AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

The Irish Agriculture and Food Development Authority

SSRH
Energy Crops and Supply Chains

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Dundalk
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On Farm Heat From Biomass

- GHG balance of energy crops
- Self supply versus delivered
- Supply chain analysis
- Supply chain considerations
- Costed project example
- SSRH support

GHG Balance Energy Crops

LULUCF already offsets almost 1.5m tonnes of emissions per annum.

The conversion of pasture to SRC or SRF has potential to help meet GHG targets.

Realising this mitigation requires:

(a) The conversion of a substantial portion of land to biomass

(b) Selection of suitable crop types

(c) Development of reliable combustion systems

(d) Rigorous measurement of emissions and carbon sequestration during cultivation

Role of biomass production in GHG mitigation.

Sequestering Carbon in the soil and biomass.

Mitigation of nitrous oxide via reduced N requirement.

Reduced emissions associated with fuel usage and manufacture of inputs.

Substitution of fossil fuels for energy generation and heat production.

Displacement of fossil fuels

When biomass feedstocks are combusted C is released

Ancient versus modern Carbon

Total emissions per unit energy produced from coal, oil, gas or peat are 3 to 7 times higher than that from biomass.

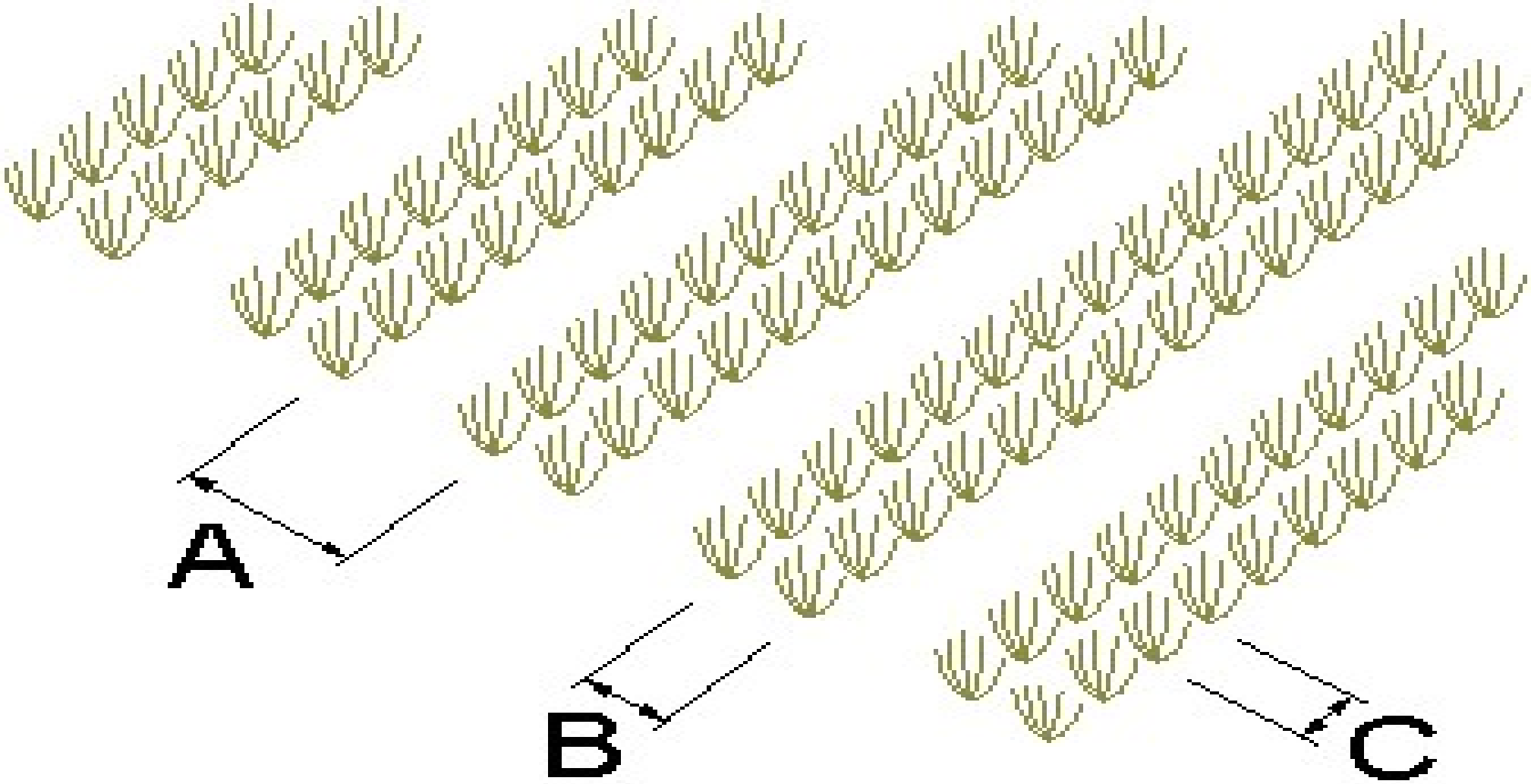
Carbon sequestration

C input into the soil – association with the conversion of tillage land to biomass – between 2.8 – 4.1t CO_2 ha yr for miscanthus and 1.8 – 2.7t CO_2 ha year for willow

If below ground biomass was included it would add another 0.5 – 1 t CO_2 ha

May take 2 – 3 years to reach this seq level

Plant Spacing



Planted Willow field

Establishment Costs

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
Establishment cost € /dry tonne	€8.44	€8.44

Assumptions

Establishment cost	€2,600 per ha
Capital grant	40% of establishment cost
Production costs spread over	22 years
Assumed Yield Willow	8.4 tonnes / ha

Method of Harvest

?

Field Storage ‘whole stem’

Harvesting Costs

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
cost € /dry tonne	€29.76	` €29.76

Assumptions

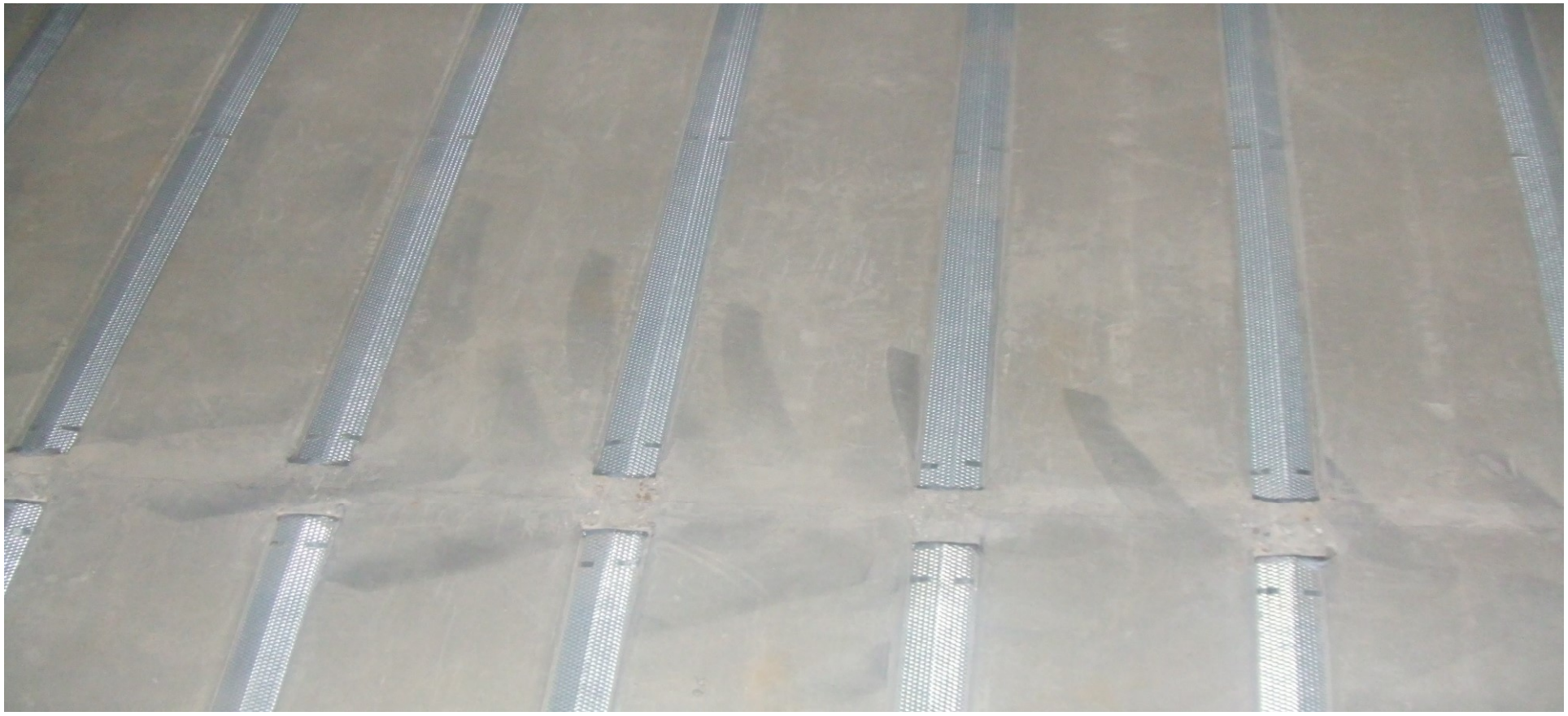
Harvest cost of SRC willow **€500 ha**

Assumed Yield Willow **8.4 tonnes / ha**

Note harvest is assumed to be every second year

Drying Floor

Uneven drying, stored crop needs turning, more expense and more energy. Slow may only dry 0.5% per day, 60 days to dry 300t or 7.5 ha of SRC!



Processing Costs

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
cost € /dry tonne	€18	€18

Assumptions

Cost of Drying Willow Chip **€18 per tonne**

Willow chip

Fuel Properties of willow chip

- Moisture content
- Ash content
- Heating value

Haulage to End User Costs

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
cost € /dry tonne	€0	` €20

Assumptions

Haulage costs of willow 100km radius — **€20 per tonne**

Lost Revenue Costs

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
cost € /dry tonne	€29.76	` €0

Assumptions

Lost revenue from food crops	**€250 / ha**
Assumed yield of willow	**8.4 t/DM/ha**

Willow Self Supply and Third Parties

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
Total cost to produce € /dry tonne	**€85.97**	**€76.20**
Farmer Profit €/dry tonne	€0	€60
Total Cost €/dry tonne	€85.97	€136.20
Cost € cent per kWh	1.67	2.65
5140 kWh per tonne Willow		

Comparison to Oil at 8 cent per kWh

Activity	Willow	
	Self Supply (Chip)	Sell to end user (Chip)
Equivalent oil price for self supply	€411	€0
Farmer Profit from Self supply	€325	/

Assumptions

Energy in willow **5,140 kWh per dry tonne**

Farmer Supply Chain Example - Hospital

Assumptions

- Supply Chain pay farmers **€20** per fresh tonne
- Yield **44 fresh tonnes** / ha after 2 years growth €880
- S. Chain dries to **15% MC**
- 44 tonnes per ha @ 55/MC drop to **23.3 tonnes**@15%MC
- Its really costing the supply chain €880 / 23.3 = **€37.77** to procure one dried tonne to 15% MC

Harvesting Costs

- If we assume harvesting costs €11 per fresh tonne of willow harvested = €484 per hectare.
- 85% DM = 15% Moisture content
- €11 per fresh tonne 55% MC = **€20.70 per tonne** dried to 15% MC (€11 / 0.45DM x 0.85DM)

Delivery to Depot

- Assume it costs €10 per fresh tonne to deliver to the depot.

- Its costing **€18.90** for each dried tonne (15% MC) to get it to the depot.

Drying Costs

- Assume it costs €10 to dry one fresh tonne 55% MC to 15% MC

- True cost is **€18.90** per dried tonne to 15% MC

Transport to Hospital Biomass Storage

- Transport costs of the dried material to 15% MC to the hospital = €8 per tonne

Total Supply Chain Costs

Operation	€/tonne @ 15% MC
Paid to Farmer	€37.77
Harvesting	€20.70
Delivery to Drying Depot	€18.90
Drying Costs	€18.90
Transportation to Boiler Storage	€8.00
Total	**€104.27 ***

Excludes Own Labour & Capex Repayment on Buildings / drying facilities.
* 4,200 kWh @15% MC = 2.5c kWh

Supply Chain Considerations

- Fuel properties of supplied material
- Storage and its effect on fuel quality
- Boiler type destination
- What cost elements of the supply chain will the supply chain absorb?
- Difference between energy tonnes and metric tonnes
- Funding mechanisms
- SSRH should make a big difference

The SSRH

What is the SSRH?

Govt. scheme

Financial support to renewable heat generators

15 year period

Administered by SEAI

Technologies – Solid Biomass Boilers & Heat Pumps

Non-domestic sector

SSRH tariff levels
(Cent for each kWh of heat produced)

Tier	Lower Limit (MWh/yr)	Upper Limit (MWh yr)	Biomass Heating Systems Tariff (c/kWh yr)	
1	0	300	5.66	€16,980
2	300	1,000	3.02	€21,140
3	1,000	2,400	0.5	€7,000
4	2,400	10,000	0.5	€38,000
5	10,000	50,000	0.37	€148,000
6	50,000	N/A	0.0	

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Thank you for you attention!

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