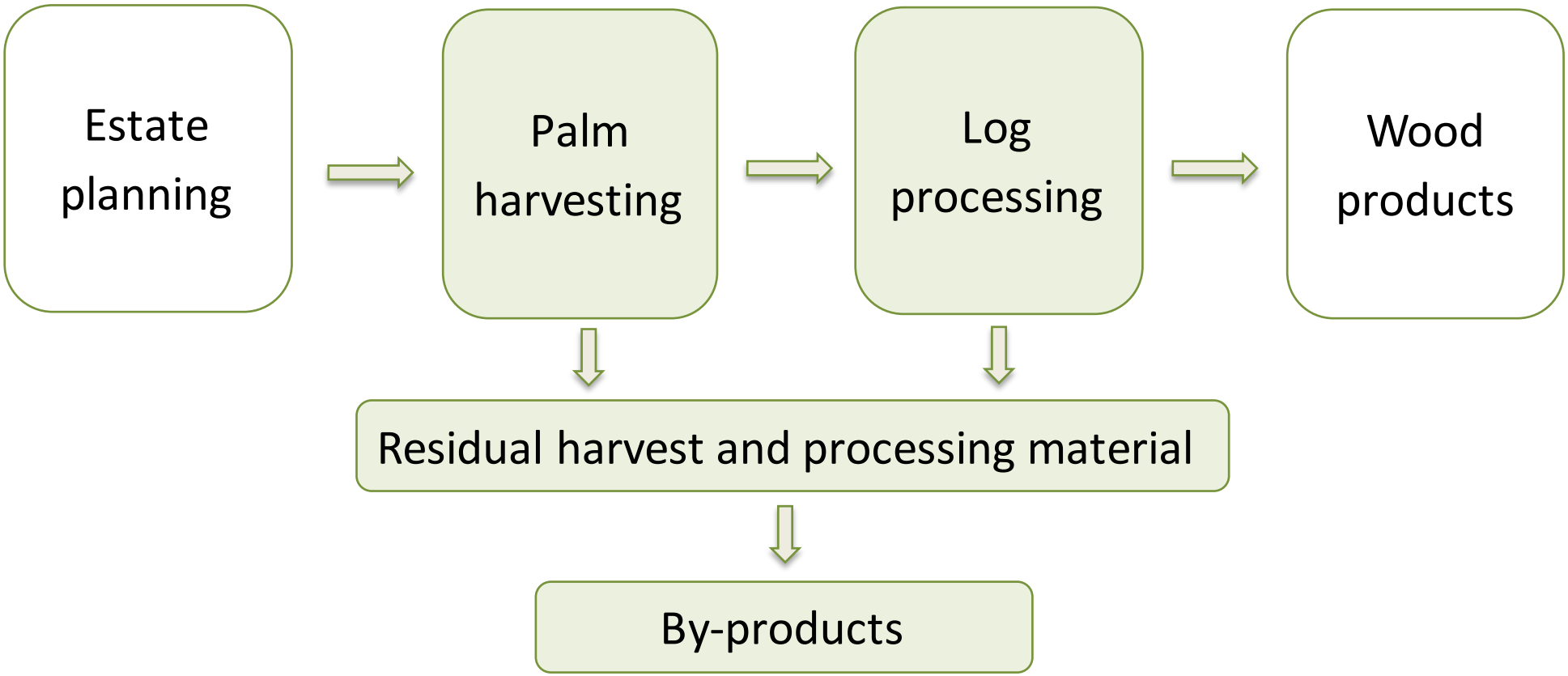
CocoVeneer – By-products

Potential by-products from coconut wood harvesting and processing residues

Content

- Source and volume of residues
- Residues as growing medium
- Residues for biochar
- Residues as fuel.

Project objective 6 – By-products



Objective 6 – By-products

Coconut palm harvesting residues

- Palm harvested for peeling trials (Savusavu, Vanua Levu. Fiji. 2015)

Objective 6 – By-products

Coconut log processing residues

(Labasa, Vanua Levu. Fiji. 2014)

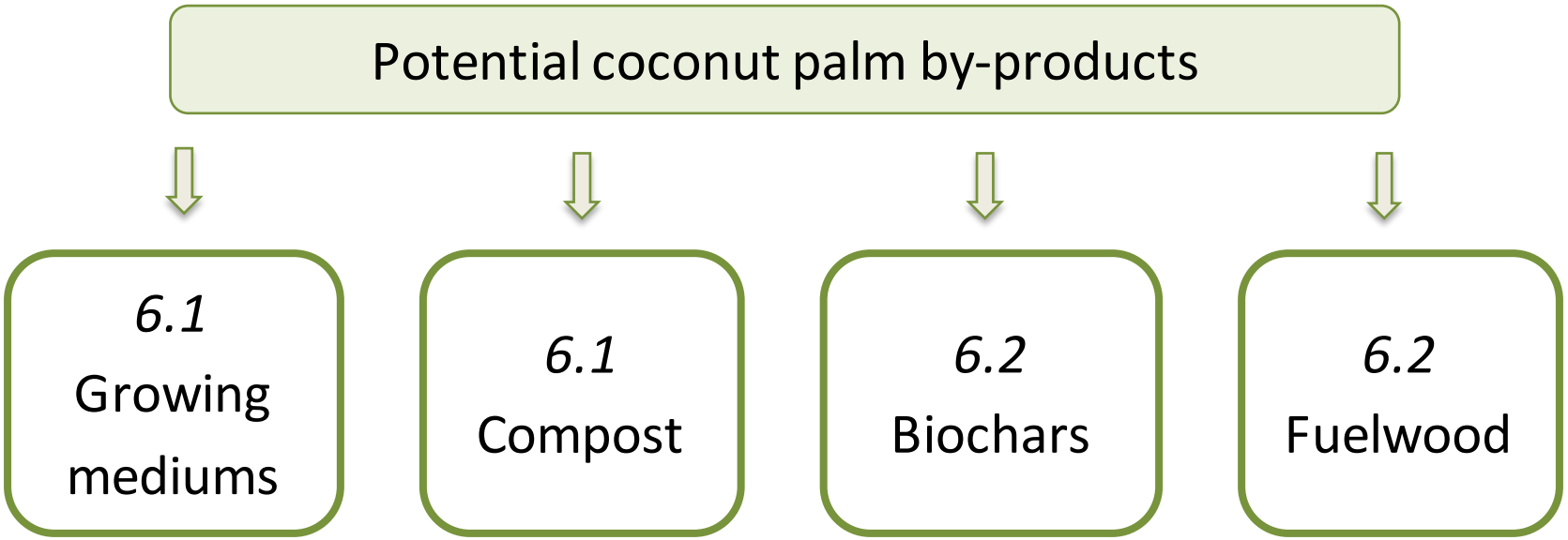
Objective 6 – By-products

Potential volume of harvesting residues

Years	Fiji 20 ha No. of palms	Fiji 20 ha Vol.m^3 of residue	Solomon Is. 20 ha No. of palms	Solomon Is. 20 ha Vol.m^3 of residue	Samoa 20 ha No. of palms	Samoa 20 ha Vol.m^3 of residue
Post immediate harvest	190	390	142	291	115	235
Post harvest year 5	171	351	180	369	115	235
Post harvest year 10	171	351	180	369	172	352
Post harvest year 15	171	351	180	369	172	352
Post harvest year 20	171	351	180	369	172	352
Post harvest year 25	171	351	180	369	172	352
Post harvest year 30	171	351	133	272	134	274
Post harvest year 35	171	351	133	272	134	274
Post harvest year 40	171	351	133	272	134	274
Post harvest year 45	171	351	114	233	134	274
Post harvest year 50	57	117	114	233	134	274
Post harvest year 55	57	117	114	233	134	274
Post harvest year 60	57	117	114	233	134	274

Nominal residues generated addressing senility with 5 yearly harvest and 60 year rotation,

Objective 6 – By-product utilisation



6.1 By-products – Growing mediums

6.1
Growing mediums

Physical analysis of fine ground cocowood medium compared with coir media

Parameter	**Cocowood (fine-ground)**	**Coir 1***	**Coir 2***	**Recommended range** (Bodman and Sharman, 1993)
Air filled porosity	34.18%	16%	35%	5-20%
Water holding capacity	44.41%	35%	64%	>40%
Water retention efficiency	61.33%	46%	63%	No data
Wettability	55 seconds	<5 seconds	15 seconds	No data
Bulk density	0.09 (g/vol)	0.07	0.08	<1.2
pH	6.22	5.84	6.4	4.7-7
Electrical conductivity	1727μS/cm	629	2254 μS/cm	<700- 1800

*source: Poulter *et al*., 2009

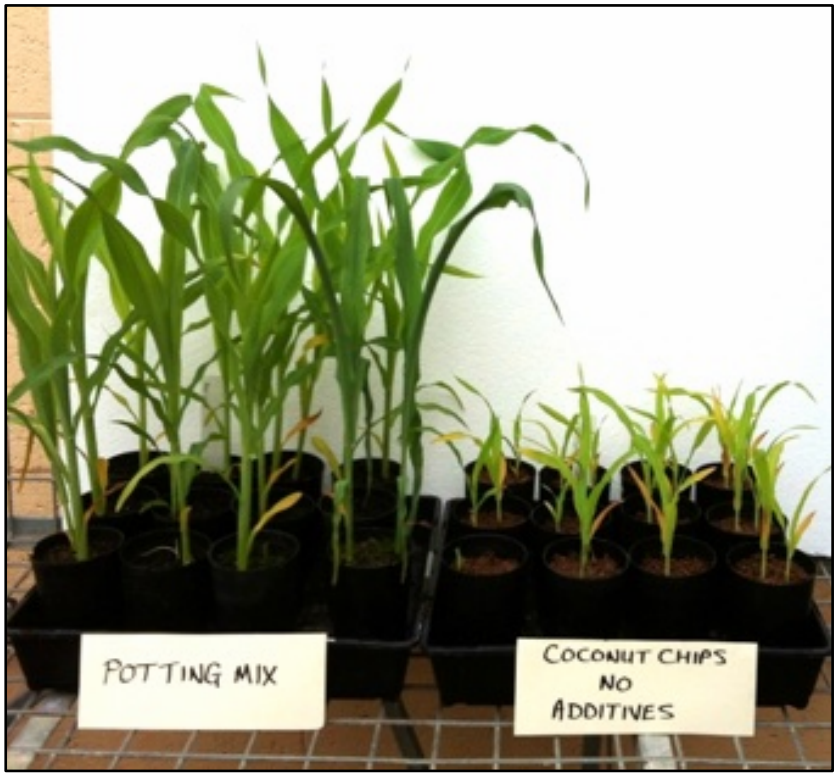
6.1 By-products – Growing mediums

Good mycellium growth through the substrate

Successful mushroom production, but poor yields

6.1 By-products – Growing mediums

Plant growth trials were established to compare germination and growth rates of sweet corn



6.1 By-products – Growing mediums

Test Required: Australian Standard Applicable:			Sample 1 240393-Coconut Wood Chips CA-PACK-007 Premium AS 3743/2003	*Requirment* AS 3743/2003	*Status*
Nutrient		Units	E3286/1	*Potting Mix*	
Air-filled Porosity		%	25	*≥13*	*Pass*
Total Water Holding Capacity		%	42	*≥50*	*Fail*
Wettability		min	1m 20s	*≤2*	*Pass*
pH (1:1.5)		pH units	6.1	*5.3 - 6.5*	*Pass*
Electrical Conductivity (1:1.5)		dS/m	5.4	*≤2.2*	*Fail*
Chloride	Cl	mg/L	162	*≤200*	*Pass*
Ammonium	N	mg/L	2.75	*≤100*	*Pass*
Phosphorus	P	mg/L	14	*8 to 40*	*Pass*
Potassium	K	mg/L	55	*≥30*	*Pass*
Sulfur	S	mg/L	8	*≥40*	*Fail*
Calcium	Ca	mg/L	28	*≥80*	*Fail*
Magnesium	Mg	mg/L	25	*≥15*	*Pass*
Ca:Mg Ratio		Ratio	1.1	*1.5 to 10*	*Pass*
K:Mg Ratio		Ratio	2.2	*1 to 7*	*Pass*
Sodium	Na	mg/L	511	*≤130*	*Fail*
Copper	Cu	mg/L	0.1	*0.4 to 15*	*Fail*
Zinc	Zn	mg/L	1.0	*0.3 to 10*	*Pass*
Manganese	Mn	mg/L	1.0	*1 to 15*	*Pass*
Boron	B	mg/L	0.07	*0.02 to 0.65*	*Pass*

6.1 By-products – Growing mediums

6.1
Compost

CSAW has trial composted coconut woodchip on a garden-scale to examine end-product properties.

12 weeks

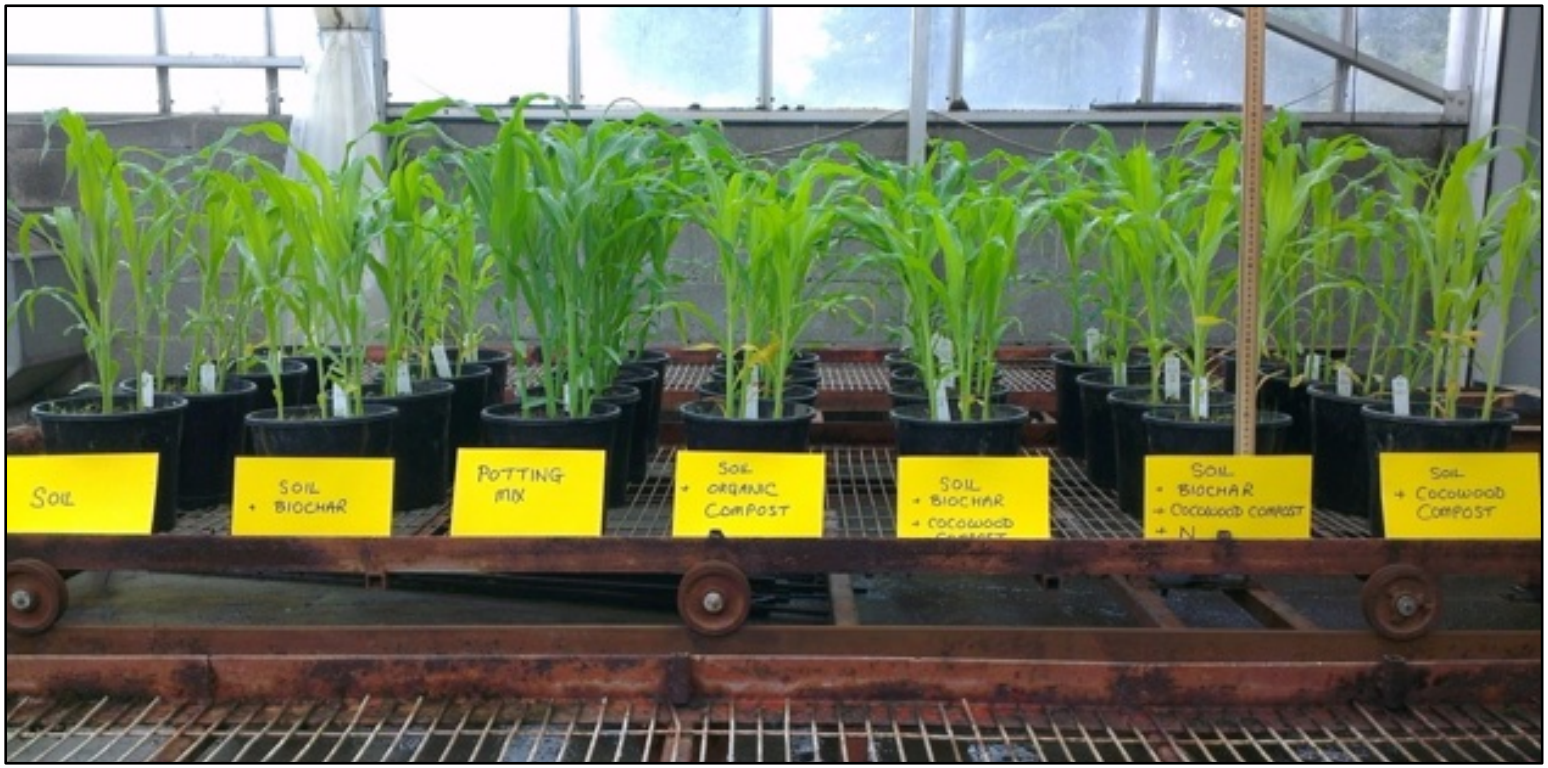
6.1 By-products – Growing mediums

Test Required: Australian Standard Applicable:			Sample 1 241254 Cocowood compost CA-PACK-006 Premium AS 3743/2003	*Requirment* AS 3743/2003	*Status*
Nutrient		Units	E3286/1	*Potting Mix*	
Air-filled Porosity		%	NA		
Total Water Holding Capacity		%	NA		
Wettability		min	NA		
pH (1:1.5)		pH units	7.3	*5.3 - 6.5*	*Fail*
Electrical Conductivity (1:1.5)		dS/m	**2.8**	*≤2.2*	*Fail*
Chloride	Cl	mg/L	97	*≤200*	*Pass*
Ammonium	N	mg/L	1.80	*≤100*	*Pass*
Phosphorus	P	mg/L	78	*8 to 40*	*Fail*
Potassium	K	mg/L	280	*≥30*	*Pass*
Sulfur	S	mg/L	36	*≥40*	*Fail*
Calcium	Ca	mg/L	14	*≥80*	*Fail*
Magnesium	Mg	mg/L	9.8	*≥15*	*Fail*
Ca:Mg Ratio		Ratio	1.4	*1.5 to 10*	*Pass*
K:Mg Ratio		Ratio	28.6	*1 to 7*	*Fail*
Sodium	Na	mg/L	**245**	*≤130*	*Fail*
Copper	Cu	mg/L	0.4	*0.4 to 15*	*Pass*
Zinc	Zn	mg/L	0.4	*0.3 to 10*	*Pass*
Manganese	Mn	mg/L	0.2	*1 to 15*	*Fail*
Boron	B	mg/L	0.6	*0.02 to 0.65*	*Pass*

6.1 By-products – Growing mediums

Composting coconut palm log harvest residues could be particularly useful for most site rehabilitation options

6.1 By-products – Growing mediums

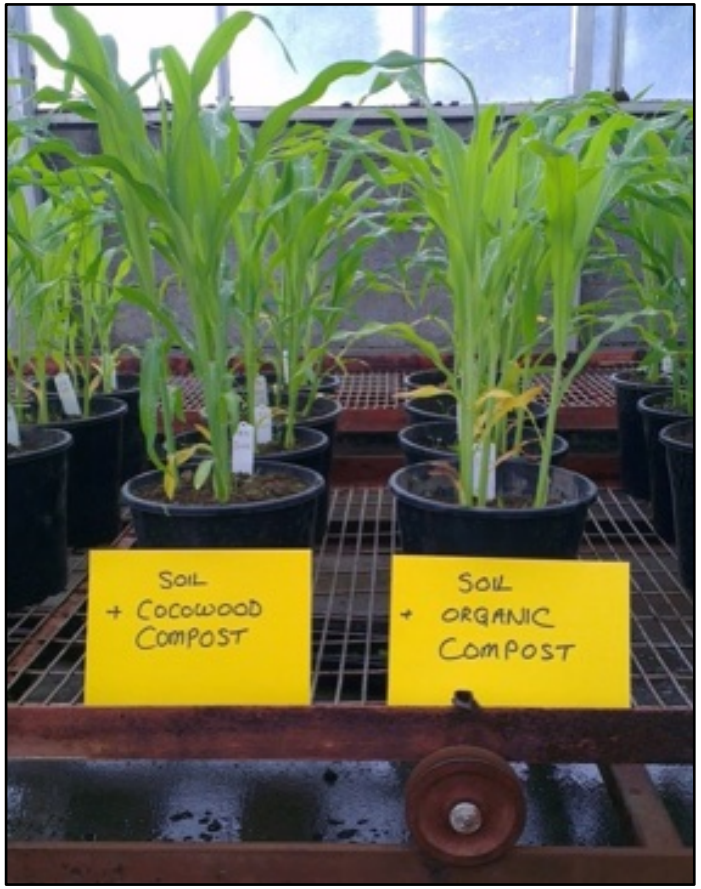


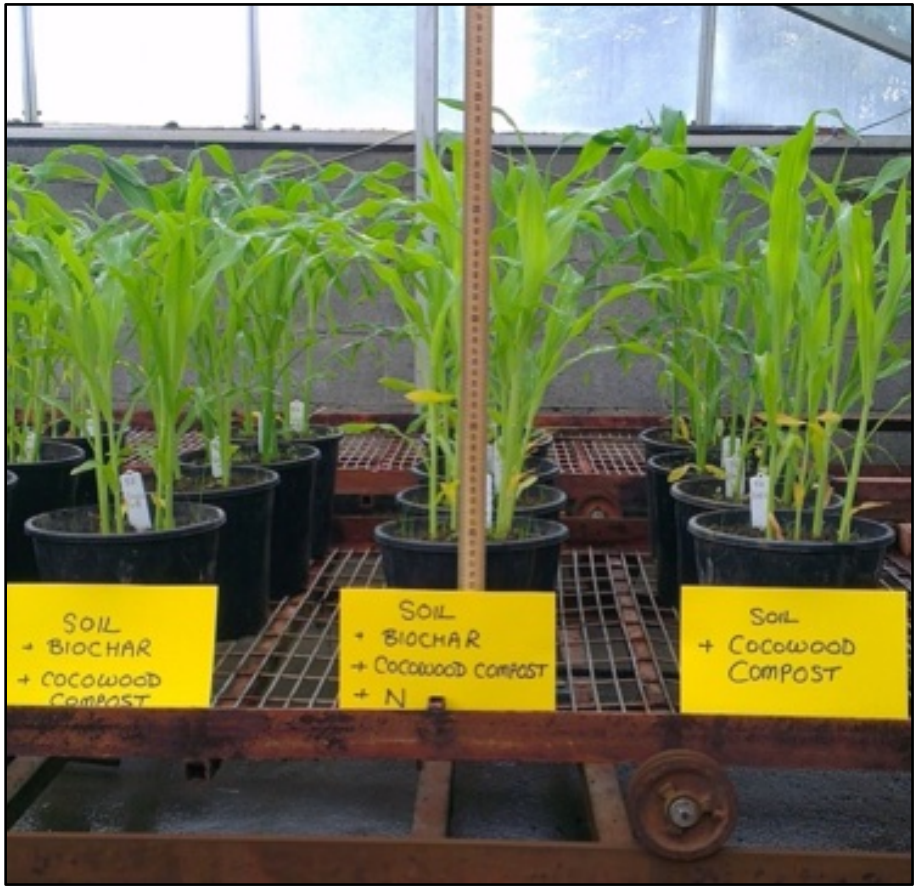
A second series of plant growth trials were established to again compare germination and growth rates of sweet corn - (Monocotyledon)

6.1 By-products – Growing mediums

Also comparing plant growth and germination and growth rates in peas - (Dicotyledon)

6.1 By-products – Growing mediums





6.2 By-products – Biochars

6.2
Biochars

Biochars from the pyrolysis of coconut wood

6.2 By-products – Biochars

Advanced veneer and other product from coconut wood

- Benefits from biochar are not universal
  - Soil types respond differently
- Applying biochar to soils in the Pacific Islands may have beneficial effects
  - Increased crop productivity through higher nutrient use efficiency
  - A retention of nutrients - limits nutrient leaching
  - An increase in water-holding capacity
  - A decrease in soil acidity

6.2 By-products – Biochars

6.2 By-products – Biochars

No statistically significant differences in mean corm weight between biochar treatments.

No consistent effects of initial feedstock, pyrolysis temperature, rate of biochar and priming.

6.2 By-products – Fuelwood

Table 3. A comparison of the energy content of various fuel types used across the South Pacific Islands (derived from Mario, R. 2000)

Fuel	Gigajoules per Tonne
Automotive Gasoline or Diesel	46
Liquid Petroleum Gas	49.4
Coconut Oil	38.4
Charcoal	30.0
Wood waste @ 40 % moisture content	10.8
Wood waste @ 12 % moisture content	17.1
Coconut palm wood	11.5
Coconut shell and husk	14.0
Sugar bagasse	9.7

6.2 By-products – Fuelwood

Tropik wood industries limited

Advanced veneer and other product from coconut wood

6.2 By-products – Fuelwood

For a jet-box veneer dryer processing approx. 75,000 cubic metres of veneer a year. A 20 MW biomass heat-plant requires approx. 30,000 tonnes wood residue.

6.2 By-products – In summary

- Coconut estate renewal and wood processing will generate significant residue volumes.
- Chipped coconut can be used as a base growing medium but alternatives have superior performance.
- Composted coconut appears to be performing very well against alternatives.
- Biochar trial was conducted but inconclusive.
- Increasing applications can exist for coconut fuelwood.

Composting and fuelwood can use high volumes of material.

Objective 6 By-products – Questions