

Ecological and Economic Challenges in Palm Oil Production (EcoPOP)

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Abstract

Within the next decade Indonesia will become the biggest producer of CPO in the world. The growth of the palm oil sub-sector has posed an increasing threat to the Indonesian environment and also resulted in social conflicts. The Federal Ministry of Education and Science of the Federal Republic of Germany (BMBF) initiated a program "EcoPOP" (Ecological and Economic Challenges in Palm Oil Production) which comprises of 21 projects, within 5 domains (Agro-Ecosystem, Technology, Socio-Economy, Material-Flow Management and Eco-Balances and EcoPOP- Management).

The EcoPOP program will evaluate resource-saving, environmentally benign and socially acceptable ways of palm oil production. The implementation of EcoPoP will start 2000/2001.

Keywords: palm oil, environment, economy, ecology, Indonesia

1 Introduction

During the last 30 years ending with the beginning of the economic crisis in 1997 oil palm production was the fastest growing sub-sector of the Indonesian economy. Planting area expanded 20-fold and crude palm oil (CPO) production showed a 12 percent average annual increase (Casson, 1999). While the growth of the palm oil sub-sector has conferred important economic benefits, it has posed an increasing threat to the Indonesian environment. Also resettlement of local communities by the large scale (Potter, 1999) and dubious land area distribution resulted in social conflicts.

As it now seems the that Indonesian oil palm production is aimed at a return to the pace of growth that prevailed prior to the economic crisis (Directorate General of Plantations, 1996,1997,1998), and because of large land areas still available to be converted to oil palm plantations,

Within the next decade Indonesia will become the worlds biggest producer of CPO (Oil World, 1999). Therefore, special solutions are to be developed for solving social and environmental threats.

History

The Federal Ministry of Education and Science of the Federal Republic of Germany (BMBF) initiated under the project sponsorship of BEO (Project Management Organisation Biology, Energy, and Environment of the BMBF) a joint research project with the subject “Integrated Environmental Protection in the Palm Oil Industry of Indonesia” in 1999. Within the scope of a preliminary project the Institute of Agricultural Engineering of the University of Göttingen was commissioned to prepare a project proposal in order to realize the main project. Potential participants from the research community, the economic world and environmental organisations were identified during two workshops in 1999 and 2000 in Göttingen. With this, potential participants were asked to formulate research proposals within the frame of the joint research project. The resulting proposals were discussed during a workshop in Indonesia in February 2000. At this workshop Indonesian universities and research organisation under the organisational lead of the IPB (Institute Pertanian Bogor) as well as representatives of the palm oil industry participated.

The final project proposal “EcoPOP” (**E**cological and **E**conomic Challenges in **P**alm **O**il **P**roduction) was derived and submitted to BEO in May 2000. The EcoPOP program comprises of 21 projects, all dealing with environmental issues in the systems oil palm plantation/palm oil mill. The EcoPOP projects are to start in Germany as well as in Indonesia by the end of the year 2000.

2 Tasks and Aims

The frame of the whole joint program has been defined during several workshops in Germany and Indonesia, where representatives of all relevant sectors have been present: science and research, agriculture, industry, socio-economy and administration. Within this frame the name of the program was defined: EcoPOP – Ecological **and** Economical Challenges in Palm Oil Production. The emphasis is here on the “and”,

meaning that the protection of the environment is regarded as an economical challenge for mutual benefit. Environmental protection is not only a conservative measure, but also a catalyst of sustainable development, socially as well as economically.

The identification of processes of palm oil production causing environmental problems should be done with relatively simple and comprehensive analyses of the production processes, from plantation establishment via harvesting to palm oil milling and palm oil refining, both on temporal and spatial dimensions.

Material- and Energy-Flows

A useful tool for identification of processes are material- and energy-flow analyses. This method allows a complete modelling and quantification of all flows and modifications into, within and out of the production system. With this procedure the major environmental impacts of palm oil production can be identified (if not already known) and quantified and hence the most effective fields for improvement delimited. Additionally, material-flow analyses can serve as a evaluation tool for all project partners, because improvements, new technologies or bench marks can be estimated with regards to its environmental and economical impact within the frame of the whole production process. Figure 1 illustrates the most relevant material- and energy-flows of the palm oil production process and the scope of the scientific structure of EcoPOP.

In the centre of the figure and therefore also the core of the project is the oil palm plantations and the oil mill. The material- and energy-flows in and out of the units state the starting points, subjects and fields of research. All these potential research areas are accompanied by socio-economic aspects and life cycle analyses (LCA).

The goal of this, that all research activities and outcomings should be beneficial for both, the environment and society. The LCA gives information about the environmental impact of the projects findings and can assess the degree of improvements that can be reached by adopting innovations.

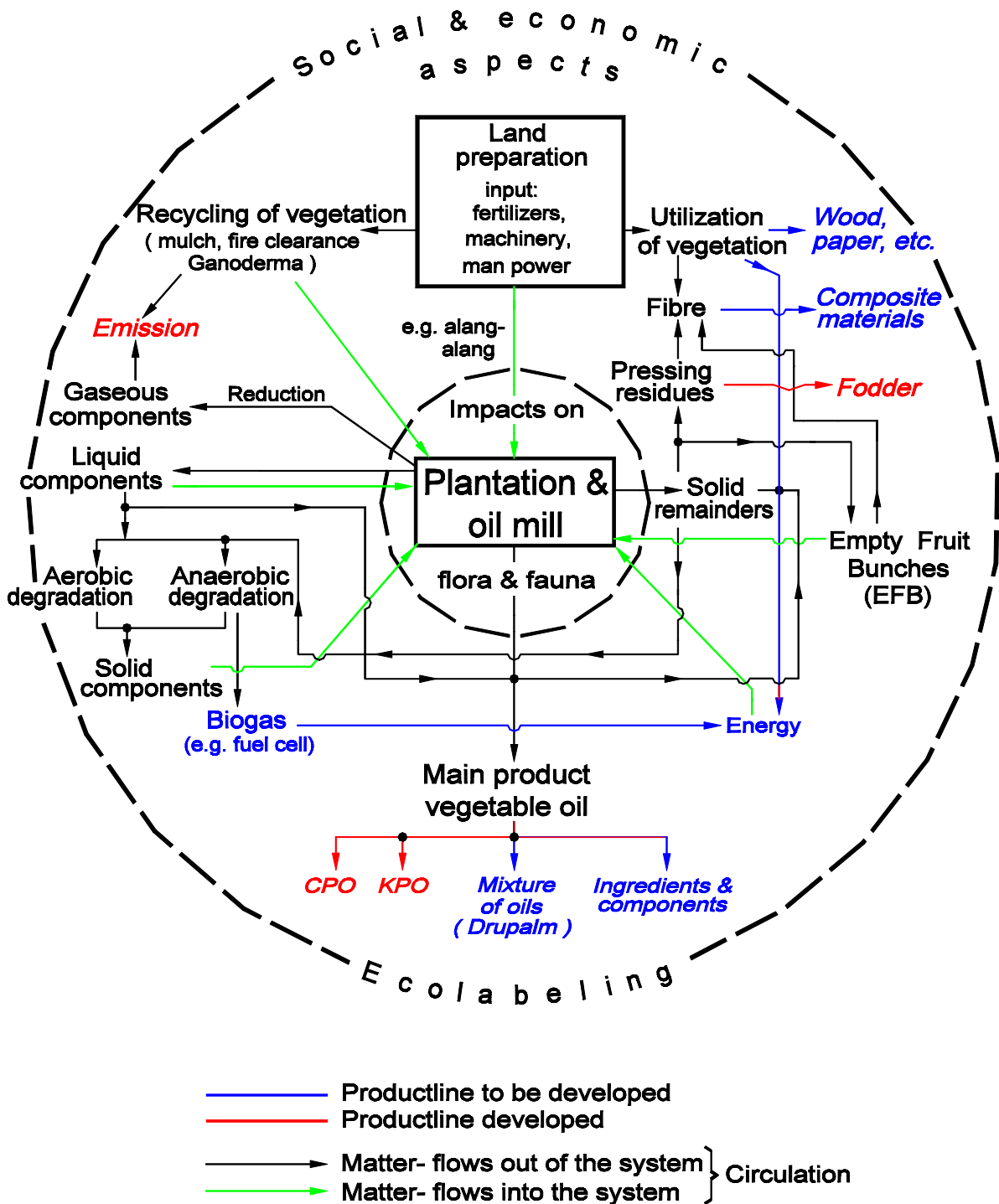


Figure 1: Material- and Energy-Flows as the basic structure of EcoPOP

The accompanying socio-economic studies are supposed to provide ways of fast adoption and integration of the project's results into the implementation process. Without any knowledge of the social structure of the oil palm producing community and their economic abilities or

constraints, a successful integration of new production methods can hardly be achieved.

3 Global Goal of EcoPOP

Taking into account these considerations, the main goal of EcoPOP and its 21 projects can be defined as follows:

The projects of EcoPOP should lead to resource-saving, environmentally benign and socially acceptable ways of palm oil production. The mode of production should correspond to state of the art ecological and economical standards and become a near benchmark business and economy, as well as product performance and consumer acceptance.

Project structure

EcoPOP will analyse the palm oil production process from different scientific and technological point of views. Consequently, EcoPOP is organised into 5 domains, each representing a different point of view/research approach:

Project domain A: Agro-Ecosystem

Project domain B: Production Technology

Project domain C: Socio-Economy

Project domain D: Material-Flow Management and Eco-Balances

Project domain Z: EcoPOP- Management

The single research projects are subdivided within these domains. Additionally to these scientific domains, another domain is defined, which deals with the organisation of the whole project. Due to the large scope of EcoPOP and the interdisciplinary, international and inter-cultural aspects, a effective project management unit is necessary.

The following chapters summarise the different domains and projects:

4 Projects of EcoPOP

Project domain A: Agro-Ecosystem

This domain comprises Crop Production, Plant Nutrition, Phytopathology, Agro-Ecology and Agricultural Engineering. The main aim is to develop alternative ways of plantation establishment, such as to identify potential

plantation areas, to raise the productivity of plantations and to optimise inputs of fertilisers and pesticides. New plantations as well as replantings will be considered.

The specific projects of this domain are as follows:

A1: “Development of a GIS-based land use information system as a decision support tool for regional land use planning”

A2: “Mechanical land preparation by Bush Chopper and mulching techniques”

A3: “Environmentally benign solutions for the clearing and replanting of oil palm plantations”

A4: “Possibilities of replacement of mineral fertilisers by organic residues from oil mills during the mature phase of oil palms”

A5: “Assessment of environmental services and sustainability of resource utilisation in oil palm plantations by means of carbon- and nutrient-balances”

A6: “The impact of Indonesian oil palm plantation management practises for plant-insect-communities and pest-beneficial organism-interactions”

A7: “Integrated management of soil born pathogens under particular consideration of *Ganoderma boninense*”

A8: “Mass breeding of (vesicular-) arbuscular Mycorrhizha fungi for the inoculation of oil palm seedlings”

Project domain B: Production Technology

This domain encompasses projects, dealing with improvements in the technical sector of the production process. Aims are the increase in productivity, development of new marketable products, minimisation of residues and effluents and finally the optimisation of the material flows in the production process.

The projects in particular are:

B1: “Enhancement of the value chain within the oil palm plantation – focus on harvest, collection and transport of oil palm fruits”

B2: “Development and establishment of a continuous thermal treatment of the oil palm fruits in the oil mill”

B3: “Techniques for the reduction of residues generated in the palm oil bleaching process”

B4: “Active ingredients from oil palm products”

B5: “Composting and biological desiccation of organic wastes from palm oil mills”

B6: “Elimination of oily substances from oil palm fruit fibres by means of thermophil bio-technology”

B7: “Biogenic by-products for composite materials”

B8: “Development of composite construction materials and components made from composite synthetic-oil palm fibres”

B9: “Production-integrated treatment of effluents and sludge of the palm oil industry”

Project domain C: Socio-Economy

The projects in this domain investigate the economical impacts and viability of an improved production of palm oil as well as potential new markets and the social conditions of the palm oil producers:

C1: “Profitability and socio-economic impacts of palm oil production”

C2: “Sustainable production and marketing of palm oil: social and economic environments from a macro-economical point of view”

Project domain D: Material-Flow Management and Eco-Balances

The beneficial environmental impact of the findings and developments of the project domains A, B and C will be assessed by the tools developed in this domain, both alone and in combination. Also the standards for an Eco-Label for environmental benign palm oil production will be developed in order to strengthen the international acceptance of palm oil and to fulfil the demands of environmentally concerned consumers:

D1: “Material-Flow Management and Eco-Balances of the system plantation - oil mill - oleo-chemical processes: coupling of agro-ecological material cycles with the trailing process chain”

D2: “Development of an Eco-Label based on environmental and social criteria for the Indonesian palm oil production under consideration of the certification process of the International Forest Stewardship Councils (FSC)”

Project domain Z: EcoPOP- Management

The project management has to create a working environment that enables interrelated, efficient and smooth research. Therefore the project management is more than just an administrative unit. It is also responsible for harmonisation of the research efforts of the single groups, the communication between the project partners from different faculties and cultures and the evaluation of the projects progress. It has to establish and if necessary to refresh links between the participants and is hence a vital part for the overall success of EcoPOP.

5 Research sites

The research sites of the project will all be located on Sumatra, because of

- ◆ the high concentration of plantations on Sumatra in Indonesia
- ◆ the private and governmental project partners, who support research in their plantations, are mostly situated on Sumatra
- ◆ the political stability.

The actual research plantations are located in different regions of Sumatra due to the different plantation structure in the different regions, which is closely related to land ownership (private large estates, smallholders, nucleus-plasma principle) and physical properties of land area.

6 Organisational Design

As mentioned before, EcoPOP demands a highly qualified co-ordination unit due to the heterogeneity of the participants. This holds true for internal as well as external tasks. Effective communication and co-ordination has to be established between the different scientific and administrative levels, both in Germany and Indonesia. It is critical for the success of the project, that the co-ordination efforts, the co-operation and the information processes run as smooth as possible.

The project management will be conducted by the Institute of Agricultural Engineering, Göttingen, Germany. The project leader (Prof. Dr. W. Lücke) will be responsible for the correct scientific and administrative conduction of the project work. He is supported by two co-ordinators in Germany and Indonesia. For the promotion of the international co-operation on the administrative side, an Alliance Management Committee (AMC, cf. to Letter of Intent, dated 31.01.2000) will be founded. Scientific support is sought by a Scientific Advisory Board, to which experts from all project domains will be nominated. Additionally, the organisation of EcoPOP will be regularly supported by external consulting, moderated workshops on an annual basis and project evaluation/supervision processes. The external consulting is supposed to identify potential and actual problems and conflicts, to moderate and assist the co-ordination of the project partners

Figure 3 shows the organisational structure of EcoPOP.

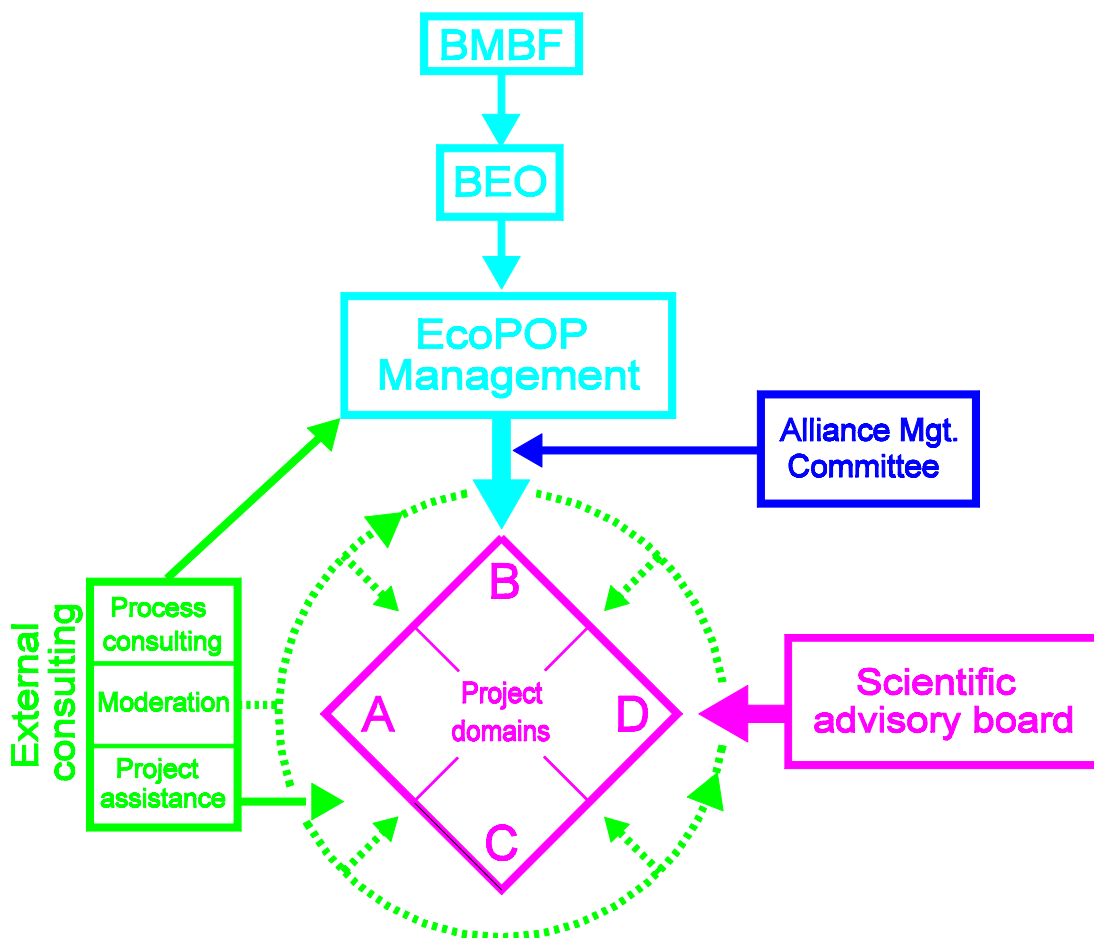


Figure 3: Organisational structure of EcoPOP

In summary the EcoPOP project wants to demonstrate that it is feasible to implement the approaches of EcoPOP within the near future. Thus, new perspectives in the “Integrated Environmental Protection of the Palm Oil Industry of Indonesia” will be created.

7 Literature

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