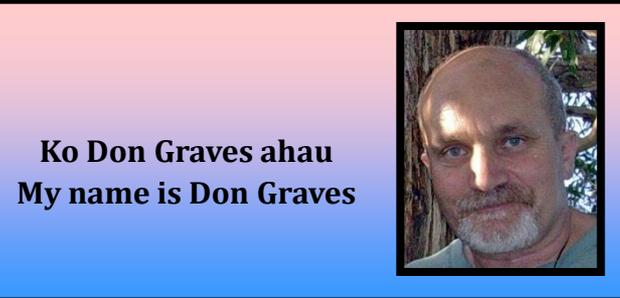




**Ko "Thomas Harrison" te waka
My ship is Thomas Harrison (1842)
Nelson**



**Ko Don Graves ahau
My name is Don Graves**



**Ko Motueka toku papakainga
My place is Motueka**



**Ko Taranaki te maunga
Taranaki is my mountain**



**Ko Whanganui te awa
Whanganui is my river**



Ko Pākeha te iwi, My tribe is Ngati Pākeha.

**Ko Keswick, ko Cumberland o te rohe a ngā roto
o Ingarani, ko Tiamana ngā hapū i te taha a
tooku papa.**

**My father's father's ancestors' & clans came
from the Lakes District England & from
Germany. My mother's peoples were Otago
whalers, sealers & shipping workers from
Scotland (Kōtorana).**

Waiata mai "Non Je Ne Regrette Rien"

My song is "No Regrets" by Edith Piaf



Transforming waste products into by-products? & or crises into opportunities?

危機 wēijī

(n.) lit. "crisis" or "critical moment"; from risk 危 and opportunity 機, the idea that there can be a positive result in a wisely handled risk

Farming within Nitrogen Limits: Cow urination ... crisis ? & or opportunity?

*Has anyone else
peed here already?
How often? How many?
How long? How come?*

*How Come? ...
the "solution to pollution is dilution"*



Freshwater Algal Bloom & Fisheries Risks



Community Shared Goals: Freshwater Quality Protection



Farming within Nitrogen Limits:

Proposal to apply biochar into dairy pasture root zones

AIM 1: (on site) within dairy pasture soils & crop root zones. “Nutrient capture & re-use” (or ‘closed-loop’) dairying. Retain soluble nutrients derived from cow urine patches and fertilizer inputs.

Refs. Clough & Condon *et al* (2013);

Cayuela *et al* (2013) Joseph & Lehmann (2015);

Farming within Nitrogen Limits:

Proposal to apply biochar into dairy pasture root zones

AIM 2: (off site) in surface waters & ground water aquifers. N mitigation - Dairy Farming.
Avoid, Remedy or Mitigate effects of dairy pasture nutrient losses on water quality

Refs. Clough & Condon *et al* (2013);

Cayuela *et al* (2013); Joseph & Lehmann (2015);

Proposed method
uses no-tillage direct
seed drills to place
biochar slurry into
dairy pasture soils in
close proximity to
plant root zones and
mycorrhizal soil
fungal zones.

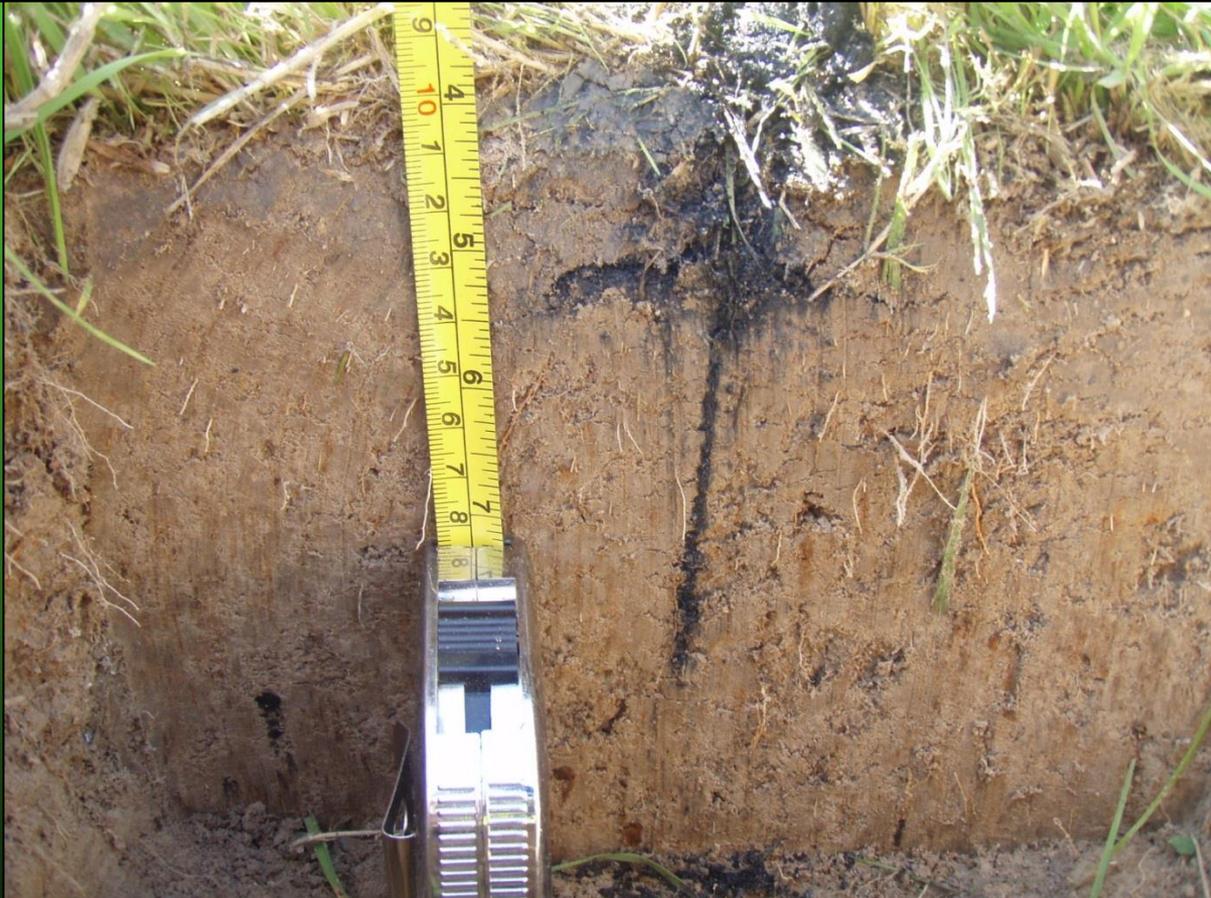


Mycorrhizal Symbiosis
S.E. Smith & D.J. Read (1997)



Smith & Read (1997)

Preliminary research has shown that no-tillage or direct drilling can effectively apply biochar into pasture root zones.



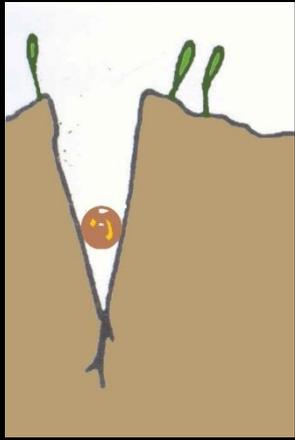
Refs: Blackwell *et al* (2009).; Baker *et al* (1996); Rikihana *et al* (2012); Bishop *et al* (2013)
Graves *et al* (2013); Graves (2013); Lehmann J & Joseph S (2015)

What is *biochar*?

“Biochar” is a modern name for **charcoal used in soils** in a manner derived from ancient gardening practices to amend the physical, biological and nutrient availability qualities of soils, ... or to capture leachate lost from composts, kitchen & toilet wastes or fertilisers.

“Biochar binds onto nutrients etc ... in a way similar to how Velcro attracts fluff”

No-tillage seedbed or 'slot' shape & seed drill options:



“V” or “Y”
shaped slots
derived from
“double-disc”
or “triple disc”
seed drill
blades



“U” shaped
slot derived
from a “U”
shaped seed
drill coulter
blade



“inverted T”
or “L”
shaped slot
derived from
“Baker Boot”
seed drill

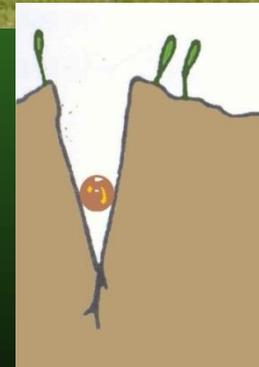


“+” shaped
slot derived
from “Cross
Slot”™ seed
drill

No-tillage seed drill options: Double Disc & Triple Disc Seed Drills

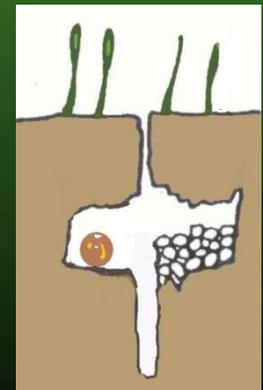


“V” or “Y”
shaped slots
derived from
“double-disc”
or “triple disc”
seed drill
blades



No-tillage seed drill options: Cross Slot™ ultra low disturbance seed drill

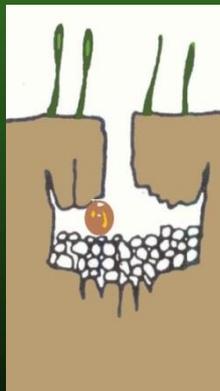
www.crossslot.com



•“†” shaped slot
derived from “Cross
Slot”™ seed drill



No-tillage seed drill options: “*Baker Boot*” minimum tillage direct seed drill / slurry injector

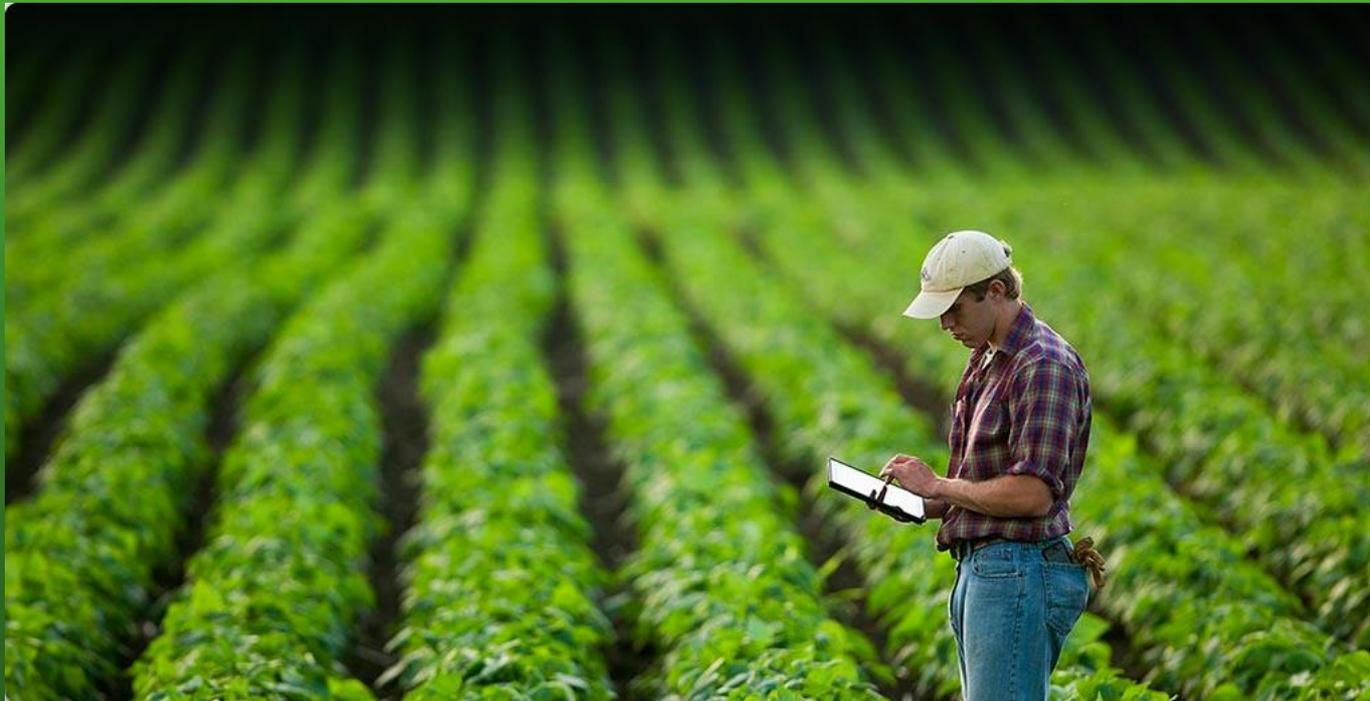


• “inverted T” or “⊥”
shaped slot derived from
“Baker Boot” seed drill

Charcoal production / purchase options: Cool Planet Energy

CoolTerra[™]

A product of Cool Planet



<http://www.coolplanet.com/>

Charcoal production / purchase options:

KILNZ Kowhai International Ltd NZ, Rotorua,
pari@wastetransformation.co.nz



- It is envisaged to **share** or “piggyback” the **effort and costs of applying biochar** into pasture or crop soils **alongside the practice of under-sowing with crop or pasture seeds.**

- Further economic opportunities for farmers that may result from a successful outcome of this method, include the possibility to **reduce the quantities of fertilizer inputs** required and thereby **lower future production costs.**

Further possible biochar applications in dairy farming

1. Making biochar from manures
2. Biochar nutrient capture & recycling from dairy shed washings & effluent holding ponds
3. Mixing biochar with supplementary feed
 - Manure + biochar for earthworms to mix into soils
4. Greenhouse gas (GHG) mitigation
 - Denitrification inhibition in soils
 - Soil Carbon sequestration

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- Trevor Richards, AllBlackEarth <http://soilcarbon.org.nz/> Sincere thanks for travel expenses to & from Rotorua