Sustainable Agricultural Practices

General Electrical Energy Plan

(Conceptual Draft)

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Community-based Environmental Education for the Self-Sufficiency and Sustainability of Small Rural Family Farms

1.0 INTRODUCTION

Farm energy costs are rising due to rising oil / fuel prices. One way to reduce the operating costs for the small rural family farm is to move to alternative energy sources and to reduce off-farm energy expenses as much as possible. The Rural Training Center-Thailand's (RTC-TH) General Electrical Energy Plan is an attempt to implement the IFS (Independent Fuel Systems) program, which is part of the RTC-TH Sustainable Agricultural Practices (SAP) model on our demonstration farm in Nan Province, Thailand.

2.0 KEY COMPONENTS

The key components involved are existing energy / fuel sources, and the alternative energy / fuel sources we will use on the farm. We selected alternative energy / fuel sources that fit the model of re-circulating energy / nutrients back to the farm with a minimal carbon foot print.

Typical Family Farm	RTC-TH Selected Alternatives
• Electrical Line Power • Fossil fuels	• Biogas digester • *Jatropa curcas* (Black soap) • Solar Photo Voltaic panels

2.1 Biogas Digester: Animal and human manure will be input to the digester to produce methane gas for cooking gas and sterilized slurry compost. This also helps to eliminate water pollution problems and black waste disposal. At the same time, it helps the operation reduce greenhouse gas emissions and lowers our carbon foot print by eliminating the use of propane cooking fuel. If sufficient gas is produced, it may be feasible to set up a demonstration electrical generator set fueled by methane. ([**Note**: Shallow slurry ponds will be built to raise duckweed as animal feed. Then the slurry will be added to the soil in the fields to help increase soil organics and improve soil moisture retention to reduce soil erosion.0

2.2 *Jatropa curcas*: The seeds from the Jatropa will be processed to produce a Straight Vegetable Oil (SVO) fuel to run the diesel equipment on the farm. This will replace fossil diesel fuel consumption. A Listeroid engine / generator set will be installed to run on SVO to generate electricity for the farm. Residual waste from the oil processing will used on the farm: Seed pod hulls will be used as mulch to reduce soil erosion and boos soil moisture retention. Pulp from the seed/oil extraction process will be supplement wood used in traditional stoves or composted. Excess electricity generated can be sold to EGAT (Electric Generating Authority of Thailand) and earn revenue for the farm.

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2.1.1 Jatropa SVO will be used to fuel the Listeroid diesel engine / generator set as the primary 220 VAC electrical energy source for the farm. All other small diesel motors (e.g. water pumps, air compressors, portable fire water pump, portable diesel generator, etc.) will also be fueled by SVO. Jatropa provides us the optimum way to reduce the carbon footprint for our farm energy supply. Deep cycle 12 VDC AGM batteries will be charged and maintained via float charging to run portable electrical tools with rechargeable battery packs. If needed batteries and inverters can be used.

2.1.2 Truck engines may, if feasible, be modified to run on SVO, or be retro-fitted with older rebuilt engines capable of running SVO.

2.2 Solar Photo Voltaic (PV) Panel: Additional solar PV panels will be set up for a battery charging station to handle both 6 VDC and 12 VDC batteries. An optional 220 VAC line from the Listeroid generator may be installed as well. The radio station will have an independent solar PV capability. The MEWS (Mobile Emergency Weather Station) will have a portable solar PV battery charging capability.

2.3 Truck Battery Charging System: Various vehicle on-board spare battery charging options may be implemented on the truck (in addition to the field deployed solar PV panel). The simplest charging option is to set up a second battery connected to the vehicle charging system. It would be better to isolate the spare battery entirely from the vehicle's starter battery, but this requires charging circuit isolation hardware. Or we can use an inverter to provide 220 VAC to a battery charger / float charger to handle the spare battery. [**Note**: The spare battery is the primary power supply for the radios and weather station equipment. The vehicle would also be able to utilize 220 VAC line power if it were available, or deploy the portable diesel generator if needed. Battery charging would be most efficient during long distance driving.]

3.0 IMPLEMENTATION

Obviously, this is a long range plan and will take time to complete. Priorities will be set and adjusted based on availability of equipment and resources to install the various systems.

4.0 SUMMARY

The primary goal of IFS is self-sufficiency and sustainability for small rural family farms. The RTC-TH General Electrical Energy plan strives to reduce off-farm fuel/energy costs and reduce the green house gas emissions / carbon footprint. The long term cost savings could significantly improve the economic circumstances of small rural farm families. The potential of producing electricity in excess of the farm's operational needs exists. This could provide a new source of income for farm families. The use of SVO to power the generator set makes this kind of power generating station sustainable.

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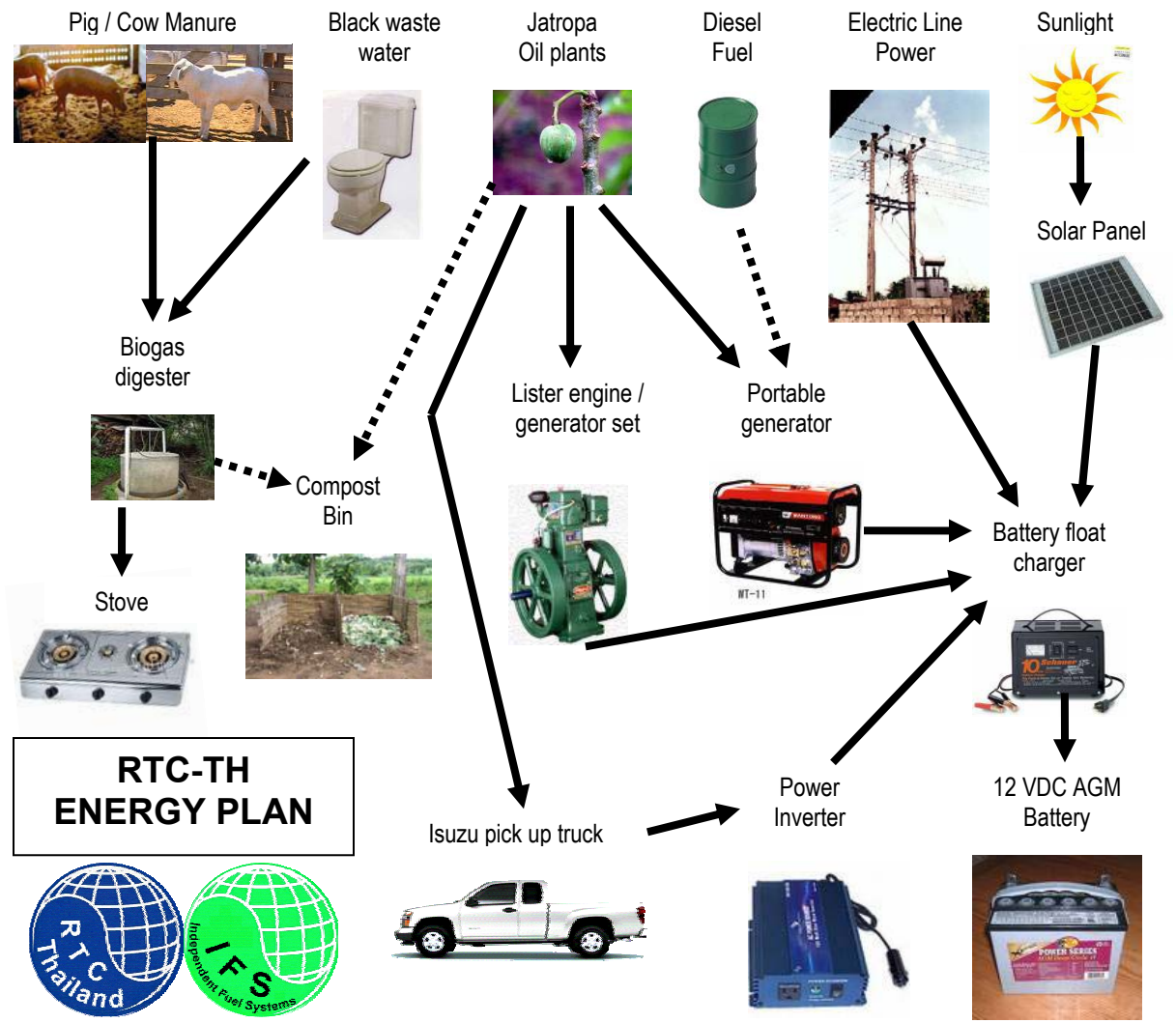

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Rural Training Center-Thailand Energy Plan

The general energy plan for the RTC-TH is a practical implementation of the IFS (Independent Fuel Systems) and our overall goal for self-sufficiency and sustainability for small rural family farms.

- **Biogas**: reduces animal wastes and possible water pollution; produces cooking gas and residue is clean compost.
- ***Jatropa curcas***: produces SVO (straight vegetable oil) fuel for all diesel engines on the farm.
- **Fossil Diesel & Electrical power**: Minimal use with an eye to reduce consumption of these to zero.
- **Generators**: to produce our own electricity; has the potential to generate revenue by selling power to EGAT.
- **Solar PV Panel**: small demonstration unit for battery charging.
- **Truck:** can be used to provide battery charging when driving long distances.
- **Battery / Batteries:** Work carts can be used to move batteries / tools to work site. Provides emergency portability for radios and other power tools.
- **Compost**: Biogas generator and Jatropa residues are composted for farm use.

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