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How to handle IAS plant waste & its potential for bioenergy production

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BEAUTY – BUT A BEAST:
practical tools for municipalities
and prevent the impact of
invasive alien plants



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How plant species distribute?

- Plants (IAS) can spread by air, water, soil or by living organisms
- Growth can continue from either seeds, roots or rhizomes
- Especially dormant seeds can tolerate changing environmental conditions (winter, fire, drought, flood)



Seed spread species

- Dormant seeds are the biggest headache
- Thermal resistance, moisture tolerant
- Seeds of IAS may survive through processes like composting and anaerobic digestion, and viable seeds can disperse via soil transfers
- Survival of seeds depends on processes and should be validated



Limitations for handling IAS plant waste



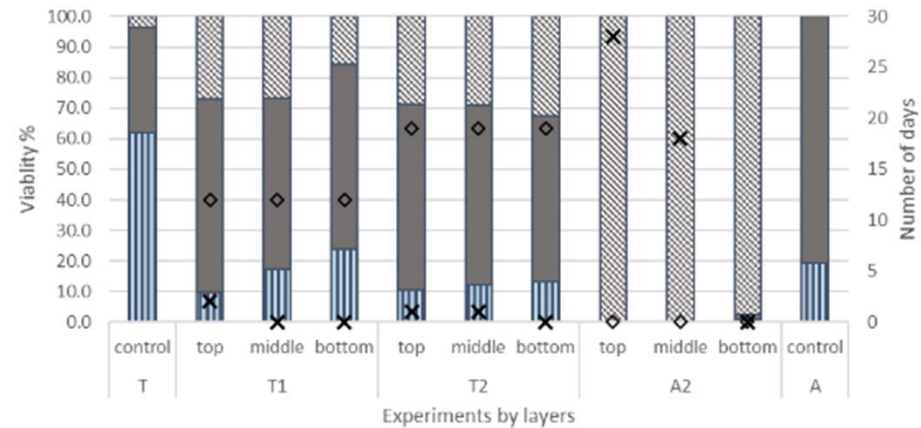
- Need for environmental permit?
- Restrictions of local waste treatment center
 - E.g. In Mustankorkea Ltd. IAS waste must be in package -> waste incineration plant



Composting

- Treatment is not sensitive for ground materials
- Waste can be transformed into organic soil

- Time of treatment is crucial
- Heat



A) ■ Viable_% ■ Dormant_% ■ Destroyed_% ◇ Days < 30 ✕ Days > 50

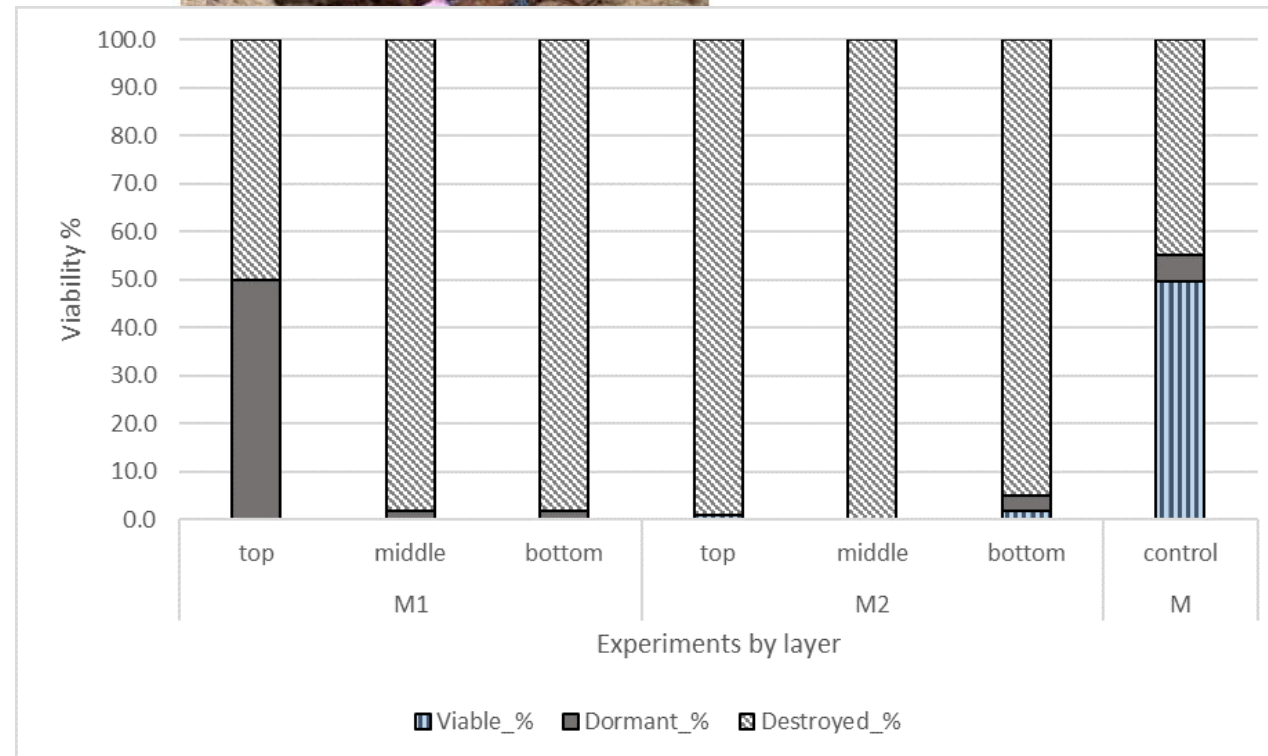
Survival rate of *Lupinus polyphyllus* seeds were in average between 6.3-6.9% in AD and 8,3% viable—31% dormant in composting. Windrow composting presented rates of 2,6% viable and 14,2% dormant seeds of lupin.

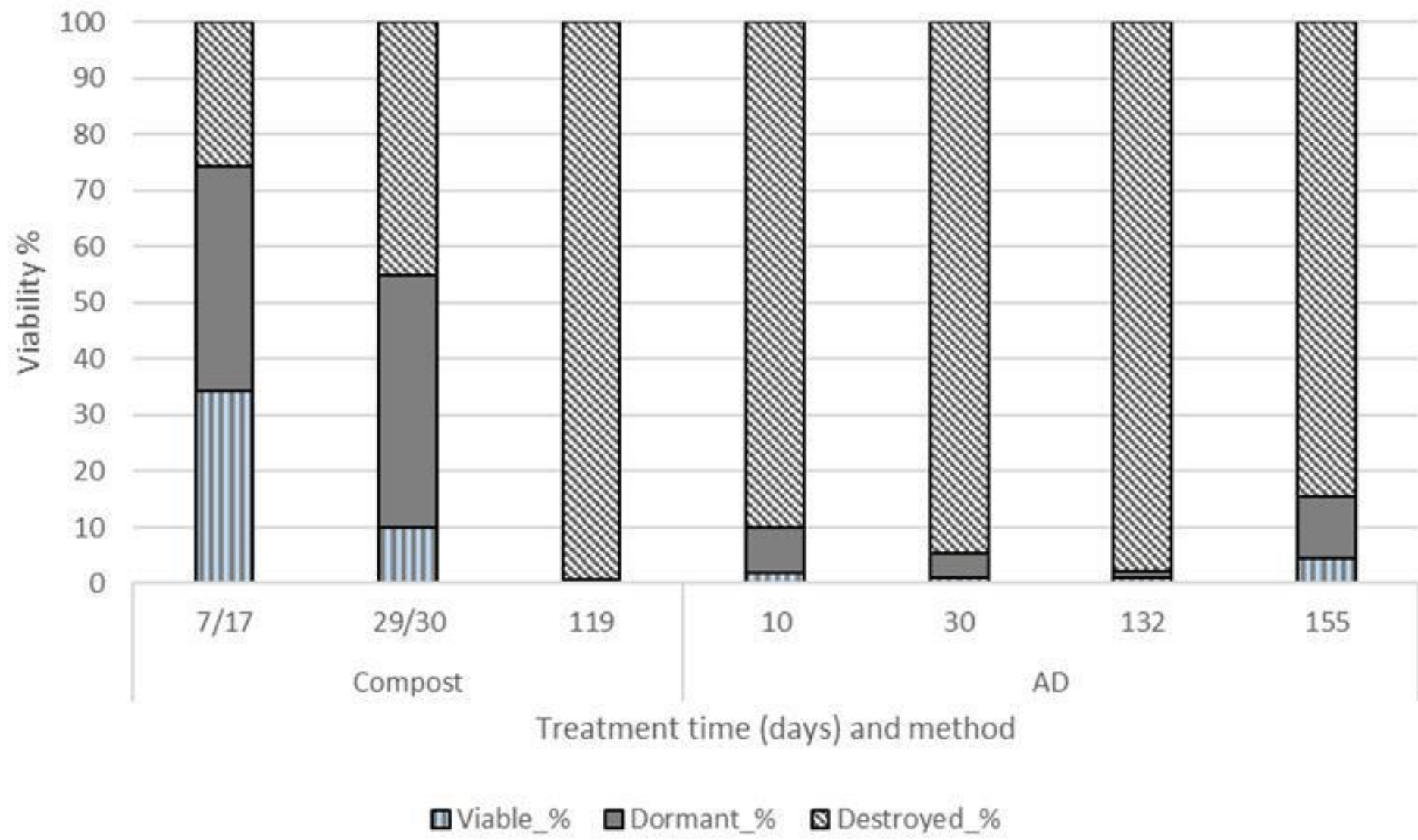
Anaerobic digestion



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- Dry/Wet process
- Patch reactor/
continuous-load digester
 - time!!!
- Hygienization 70°C/1hr is not enough!
- **Combining processes guaranties result**





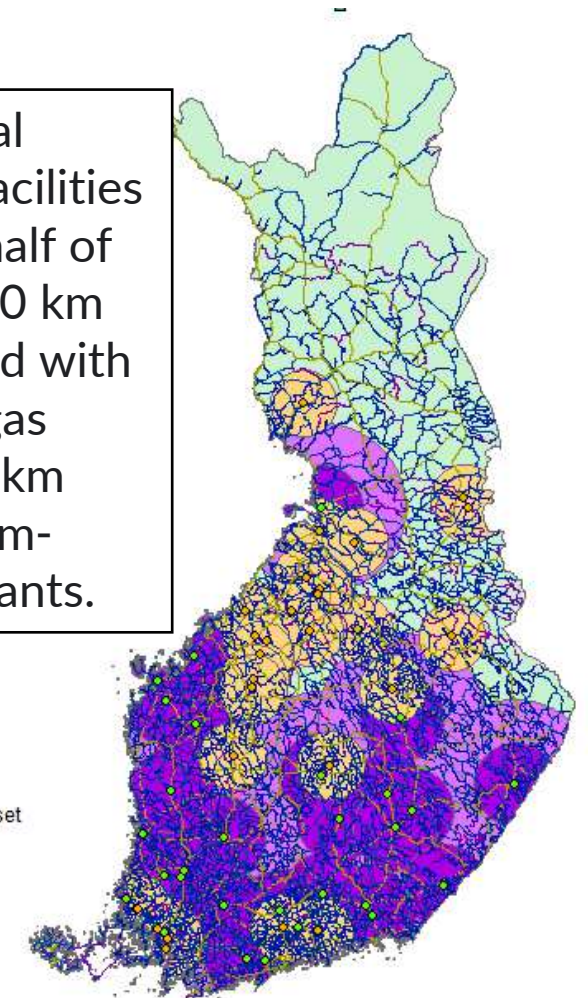
Potential biomasses

- Road verge area of 2m width (in government district) covers **23172 ha**
- In middle Finland 2020-2022 the average production
 - 5,96 tFM/ha (tons of fresh matter per hectare) with lupin
 - 3,36 tFM/ha without
 - maximum yield was 9,7 tFM/ha
- If compared to other studies
 - Yield in road verges 3,09-5,15 tDM/ha/a
 - In lupin infested mountain meadows yield varied 2,8 tDM/ha — 3,2tDM/ha e.
- This would give approx. 301,2-509,8 GWh/a
- **No additional costs of fertilizers, tillage or pest control**

The operational radius of the facilities covers about half of Finland. 50-100 km radius was used with combined biogas plants, and 40 km radius with farm-scale biogas plants.

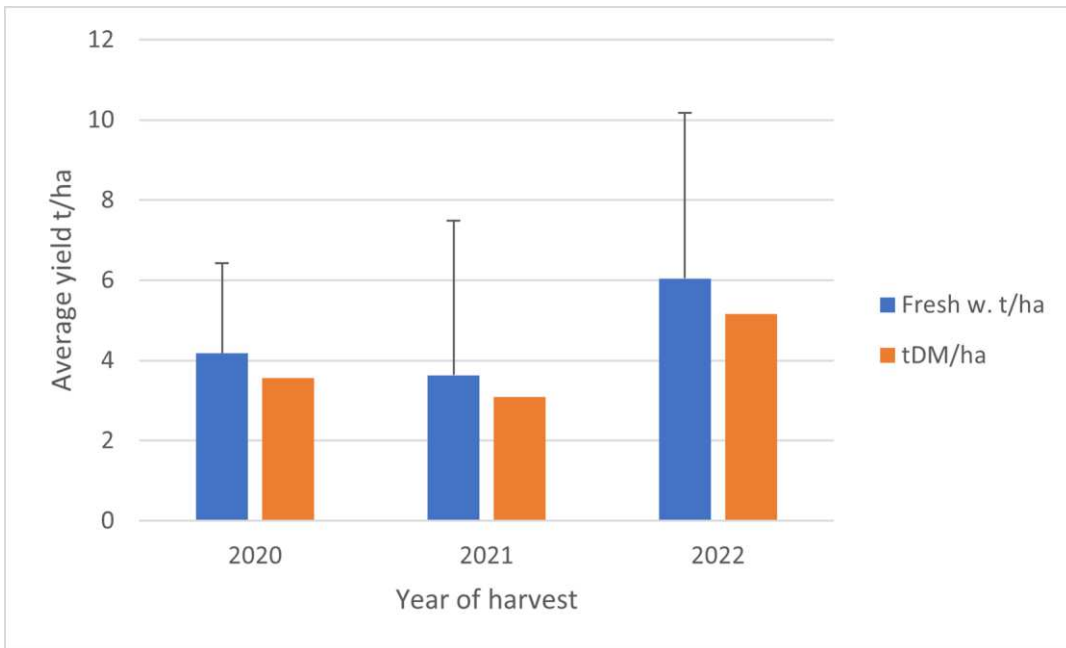
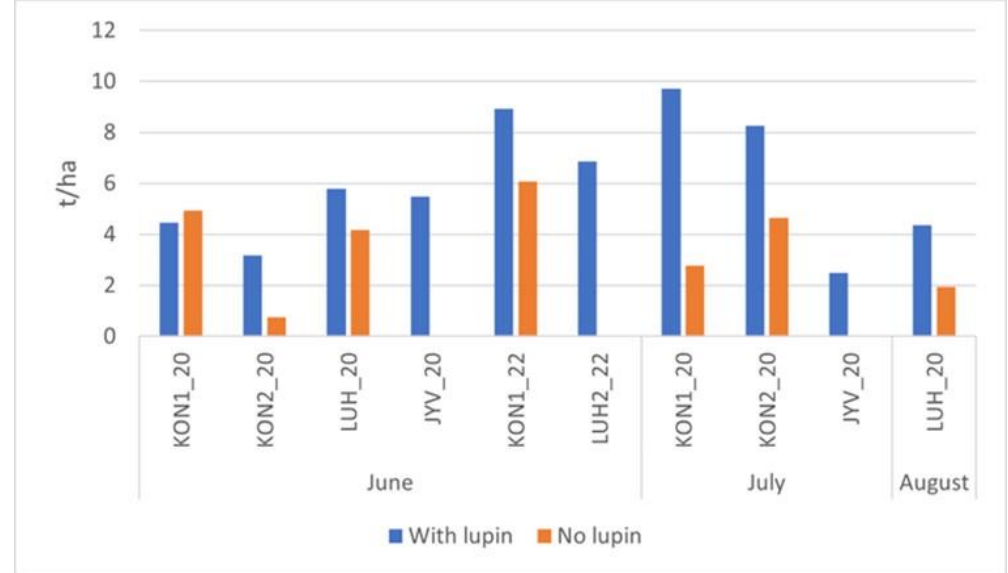
Legend

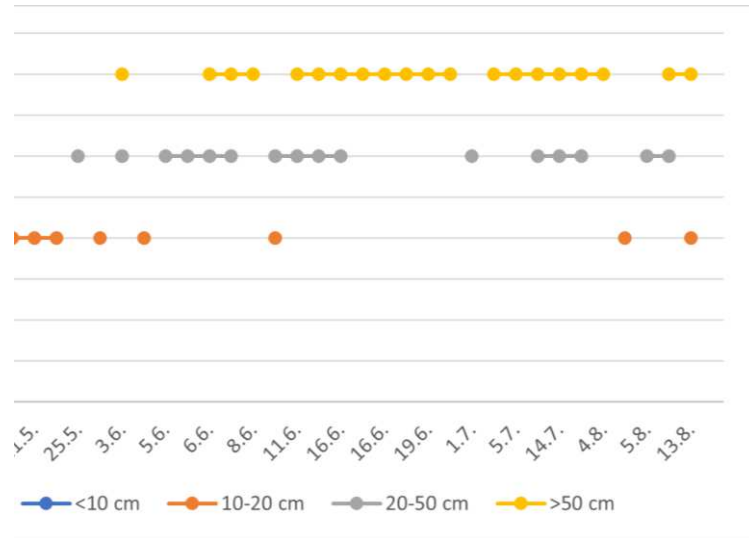
- ◆ Maatila
- ◆ Yhteislaitokset
- 40
- 50
- 100
- TieViiva



Harvesting road verges

- Biomasses are heterogenic
- For restricting IAS harvesting should be done in early summer and repeated by need





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Time	Early June	Late June	Early July	Late July	Early August	Late Aug
1 mowing in June	Multia 2020-2022	Multia 2020	Multia 2020		Multia 2021	
1 mowing in August	Multia 2021 LUH 2022	LUH 2022			Multia 2021	LUH 2021
2 mowings (June, July or June, August)	JYV 2020 KON 2021	KON 2022	JYV 2020 KON 2021		KON 2022	
2 mowings (June, July or June, August)	LUH 2020	LUH 2020			LUH 2020	
3 mowings (June, July, August)	KON 2020		KON 2020		KON 2020	





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Thanks!

LET'S KEEP IN TOUCH!



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