Information System Better-iS

ZALF - Output

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Summary:

A Multifunctional Platform has been installed in Laela. Locally produced sunflower oil could potentially be used as a diesel substitute. Production costs of oil are quite stable throughout the year (about TZS 1.000 per litre). Each year, three quarters of the yearly sunflower harvest would be required for powering the MFP, and in this way, for providing electricity to 200 households.

Title:

ZALF Better-iS Master thesis result: Value chain of sunflower oil used as diesel substitute for a Multifunctional Platform in Laela.

Problem and Objective:

The village of Laela (5.460 inhabitants) is situated in the Rukwa District, in Western Tanzania. The nearest larger cities are Sumbawanga (93 km) and Tunduma (130 km).

7.403 acres (75 % of the territory of Laela) are used for agricultural activities. Main crops are maize, groundnuts, sunflower, finger millet, beans and sorghum. Livestock keeping is also common. Rukwa region is characterized by the Tanzanian government as a “food basket” region. This implies specific political restriction such as a ban on food exports outside Tanzania or on the use of food crops for energetic purposes. About 150 tonnes of sunflower seeds are harvested each year in Laela. 75 % of them are traded while 25 % are processed in sunflower oil for local consumption.

A Multifunctional Platform (MFP) has been unsuccessfully installed in Laela in November 2009 by the Tanzanian NGO TaTEDO. An MFP is a low-cost technology to provide rural energy services. It consists of a diesel engine to which a variety of end-use equipment can be added. The technology is

comparably simple and can relatively easily be installed and maintained even in remote areas in developing countries. MFPs normally run on fossil diesel but vegetable oil can, under specific conditions, also be used.

This fact sheet aims tat studying the value chain of sunflower oil used as diesel substitute as well as its feasibility for Laela.

Method:

The sunflower oil which would be used as diesel substitute for powering the MFP would be produced all over the year. Two scenarios have thus been considered:

- seeds are processed during the harvesting season, when wages are high because of the high need of workers.
- seeds are processed outside the harvesting season, when wages are low because of low need of workers. Seeds need therefore to be stored.

In both cases, seeds are bought from farmers during the harvesting period when prices are the lowest (TZS 170 per kg). Seeds are transported from the field to the processing place. They are then expelled (eventually after a storage period). After the filtration, the oil is ready to be used. The press cake resulting from the process can be an income source if used for example for feeding poultry or pork.

We made the assumption that the MFP works 14 hours per day during the whole year.

The data used in this study were generated through semi-structured qualitative interviews with local stakeholders and a quantitative socio-economic household survey (160 households) compiled in a three-week field visit in Laela, in November and December 2010.

Results:

The MFP installed in Laela normally consumes 5,64 litres diesel per hour, that is to say 28.820 litre per year. That would be equivalent to a slighter higher oil consumption reaching 32.541 litre per year. Because 3,5 kg seeds are needed in order to produce one litre of sunflower oil, about 114 tonnes of seeds would be necessary each year.

Even when they are bought at the lowest price, purchase of seeds represents more than half the production costs. In spite of the storage costs, production costs would be lower when seeds are processed outside the harvesting season (TZS 972 per litre against TZS 1.019 per litre when process takes place during the harvesting period). Wages represent a big part of expeller and, above all, of

filtration costs. Production costs could be significantly reduced when these two stages occur outside the harvesting period.

The MFP aims to provide electricity to 200 households (16 % of Laelas households). If the MFP is only powered by sunflower oil, 76 % of the yearly harvest would have to be processed. 523 acres would be required for sunflower. This area represents 7 % of the total arable land in Laela.

Lessons learnt:

For practitioners:

Comment: Now results appear to be positive just out of the view of MFP Entrepeneurs (170 TZS!) If you calculate with the price needed to recover productions costs: How is the profit margin against diesel if sunflower prices would be higher?

Documentation

MFP Characteristics	
Households connected to the electricity grid of the MFP	**200**
Energy generated per hour [kWh]	12
Diesel consumption per hour [L]	**5,64**
Diesel consumption per year [L]	28.820
Volume of sunflower oil equivalent to 1L of diesel [L]	1,13
Sunflower Oil consumption per hour [L]	6,37
Sunflower Oil consumption per year [L]	**32.541**

Quantity of oil needed [L]	**32.541**	
Extraction rate [kg/L]	3,5	
Quantity of seeds needed [kg]	**113.892**	
Price of seeds [TZS/kg]	**170**	
Production costs for 1L of sunflower oil	**During the harvesting season**	**Outside the harvesting season**
Seed costs [TZS]	595	595
Transportation costs [TZS]	210	210
Storage costs [TZS]	0	70
Expeller costs [TZS]	368	321
Filtration costs [TZS]	105	35
Income from press cake [TZS]	259	259
Production costs per litre oil [TZS/L]	**1.019**	**972**

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Feasibility of a MFP in Laela	
Households in Laela	1.260
Households connected to the electricity grid of the MFP	200
Share of households connected to the electricity grid of the MFP	**16%**
Surface of arable land [acre]	7.403
Surface of sunflower needed [acre]	523
Share of total arable land	**7%**
Sunflower seeds production per year [kg]	150.494
Sunflower seeds needed per year [kg]	113.894
Share of total sunflower seeds production	**76%**

Policy recommendations :

- To use oil as diesel substitute for producing electricity in Laela could be one of the opportunities to enlarge the market of sunflower oil in Laela. The process of oil could provide employment opportunities during little-activities periods.
- The improvement of the process efficiency of sunflower seeds could decrease the amount of seeds which is needed for the MFP. The extraction rate could for example be improved by using better expellers.

Reference:

RORDORF, J. (2011) *Opportunities for a sustainable rural energy supply through renewable energies in developing countries. Socio-economic feasibility study of the operation of a multi-functional platform in the village of Laela, Tanzania on locally produced biofuels. Master thesis: Berlin School of Economics and Law, Institute of Management, 158 p.*

The chapters of the factsheet do provide an overview of the thesis. The whole document can be downloaded via this link:
http://www.better-is.com/files/Master_thesis_Rordorf.pdf

Additional detailed and comprehensive background information available at Better-iS homepage:
http://www.better-is.com/files/Hoffmann_etal_2012_Sunflower_as_horesepower_IFSA_conference_Aarhus.pdf

Participating institutions: International Food and Policy Research Institute (IFPRI), Institute for Environmental Economics and World Trade IUW, World Agroforestry Centre ICRAF, Wuppertal Institute for Climate, Environment and Energy, Leibniz-Centre for Agricultural Landscape Research (ZALF e.V.), Association for Strengthening Agricultural Research in Eastern and Central Africa. Associated partners: SOKOINE University of Agriculture, Ministry of Agriculture, Food security and Cooperatives Tanzania, Ministry of Energy and Minerals, Tanzania.