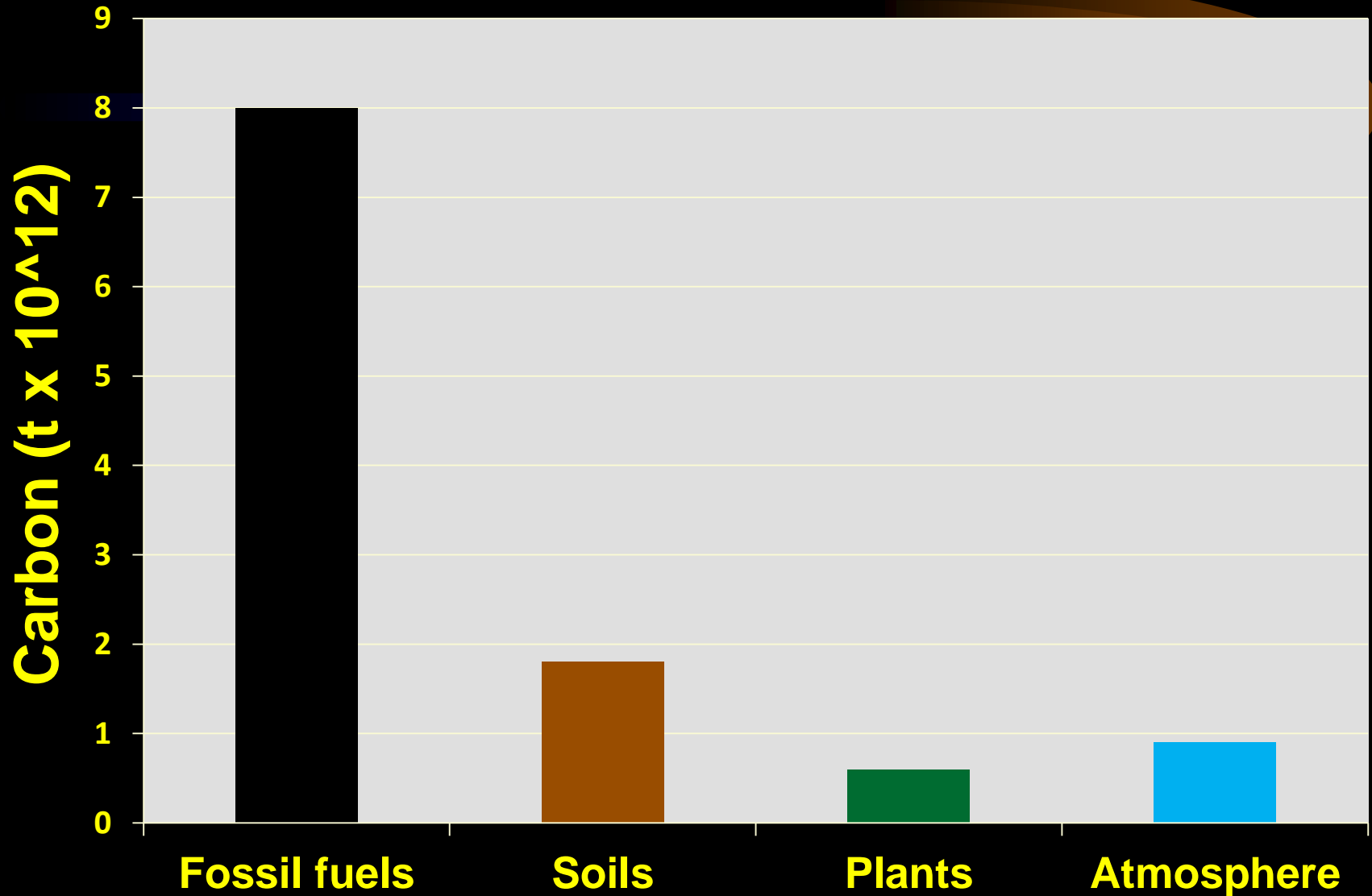


Carbon legislation,
carbon mitigation
and sustainable agriculture –
what does the future hold?

Brian Purchase

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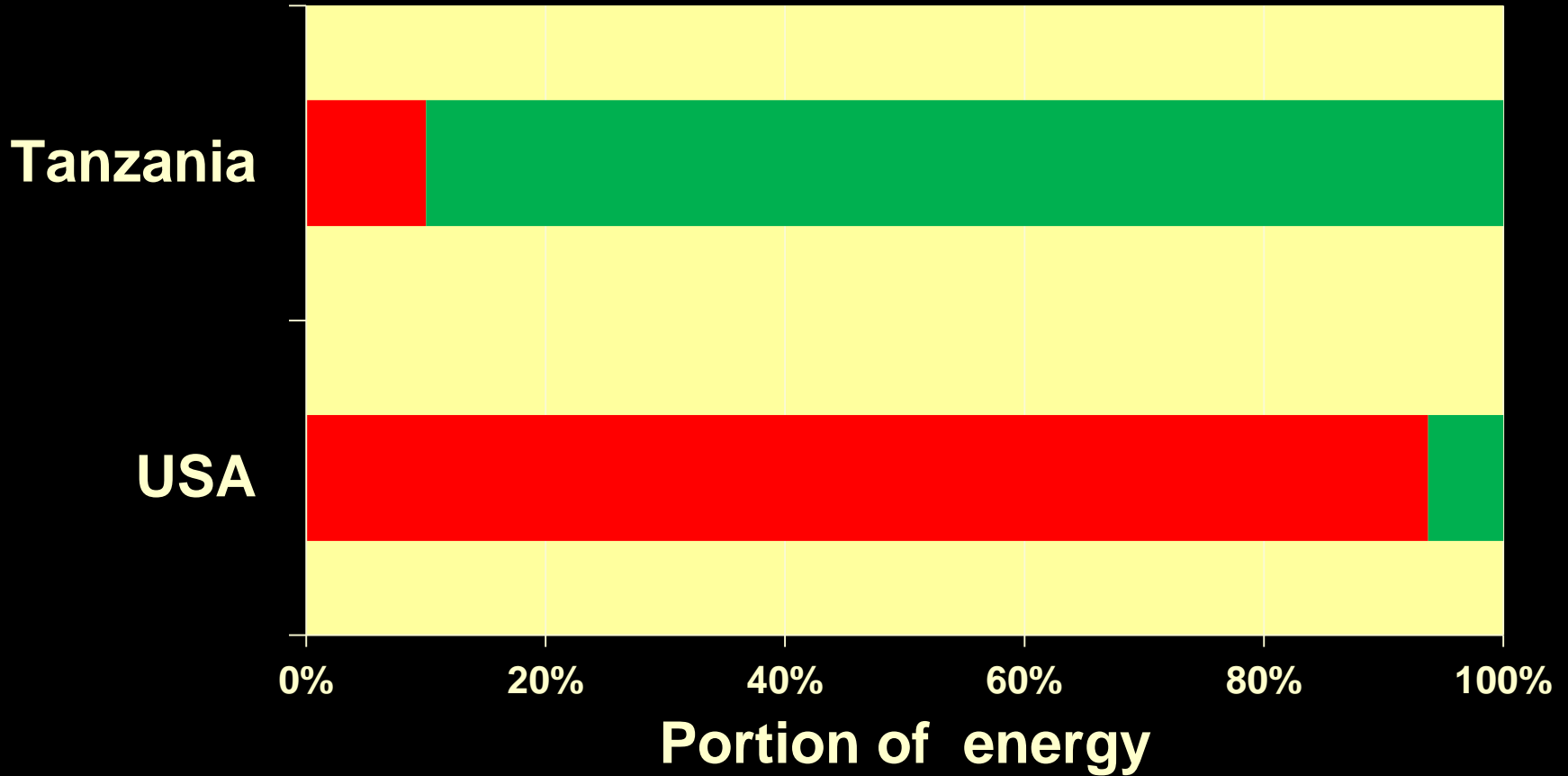
Perspectives – C distribution



Contrasting situations

Contrasting perspectives

Fossil **Non-fossil**



Legislation - history

- UN Framework Convention on Climate Change – **encouraged** mitigation
- Kyoto protocol (1997) **sought commitments**
 - Live as from 2005 with commitments by developed countries sufficient to reduce GHG emissions to 5.2% below 1990 levels by 2012.
 - Further reductions intended as from 2012

Legislation – history (cont.)

- UNFCCC - Copenhagen 2009
 - Sought mitigation commitments of about 40% to keep temp rise $<2^{\circ}\text{C}$.
 - Actual commitments by developed **and developing** countries are well below target.
 - Funds (\$100 bn by 2020) pledged to assist less developed countries with clean development.

Kyoto mechanisms

- “Annexure 1” countries (37 developed countries plus EU) made commitments.
 - *(USA refused because China & India not included)*
- GHG reduction would be by:
 - Own mitigation projects and
 - Offsets traded with other countries

Kyoto trading mechanisms

- **JI** = Joint implementation between Annexure 1 countries.
- **CDM** = Clean Development Mechanism - projects in developing countries, assisted by developed.
- **IET** = International emissions trading. Carbon markets.

The Clean Development Mechanism



- Most relevant for Africa.
- Depends on production of Certified Emission Reduction certificates (CERs).
- 1 CER = 1 t CO₂ equiv.
 - 1t CH₄ = 23 t CO₂
 - 1t N₂O = 300 t CO₂

CDM Project cycle

- 1 – Project design by participants.
- 2 – National approval by Designated National Authority (DNA).
- 3 – Validation by Designated Operational Entity (DOE) (*private accredited certifier*).
- 4 – Registration by Executive Board.
- 5 – Monitoring by project participant.
- 6 – Verification by DOE.
- 7 – CER issuance by Executive Board.

Project methodologies

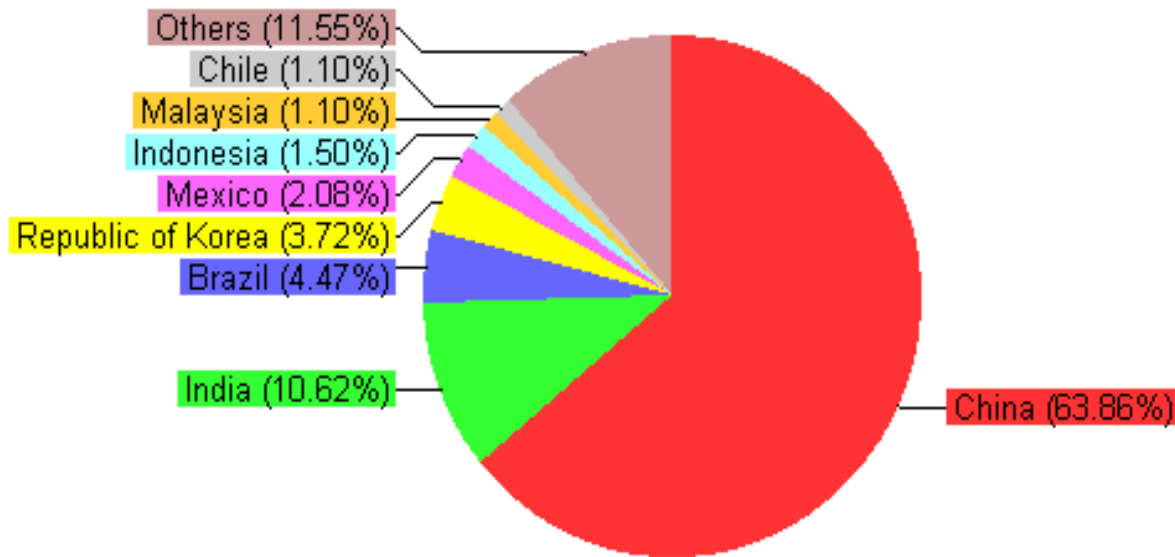
- Numerous CDM-approved methods exist for calculating CERs.
- These fall within 15 “scopes”.
- Motivation of new or different methodologies is readily considered.

Number of CDM methods and scopes

Scope	No.	Scope	No.
Energy industries	59	Metal production	7
Energy distribution	3	Fugitive emissions ex fuels	8
Energy demand	21	Fugitive emissions ex halocarbons & SF₆	9
Manufacturing	28	Solvent use	0
Chemical industries	20	Waste handling & disposal	20
Construction	0	Afforestation & reforestation	21
Transport	12	Agriculture	6
Mining	1		

Expected annual CERs from registered projects (Total = 503 304 290)

Expected average annual CERs from registered projects by host party. Total: 503,304,290



SA Perspective

- Only 1.9 million CERs issued (Aug 2011)
 - = 0.3 % of world total.
- Only 18 projects registered – e.g. Omnia fertilizer's N₂O-reduction project
 - IFC agreed to buy 50% of CERs for 5 yrs for re-sale.
- Capacity constraints at DNA are causing holdups.
- Awareness among potential participants is generally low.

Agric perspective

- Registered CDM agric projects are mainly manure harvesting for electricity production via methane.
 - In SA such a project, involving 13 farms, has waited 17 months (Aug 2011) for DNA go-ahead.
- Copenhagen accord recognised need to focus on REDD (Reducing Emissions from Deforestation and forest Decline).
- Recent Kenya project is first in Africa to seek CERs related to soil C (*see later*).

Alternatives to UNFCCC (Kyoto) initiative

- Alternative schemes and markets developed –
e.g.:
 - Chicago C exchange (*closed late 2010*)
 - Individual country (or region) schemes
 - Australian plan (July 2011) for cap and trade
 - “Socialism masquerading as environmentalism”
 - Over-the-counter schemes (simplified)
 - Codes for responsible investing
 - SA code (CRISA) launched July 2011

C market - summary

- After slow start, C trading increased rapidly until 2008.
- Various schemes and markets developed.
- Trade volumes decreased substantially after 2009.
- A unified world-wide scheme is not developing but regional schemes and voluntary action have expanded (*IDC 22.4 bn over 5 yrs for green projects*)
- The future of CDM is uncertain but useful methodologies have been put in place.

C market – summary (cont.)

- The EU Emissions Trading Scheme has been the major driver of C markets but
- As from 2012 buying of foreign offsets (by EU) will be severely restricted and limited to “least developed countries” (excludes China, India, SA).
- SA’s commitment to reduce by 34% is contingent on foreign funding, therefore unlikely to succeed.

Biofuels linkage

- Demand for GHG mitigation and alternative energy caused demand for biofuels.
- Concern over adverse spin-off effects led to sustainability certification requirements.
- Sustainability standards were finalised in 2011
 - Bonsucro standards are an example

Biofuels sustainability standards

- Have strong GHG challenges, particularly relating to land use change.
 - e.g. a greenfield project in Mozambique could not meet standards due to C release when clearing woodland.
- The standards involve:
 - Economic sustainability
 - Environmental sustainability and
 - Social sustainability

200 ML Ethanol Project - Energy Flow

Source	Petrol equiv (ML)	Coal equiv (kt)	Agric use	Factory use	Balance for sale (Pet/Coal equiv)
Ethanol	124				124 ML
Biogas	13		12		1 ML
Bagasse		171	29	86	56 kt
Trash		154			154 kt

i.e. 125 million litres petrol and 210 000 t coal

Gas tractor



Mitigation – via increased soil C

- Increased soil C = “triple win”:
 - Development (better farming, more income)
 - Climate change resilience (water retention etc)
 - Climate change mitigation (reduced GHGs).
- Soil C sequestration has been neglected in C mitigation and trading.
- World Bank report (2011) acknowledges that soil C deserves more attention.

Mitigation – soil C – Kenya Project

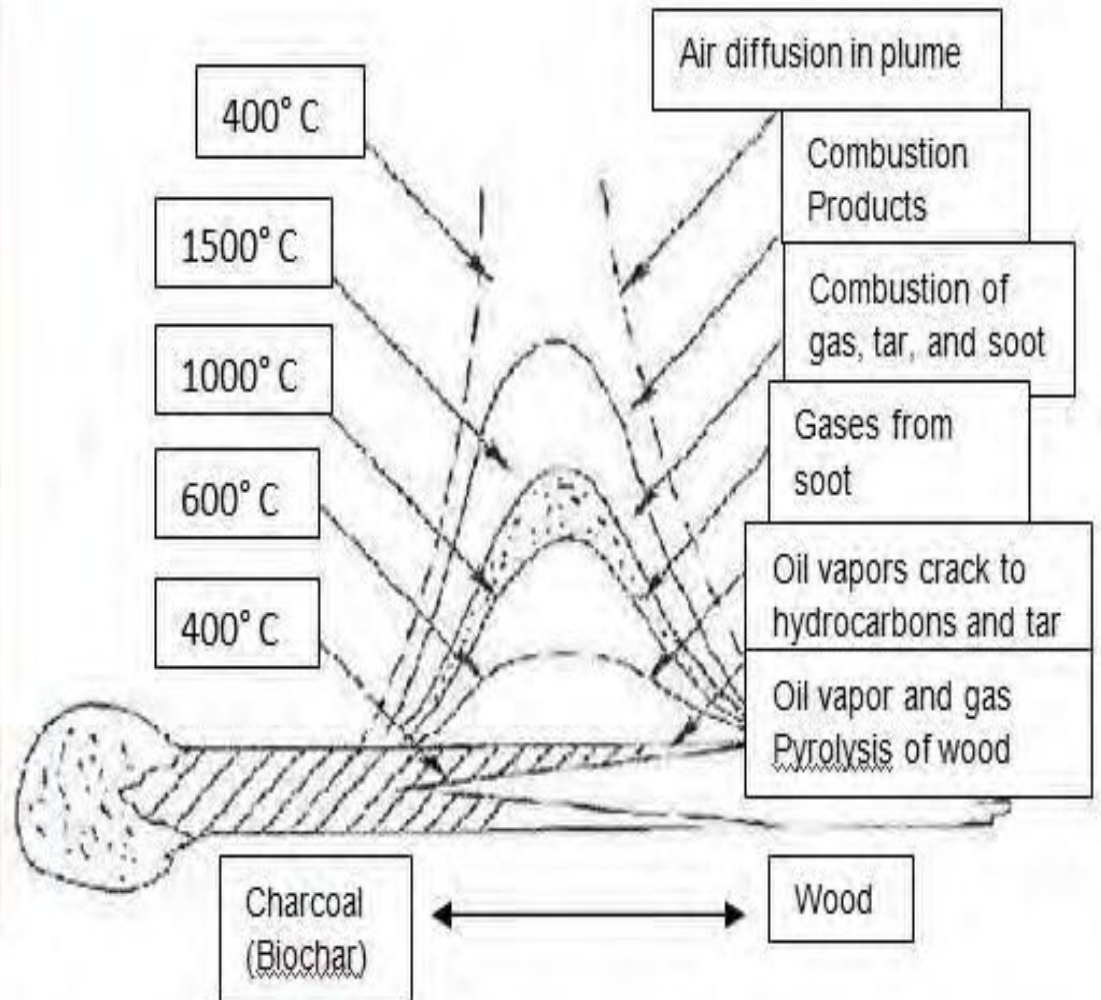
- Initiated in 2010 by Swedish NGO.
- Covers 40 000 ha of smallholder farms.
- Involves training in cropland management techniques (rotation, cover crops, compost management, agroforestry) leading to C sequestration.
- Methodology being developed by BioCarbon Fund – sequestration must be quantifiable. 1st validation completed.

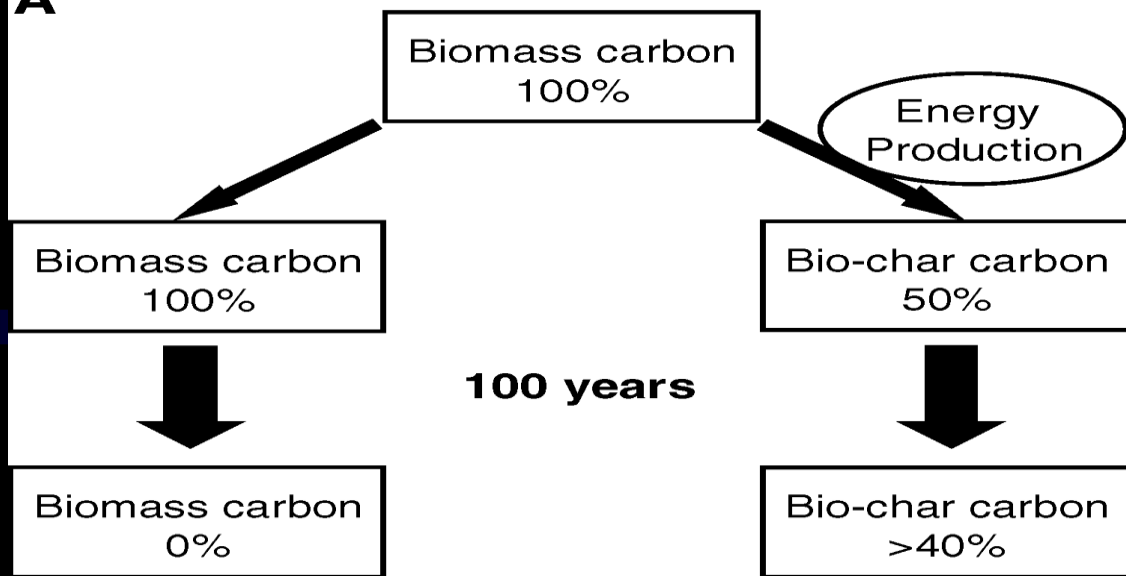
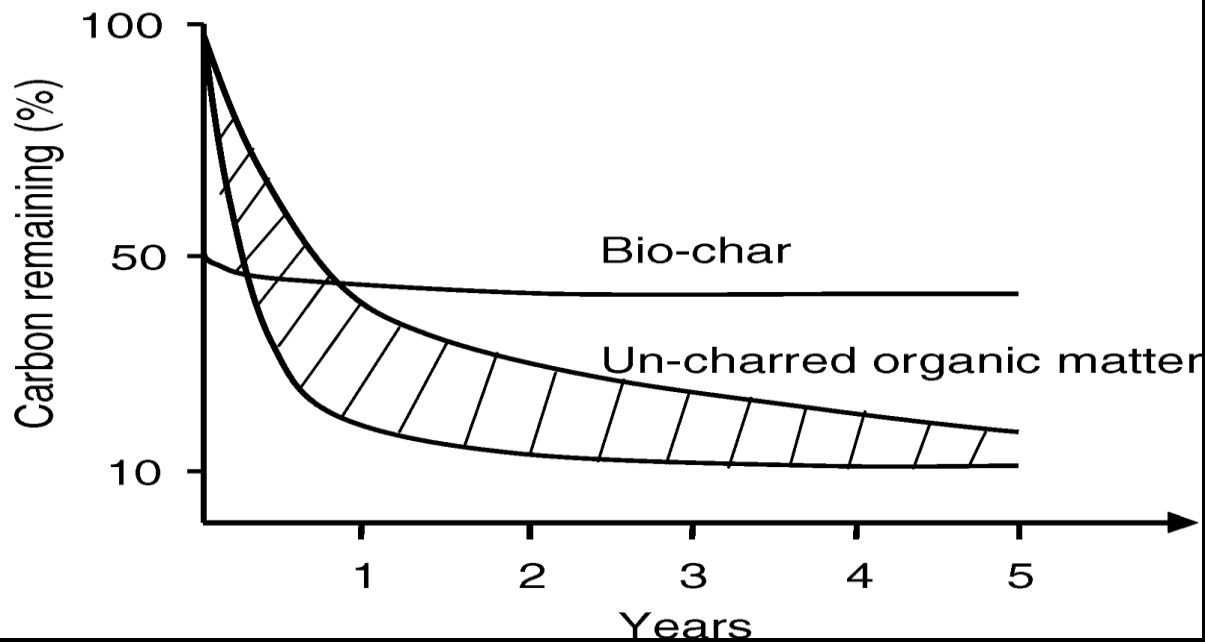
Mitigation – soil C - sugarcane

- Eustice et al (SASTA 2011)
 - Valuable assessment of trashing vs burning
 - Emphasises need for careful N management to control N₂O emissions
 - The type of work necessary for generating CERs for the sugar industry.

Mitigation – soil C – Biochar

McLauchlin et al 2009



A**B**

Biochar benefits

- Higher yields.
- Water retention - less irrigation.
- Nutrient retention – less fertilizer.
- Reduced acidity.
- Substantial suppression of N₂O and methane emissions.
- Reduced impact of land-use-change
 - “Slash & burn” changed to “slash & char”

Potential for Biochar ???



Biochar for Africa

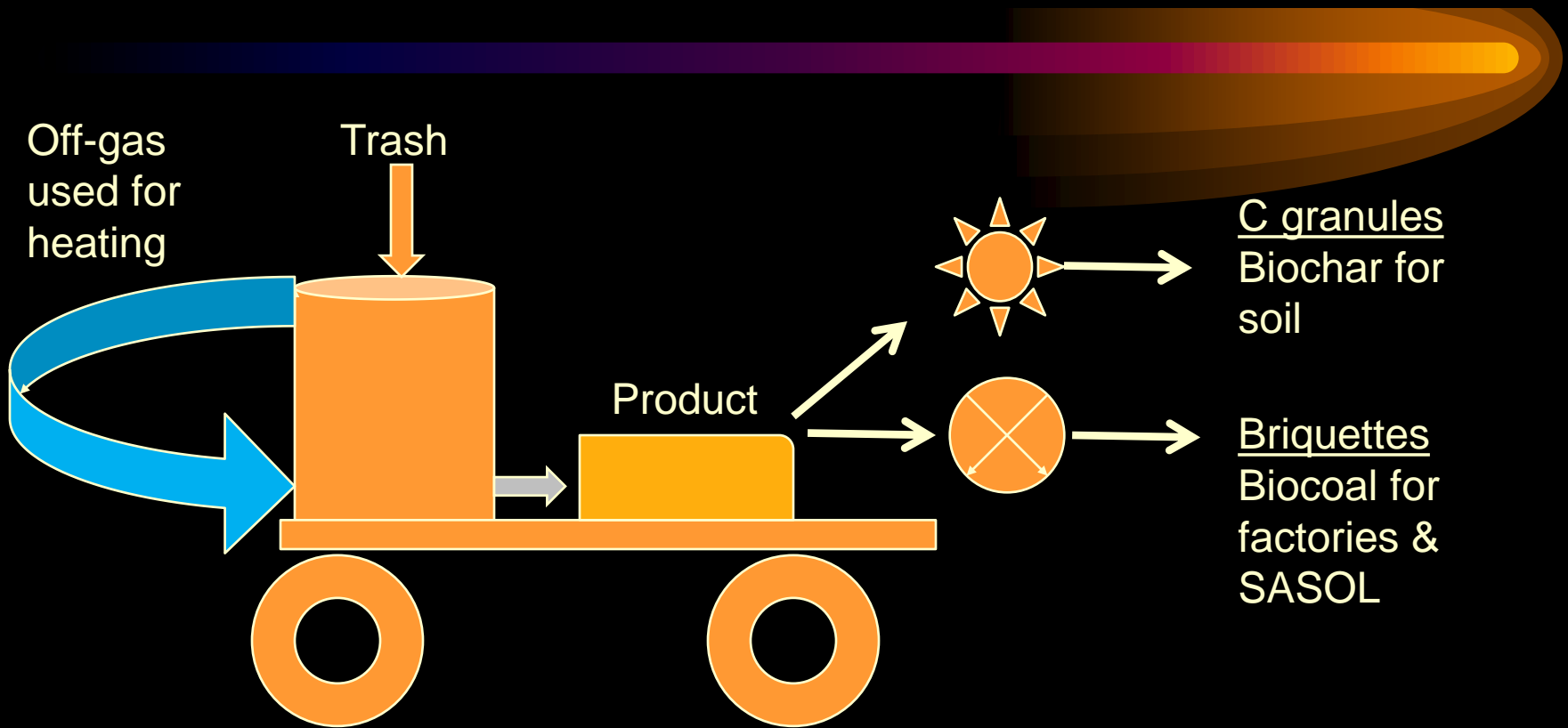




R & D motivation

***MOBILE ON-FARM
BIOREFINERIES***

Mobile torrefication unit



In soil, Biochar C lasts $>100 \times$ trash C
Therefore this system allows much more C to be sold without depleting soil C

Sustainable farming - the future

- Minimum reliance on CDM etc.
- National paradigm change w r t farming
 - It's a worthwhile business (may be small), not merely a peasant activity.
 - A respectable career, requiring a multitude of skills (need for appropriate training).
 - Farmers are more critical to human sustainability than doctors, engineers, lawyers and accountants.
 - Secure land tenure a pre-requisite.

Sustainable farming - the future

- R & D & Extension support for farmers
 - Treasure existing long-term trials
 - Develop “sustainability thinking & expertise”
 - Encourage technologies related to sustainability
 - Labour satisfaction and training
 - Farm planning
 - Minimum tillage
 - Efficient use of fertilizers, cover-crops & water
 - Green cane harvesting and better use of whole plant
 - Etc, etc

Sustainable farming – paradigm shifts





Nutrients in human urine

NUTRIENT	URINE FRACTION	
	g/p/d	% of total
N	11	88
P	1	67
K	2,5	71





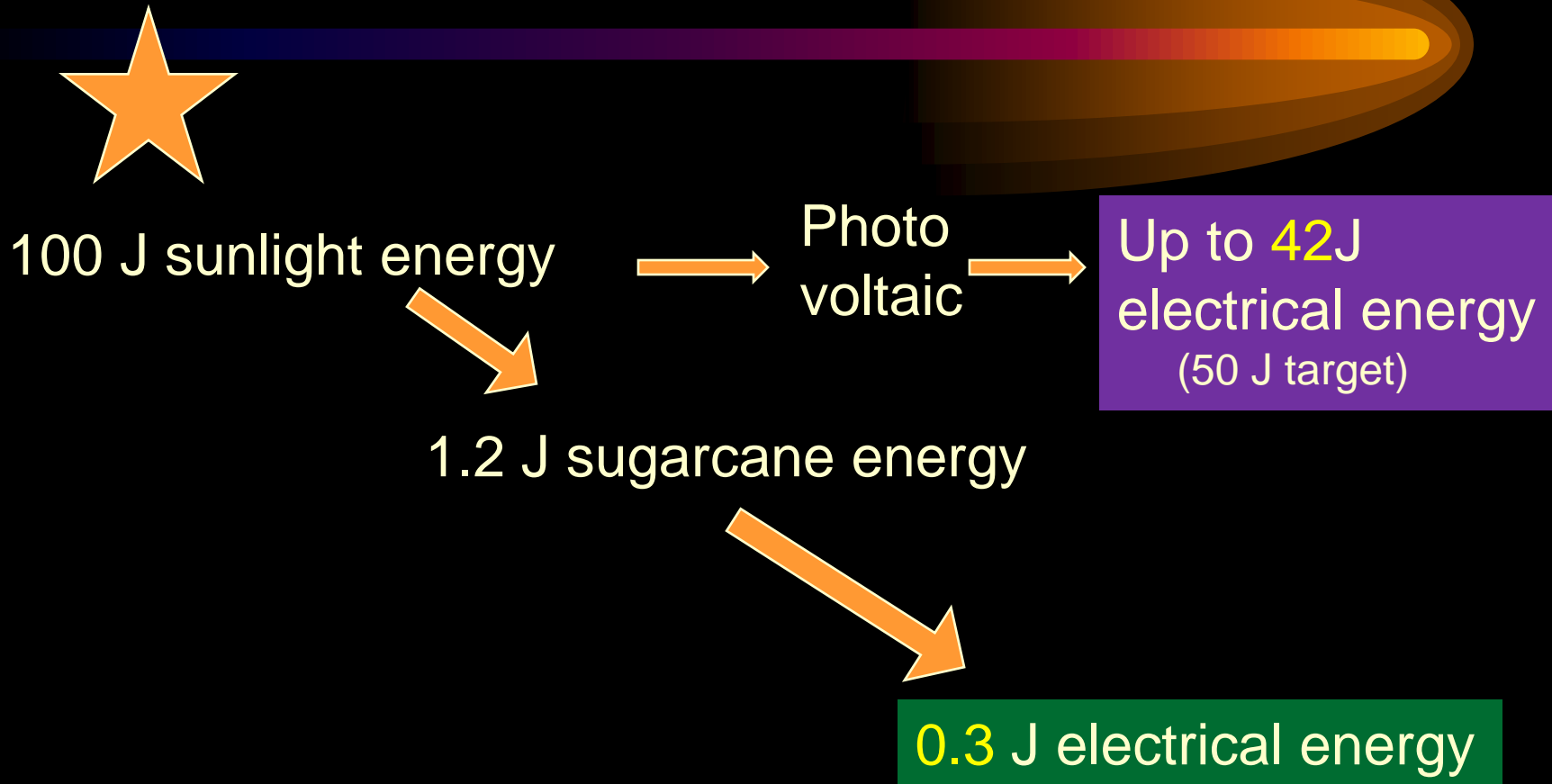


Dubious long-term sustainability



Crops grown purely for electricity

Photovoltaic comparison



Deserts of energy



Courtesy: Desertec Foundation



THANK YOU