to talk about this to us. So, we believe that the people are under pressure of the government.

Transportation

Some scooters, no cars. A few boats.

Facilities

- We have been into a house. The house was very basic, but it had Television. The people were cooking with wood.
- In the house were the nuts of the rubber tree used by children for playing.
- Most of the houses have electricity
- Minimal facilities, hard to understand why this village is *maju* village

Dadahup A2

The numbers of the Dadahup villages are not logical so it took us 30 minutes by Klotok to reach this village. During this travel we have seen again many logging. Some boats transfer cut trees. Dadahup A2 is a small village and the houses are located spread out over the area. It is a transmigration village, with people from Java, Kalimantan and Sulawesi. The streets are very small and in bad condition. According to a local shop owner the government invest in infrastructure in this area. In Dadahup A5 there are already roads from asphalt and according to him this will be also the case in Dadahup A2 next year.

Businesses

- Many rice fields, the main income is rice. They use the rice for local consumption or they sell this to a company. This company sells this to Benjarmasin. According to the shop owner, the irrigation system is not good, mostly due to the bad condition of the dam close to this village. The government need to invest in and repair this dam. They harvest the rice now twice a year, to increase to this to 3 or 4 times a year, they would need an engine for water management. This could be an opportunity for the MBD!
- They also have fishery, but on low scale
- Once a week there is a little bazaar. People from outside the village come here to sell their products. This is a small market, so for other goods they go to Dadahup village. The supply to the village is mostly with scooter
- We asked the shop owner what the future will bring him, he said that it all depends on the government. We heard him talking about Sawit, but again no translation from our translator. So maybe he knows about the plans of the government, but we could not ask.

Transportation

We have seen a couple of scooters, but no cars. In the current situation not possible to come here by car, but with the plans of the government this will change in the near future.

Facilities

- They have two schools, both in good condition
- There was a medium sized community health centre
- Each house has their own toilet and shower. There is a water system, a big tomb with access for twenty houses.
- This is a *tertinggal* village, but compared with Dadahup A1 we think this village is more developed.

Dadahup G5

This village is at least 20 kilometer a way from Dadahup village, on the road from Dadahup to Kapuas. From this way it is necessary to take a small road in bad condition of 4 kilometer to reach this “village”. It is the smallest village we have seen so far. A couple of houses spread in the area. It is also a transmigration village, with people from Java.

Businesses

- There were many rice fields, but also many who were still unused. According to a local they needed rice seeds to plant the rice.
- There was a little shop selling basic products.

Transportation

The main transport was by scooter, but we have seen two cars.

Facilities

- This village does not have an electricity network, but most people have a generator. We have that most houses have a connection to get TV signal, so most people have television.
- There was a small school
- A small community health centre
- The status of this village was also *tertinggal*, something we surely understand

Photo Report

Main road Kapuas - Dadahup

Village with many shop along road Kapuas - Dadahup

Logging along road Kapuas - Dadahup

Main road *(Dadahup A1)*

House with TV *(Dadahup A1)*

Rubber nuts used as toy *(Dadahup A1)*

Logging on the river *(Dadahup A1 & A2)*

More logging along the river *(Dadahup A1 & A2)*

Community Health Centre *(Dadahup A2)*

Rice Field and road condition *(Dadahup A2)*

Water system *(Dadahup A2)*

Fishing and Bazaar stand *(Dadahup A2)*

Road to Dadahup G5

Community health centre *(Dadahup G5)*

Dadahup G5, "the village"

Observation Report 7: Mandomai, Pantai, Anjir, 25-05-2010

Mandomai

The road from Kapuas to Mandomai (18km) is really good, mostly asphalt with a line in the middle. To finally reach Mandomai, we had to take the ferry. This is only for scooters, so cars have to take another road, which is longer in distance, but also good (via Pulang Pisau). Between Kapuas and Mandomai there are a lot of rubber fields, but mostly still young. We also saw some rice fields and even intercropping with rice and rubber or coconut trees. We also passed Pulau Telo, which has a *maju* status according to PODES 2008. Mandomai is also quite big, and both are not in need of further development and this is in our believe caused by their location along the road and good infrastructure. Many shops for food, car reparations and selling of products. We also saw the weekly bazaar. Mandomai is the main village and is very well accessible. From Pulang Pisau the village is easily accessible by car. Most people live along the river, but have their own toilets.

Businesses

- The main source of income is rubber and other farming.
- There are a couple of small shops.

Transportation

A lot of scooters, some bicycles and also a few cars.

Facilities

- A supermarket.
- SMK specialized in making furniture from wood.
- Most of the houses have electricity. They use it for luxury goods.

Pantai

When we follow the road from Mandomai along the river, the road becomes smaller and of soil, before we end up in Pantai. This village cannot easily reached by car, but with motorcycle no problem. In this village a lot of people have their own rubber fields, especially the men, and the women make souvenirs like bags, hats, etc from Rotan and similar products. We have talked to some people and they said they live day by day, have no expectations of the future and do not really have needs; it's ok the way it is…

Businesses

- The main business is rubber or other gardening.
- The women make souvenirs from Rotan. One person can make 2 bags per day, which they sell for 17.000 Rp to the middleman who takes it to Kapuas, Pulang Pisau or Palangkaraya to sell in a souvenir shop.

Transportation

We did not see cars, motorcycles or bicycles.

Facilities

- We see a house from the inside. The house was very basic, but it had Television.
- Most of the houses have normal electricity.
- No health facilities > community health center in Mandomai.
- Two elementary schools.

Anjir Kalampan

From Pantai back to Madomai, we took the main road that leads to Pulang Pisau. Again this is a very good road. Workers were building new bridges, so this road even gets better. Along this road, the village Anjir is located. Because of the location between Mandomai and Pulang Pisau, this village has good access to markets and other things they need. Anjir village is located on both sides of the river which are easily accessible by bridges, however not for cars. People live along the river and since one side of the river also has the main road from Mandomai to Pulang Pisau, people on this side of the river live between the main road and the river.

Here we also visited a palm oil plantation of PT. Fajar Mas Indah company. We took a side road and followed this small road and bad soil road about 3 km and ended up at the plantation. Since we did not have a formal letter, we could only take a quick look at the plantation. It was quite big, although our guides said this was a only a small plantation. The security was very strict and we had to leave. In this side road we also saw the rubber process again. The man told us he produced 50-100 kg rubber per day and sells this to the company for 7.000 Rp per kilogram.

Businesses

- Main source of income is rubber or other farming.
- On the main road, there are a lot of little shops where we could also eat.

Transportation

We have seen a couple of scooters and cars and bicycles.

Facilities

- They have a community health center.
- They have electricity.
- Good infrastructure.
- A lot of shops.

Photo Report

Main road Kapuas to Mandomai

- Weekly bazaar

Small part of main road is amplified

Rubber&rice intercropping *(Kapuas-Mandomai)*

Mandomai – people live along the river

Main road in Mandomai *(going to Pulang Pisau)*

SMK Mandomai – wood furnituring

Main road from Madomai to Pantai
- Drying of Rotan next to the road

Main road in Pantai (soil)

Making souvenirs from Rotan *(Pantai)*

Living along the (side) river *(Anjir)*

People living on both sides of river *(Anjir)*

Living along the (side) river *(Anjir)*

Palm oil Plantation 3km of main road *(Anjir)*

Security at entrance

Mixing rubber with some kind of vinegar *(Anjir)*

Vinegar added to the rubber *(Anjir)*

The hard rubber is kept in the water *(Anjir)*

Several private palm oil trees along the main road before the company picks it up *(Anjir)*