

Diesel survey Cabo Delgado, 2007-2008

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1 Interview Erik Schurmann, about Diesel generator set at EPF school

EPF school Bilibiza has 325ha of ground and large part could be used for Jatropha, no problem with 20-50 ha.

Minimum payment for local worker is 800.000 MT or \$ 34/monts or slightly above \$ 1/day

In near future the total use of diesel will be around 350 l/wk with a new car fro the Agri school and the new 1.5 Mitsubishi truck for EPF.

This would mean that between 25 – 60 ha has to be planted wit Jatropha to cover 100% PPO instead of diesel.

Erik is setting target at

Getting Bilibiza ADPP schools running fully on bio-fuel by 2010!

Capital costs:

House?

The power gen set at the school operates 3 years, a John Deere 24 kW diesel with Leroy Somer generator.

Costed \$ 13000 installation complete \$ 2000

Uses 200 l/week diesel.

Uses 4 l/hr at evenings from 6-9hrs. 7 days

3 l/hr from 9-12 and 1.30 – 5 5 days

Costs diesel :

200 l/wk is bought in Pemba for 5.400.000

8 hrs driving is another 1 million for diesel with own truck of 1.5 ton, but carrying more things weekly. Rent of truck is 3 million, including fuel.

Diesel price went up from 16.000 to 27.000 in 2005.

Normally \$ 1/km has to b paid for transport with a 4 tons truck.

Running costs:

Diesel: 200 lx 52 week x \$ 1.08/lt \$ 11230/yr

Transport cost ca \$ 5,2 /wk \$ 270/yr (ca 2 %)

Lub oil: 10 lites x 4 times a year @ \$ 3liter = \$ 120/yr

Total fuel costs: \$ 11620/yr

Maintenance:

Changing oil filter: 4 x yr at 10 = \$ 40/yr 1.5 days x 2 man

Changing diesel filter 2xyr at \$ 60 = \$120/yr 50 minx2 man

Airfilter 1/yr \$ 100/yr 5 min

Average repair costs = \$ 100/yr

Total material for maintenance` \$ 360/yr

Supervision by Erik, with 2 students.

Diesel data:

John Deere
Type: 3029DF120
Nr: 428321

Alternator:
Leroy Somer
LSG2219
Nr. 119815/15
Power 30 kVA- cos PHI =0.8 --→ 24 KW power
1500 rpm, 50 Hz, 400/230 V

The maize mill at the EPF school

Capital investment costs:

House \$ 2000
Maize miller \$ 1000 sec hand (new costs ca 2000)
Yanmar diesel (ca 20HP) 36 millin Metc was \$ 2000 5 years ago.
Uses roughly 1000 l/year
According maintenance manual of Honda, the fuel use is 0.2 liter/kw /hr (think too high!)

Running costs:

Diesel: 1000 l/year x \$ 1.08/lt	\$ 1080/yr
Transport cost	\$ 20/yr (ca 2 %)
Lub oil: 10 litres x 2 times a year @ \$ 3liter =	\$ 60/year
<hr/>	
Total fuel costs:	\$ 1160/yr

Maintenance:

Clean oil filter:	
Changing diesel filter 1x/yr at \$ 2 =	\$2/yr
Airfilter 1/yr	\$ 10??/yr 5 min
Change belt once per year	\$ 25
Average repair costs =	none
<hr/>	
Total material for maintenance`	\$ 37/yr

Supervision by Erik, with 2 studenets.

1 l fuel is good for 35 kg of maize.

When people brought in maize to mill, 1500 MT /kg was charged or \$ 0.06/kg

Maize: 400 grams/day per student---with 230 students was 1 ton/week
Now only few students, only 400 kg/week Average about 750 kg/weeks costs ca 20 l fuel/week.

The harvest season, thus milling is in the months June July, August.

Last year bought in total 21 tons; total about \$ 4000/year

In June 2 tons from Bilibiza 2500 MT/kg or \$ 0.10/kg

4 tons from Montepuez

5 tons from Mueda

Etc.

Sometimes go 300 km to buy good quality and low price.

On average price is ca 5000 MT/year or \$0.20/kg

At this moment (end Jan 200) price is 10.000 Mt /kg in Pemba due to bad harvest.

Grinding; when operating 8 hrs per day → 400 kg or ca 50 kg/hr.

Salary paid to operator who is also a guard is 1.277.000 /month, he is working maybe on average 2 days per week on milling, rest guard.

Bilibiza has about 4000 people, EPF used to buy about 8 tons per year from Bilibiza farmers. Production ca 1 ton/ha Maybe it is 2 tons /ha, but animals eat it and people steal it in harvest time.

There might be competition from sesam seeds .

Farmers get 10 - 15.000 Met/kg sesam seeds

Some farmers are having small plots of sesame. Promoted by AgaKhan.

Te climate is the problem, harvest ca easily been destroyed,

There is a German people o n the island in front of Pemba, who is taking rain fall measurements over the last 30 years that state that over the last 10 years rainfall reduced 50%!!

This year rain only started in January, not in Nov as usual.

2 The maize mill in Bilibiza village, private firm.

Capital investment costs: Unknown

Maize miller bought in Tanz

Chinese brand diesel (26HP) 2000 rpm, bought in 2005.

Running costs: (assumed same as EPF school)

Diesel: 1000 l/year x \$ 1.08/lt \$ 1080/yr

Transport cost \$ 20/yr (ca 2 %)

Lub oil: 10 lites x 2 times a year @ \$ 3liter = \$ 60/year

Total fuel costs: \$ 1160/yr

Maintenance: (assumed same as EPF school)

Clean oil filter:

Changing diesel filter 1xyr at \$ 2 = \$2/yr

Airfilter 1/yr \$ 10??/yr 5 min

Change belt once per year \$ 25

Average repair costs = none

Total material for maintenance` \$ 37/yr

1 l fuel is good for 100 kg of maize. (20 l per 2000 kg of maize)

Do this in 2 days, from 7 – 17 hrs. 10 hrs-→ 1000 kgmaize/day with 10 l fuel)
100 days x 10 l -→ 1000 l/year

2 employees, minnum wages(family)
Work 6 days/wk not on Sundays.

The harvest season, thus milling is in the months June July, August.

They are used to buy maize and sell grinded maize, but also have customers to have the maize grinded which came from outside Bilibiza, gives a wide market area.
Buying price of maize varies from 3000-5000 MT

3 Diesels observed in the first diesel engine survey done November 2007,

Diesel at EPF Bilibiza used at maize mill of EPF School

Type: Feidong 295GJ
Power: 26 HP
Revs: 2000 rpm
Date produced: 2006/10
Manufacturer: Shandong Tractor Works Engine Branch China
Dealer: Unknown, via Tanzania



Fuel pump and filters



Injectors



Skid based



**Watercooled, with external open tank,
inlet and outlet pipe**

4 Diesel of Grain miller in Quisanga

Type: Feidong: 295GJ

Visit Nov 2007



2 cylinder, injectors



The various filters



watercooled

According Gert Groeneveld (Dutch expert involved in modifying diesels in the Gota Verde project) these diesels are copies of the English Petter. He thinks it is quite well possible to run them on 100% PPO with only having the oil at the proper viscosity.

When the surrounding temperature is 20 -23 degrees, it even has not to be heated up.

He has himself various old types of diesels running for longer time on PPO . Amongst them one Lister which has run 350 hours on PPO of old used oil, 50 tot 60 hrs on self made bio-diesel for which he has a small plant developed, and only 8 hrs on pyrolises oil (very bad for the engine).

5 Wednesday 25, 2008 Independence day a brandnew Feidong 295GJ

was found and can be purchased for 100.000 MTN from the owner Mr Daniel Anli of **Aldeia 19 Outubro** ,

tel: 258-82 5522339(Owner of 2 Moageiro's and about to start a new place with the one he had just bought (in Bilibiza etc). This diesel engine will be used for a duration test with Brendon Evans in Chimoio (producer of Goudagold cheese)

Transport to Chimoi by own transport from ADPP.

6 In Aldeia de 25 de Junio

we found one owner of a Moageiro who used a 30 years old 2 cylinder air cooled Lister , still working! Used ca 20 liters fuel/week and could maximally produce 3 tons of flower per day using 20 liters.

He knew another place where they had a 3 cylinder Lister.



7 Various engines





Operator of maize mill with Feidong diesel engine

8 Questionnaire used (Portuguese)

Objectivo da pesquisa: Identificar motores existentes de gasóleo (diesel) estacionários, que economicamente e tecnicamente podem ser viáveis para modificação - e usar óleo de plantas como combustível.

Tira uma foto da maquina, dos injectores por perto, a bomba de combustível, e a placa (se possível).

Nome do dono : _____

Localidade : _____

Função do motor : _____
(por exemplo gerador, bomba de água, moageiro)

1: Identificação do motor	
Marca e modelo do motor	
Ano da produção	
Número de horas trabalhadas	horas
Volume dos cilindros (Displacement)	litro / cm ³
Número de cilindros	
Poder	kW / hp
Produtor da bomba de injeção (Identificar agora se possível) (Deve ser conhecido antes da modificação)	Bosch , Diesel-Kiki , Nippon-Denso , Zexel , Lucas/CAV/Delphi , Roto-Diesel , Stanadyne , Doowon , outro: _____ (marque com um círculo ou escreva outro nome)
Sistema de injeção (Identifique se possível)	Injeção: directo / indirecto (marque com círculo)
Sistema de esfriamento	Esfriamento com: água / ar / óleo (marque com círculo)

2. Identificação da carga e consumo de combustível	
Meses usado por ano	Meses
Números de sacos moído por dia	Sacos
Normalmente corre com poder máximo	100 % do tempo - 50% do tempo - outro (marque com círculo)

Uso por dia de trabalho	Horas o motor trabalha por dia
Uso por semana	Horas motor trabalha por semana
Número de arrancas a paradas por dia de trabalho (em média)	
Consumo de diesel (gasóleo) por dia	Litros usados por dia
Consumo de diesel (gasóleo) por dia ou semana	Litros usados por semana

Data: _____ Assinatura: _____

9 Questionnaire obtained from Niels Ansoe from Gota Verde project Honduras

Aim of questionnaire: Work Package 5, Identify existing diesel engines, stationary or in vehicle, which in economical and technical terms are suitable for modification- and to operate on Pure Plant Oil – PPO.

Name of owner : _____

ID no. of engine : _____
(e.g. 1,2,3 if more from same owner)

Descriptions : _____
(e.g. pick-up, tractor, water pump etc.)

1: identifying the engine	
Engine manufacturer & model	
Year of manufacture	
Mileage or no's of working hours	km / miles / hours
Displacement	litre / cm ³
No. of cylinders	
Power	kW / hp
Manufacturer Injection pump (Identify now if possible) (Must be known before modification)	Bosch , Diesel-Kiki , Nippon-Denso , Zexel , Lucas/CAV/Delphi , Roto-Diesel , Stanadyne , Doowon , other: _____ (mark with circle or write other name)
Type of injections system (Identify now if possible)	Direct injection / Indirect injection (mark with circle)
Cooling system	Water cooled / air cooled / oil cooled (mark with circle)

2. Identifying load and fuel consumption	
Select kind of installation	Vehicle / agricultural machine / Stationary
Typical work/load	
Workload per year	km / miles / hour
Workload per day	km / miles / hour
Numbers of Start/Stop per day	
Fuel consumption per day	Litre / gallon
Fuel consumption per year	Litre / gallon

Date: _____ Signature: _____

10 Specifications Feidong Diesel engines

Model		295T	295G	295GA	295GB	295GJ	295G-2
Type		Vertical,water cooling,four stroke,swirl chamber					
Number of cylinder		2					
Cylinder bore(mm)		95					
Piston stroke(mm)		115					
Total displacement(L)		1.63					
Compression ratio		18~20					
Rated power/speed kW/rpm		12 hr power					
		17.6/2000	18/2000	17.6/2000		18/2000	
Fuel specific consumption at rated output g/kW · hr	Qualified product	≤265.2	≤258.4	≤265.2		≤258.3	
	First rate	≤258.4	≤253	≤258.4		≤253	
	High class						
Max torque(N · m)		≥96.9					
Max torque speed(rpm)		≤1500					
Max no-load speed (rpm)		≤2160					
Idling speed(rpm)		≤600					
Direction of rotation(face on end of power output)		Counterclockwise					
Cooling manner		Forced water cooling					
Lubricating manner		Pressure and splash combined					
Starting manner		Elec.	Elec. and Hand	Elec.		Hand	
Net mass(kg)		≤280	≤380	≤395	≤355	≤310	≤365
Main applications		Tractor	Farm products processing.agriculture irrigation. Engineering machinery				

1-3 Main Technical specifications and Applications of Model 295A Diesel Engines

Model		295TA	295A	295A-1	295A-2	295A-3	295A-4
Type		Vertical,water cooling,four stroke,direct injection chamber					
Number of cylinder		2					
Cylinder bore(mm)		95					
Piston stroke(mm)		115					
Total displacement(L)		1.63					
Compression ratio		17					
Rated power/speed (kW/rpm)		12 hr power 20/2200					
Fuel specific consumption at rated output (g/kw · hr)	Qualified product	≤290	≤243.2	≤250	≤250	≤243.2	
	First rate	≤243.2	≤236.4	≤243.2	≤243.2	≤236.4	
	High class						≥99.8
Max torque(N · m)		≥99.8					
Max torque speed(rpm)		≤1650					
Max no-load speed (rpm)		≤2376					
Idling speed(rpm)		≤700					
Direction of rotation(face in end of power output)		Counterclockwise					
Cooling manner		Forced water cooling					
Lubricating manner		Pressure and splash combined					
Starting manner		Elec.	Elec. and Hand	Hand	Elec.	Hand	
Net mass(kg)		≤280	≤380	≤310	≤395	≤355	≤365
Main applications		Tractor	Farm products processing agriculture irrigation. Engineering machinery				

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295A-5	295A-6	295BA	295CA	295C.A	295DA	295D.A	295D.A	295YA			
Vertical,water cooling,four stroke,direct injection chamber											
2											
95											
115											
1.63											
17											
12hr power		Continuous power		12hr power		1hr power					
20/2200		15.6/2000		16.3/2000		13.5/1500		16/1800	20/2200		
≤243.2		≤250		≤243.2		≤250					
≤236.4		≤243.2		≤236.4		≤243.2					
								≥99.8			
								≤1540			
≤2376		≤2220		≤1575		≤1890		≤2100	≤2376		
≤700											
Counterclockwise											
Forced water cooling											
Pressure and splash combined											
Elec and Hand		Elec.		Elec and Hand		Elec.					
≤300		≤295		≤340		≤350		≤295	≤340	≤340	≤280
Inland river dredgers		Air pump unit		Marine engine unit		Generating sets		Rear stored with SAE standard of USA	Farm trucks		

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Engines

Model		295T	295G	295GA	295GB	295GJ	295G-2	295G
No. 1 Fuel injection pump	Model	BF2180ZR						
	Type	Hypotenuse fuel cut-off, regulating arm adjust						
	Plunger diameter(mm)	8						
Fuel pump	Model							
	Type							
Governor	Model	TIF250-1000TX	TIF250-1000ZX					
	Type	All-speed centrifugal						
	Steady governing rate(%)	≤8						
Fuel injection	Model	ZS4SI						
	Type	Single-hole pintle type						
Oil pump	Model	JZK1018						
	Type	Single stage,radial,gear-within-gear rotary pump						
	Speed(rpm)	1905						
	Pressure(Kpa)	294						
	Displacement (L/min)	10.98~13.02						
Cooling water pump	Type	Centrifugal,volute,single stage						
	Speed(rpm)	2790						
	Delivery lift(m)	5						
	Displacement (L/min)	55.8						
Thermostat	Model	155D		155D				
	Initial open temperature(°C)	70±2		70±2				
	Full open temperature(°C)	82±2		82±2				
Oil filter	Type	Single stage paper filter cartridge						
	Model	J0810H						
Fuel filter	Type	Single stage paper filter cartridge						
	Model	C0708						
Air filter	Type	3-stage net cartridge oil-bath	Single stage,dry					3-stage net cartridge oil-bath
	Model		K1706					