



Global Village Energy Partnership Action Programs Fund - GAPFund



Towards Biofuel Self Supply - Jatropha in dual fuel systems for stationary engines in rural communities

Implemented by:

**The GAIA-Movement &
Development Aid from People to People (DAPP) Zambia**



Project Objectives



Develop smallholder jatropha production



Develop a viable dual fuel system



Develop market for jatropha oil



Promote a decentralised energy supply system for stationary diesel engines



Why this Project?



To create a model for local development by improving access to energy for production. (Only 2 % of rural Zambians have access to electricity!)



To generate an option for income generation without competing with food crops by using degraded or fallow land



To improve local tree cover



To reduce global warming

Why Jatropha for Biofuel?



Jatropha can be produced by small farmers and is easy to multiply locally.



Jatropha need not compete with foodcrops. It is more drought resistant and can grow on degraded lands.



Jatropha fences can be used to protect gardens and homesteads.



Burning jatropha oil is nearly 100% carbon neutral (little/no energy inputs).

Global Warming

People in the developing world are the least responsible for this, but will be the ones most affected by the changing weather.

E.g. when more wells dry up.



Irregular rains

A catastrophe for all those who depend totally on rains for farming. Africa will experience more drought periods and more floods. 75-250 million extra people could be at risk by 2020.



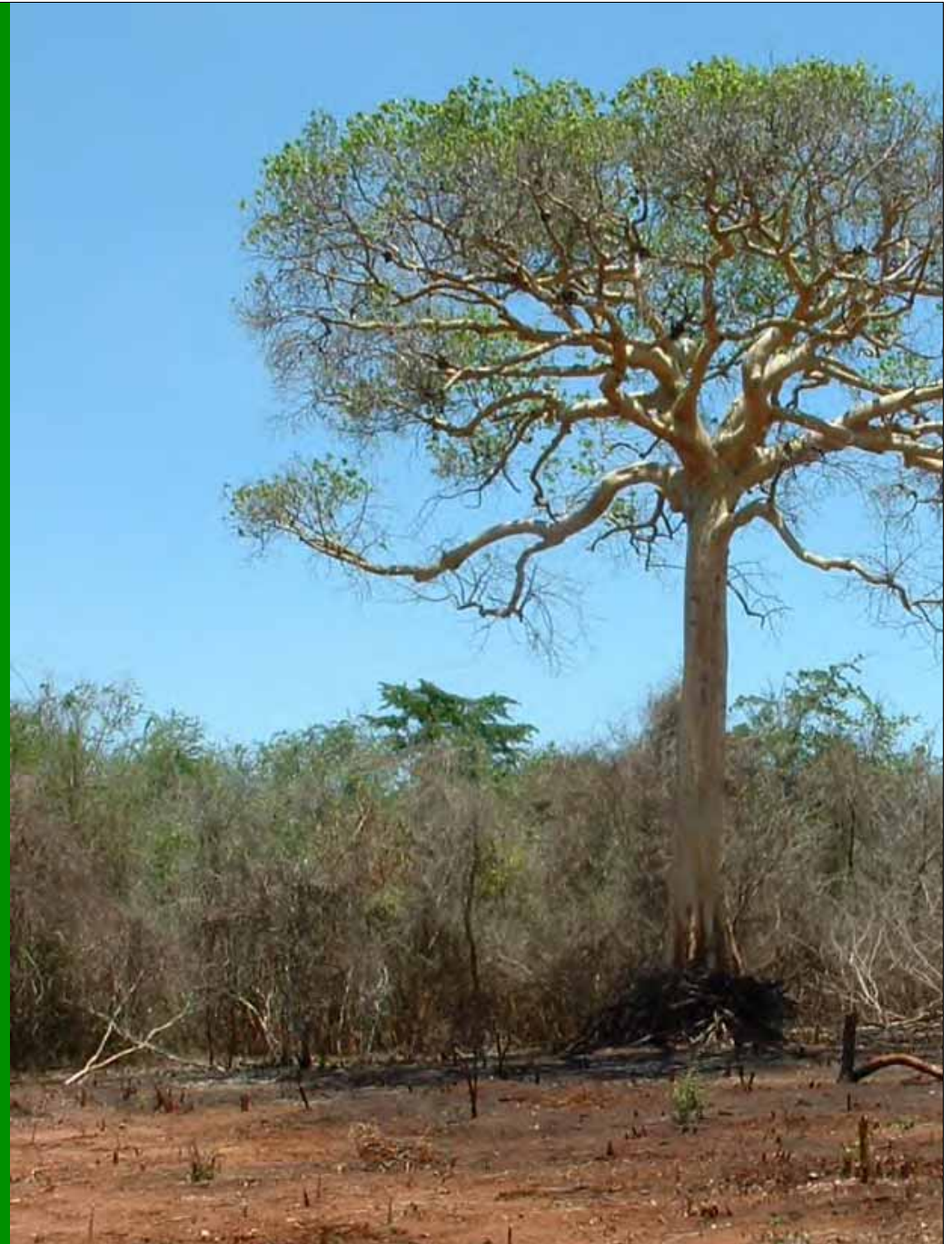
Adaptation needed

More and more farmers will need low-cost options, such as rope pumps, to adapt to drought spells, enable emergency irrigation and have garden production during the dry period.



Deforestation

accounts for 20% of global warming. Planting jatropha on degraded land for biofuel production can thus turn this tide, and contribute doubly to reduce carbon emissions.



Pressing oil from jatropha seeds

Jatropha seeds are pressed manually or mechanically.

4 kg of seeds are needed to produce 1 l oil.



The dual fuel system

Plant oil does not run so easily as diesel. It is therefore necessary to heat up the engine first by running on diesel for at least 10 minutes.

To avoid deposits in filters and injectors, the engine must run on diesel for 10 minutes before stopping it.



Testing the use of plant oil in the first version of the dual fuel system

Two grinding mills have run a total of 107 hours on cottonseed oil without problems.



Endurance tests at Delhi College of Engineering

A 512 hour test of jatropha oil following international standards is currently being conducted in India by Professor Naveen Kumar.



Preliminary results of dual fuel test runs

The 1 cylinder Kirloskar engine was opened after running 216 hours on jatropha oil.

2 of 3 compression rings were sticking which had caused some scratches on the cylinder.

There were deposits in the filter.

No coking but some carbon deposits on the injector.

Carbon deposits on cylinder head on high side.

The inlet and outlet valves were fine.



Next endurance tests

The engine has been reassembled after changing filters and rings, and the test continues to the standard 512 hours.

In the first dual fuel version, jatropha oil is not heated, just filtered through a fine cloth.

The GAIA-Movement will organize a new 512 hours test, where the jatropha oil is heated by coiling the supply tube around a hot engine part.

Tests will also be conducted to assess if the oil should be pre-treated in any way to reduce the viscosity of the oil.