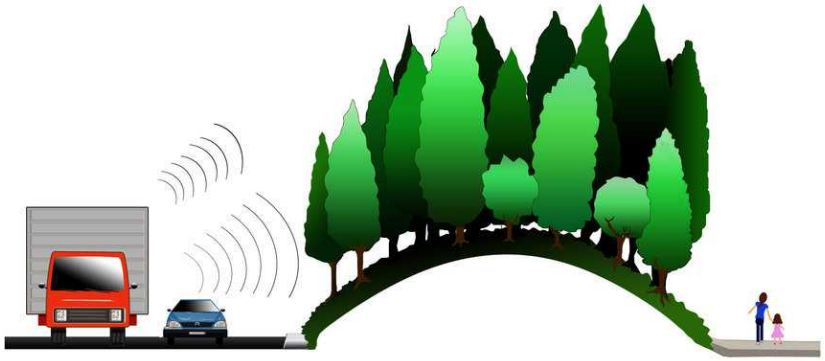
Trees as recultivation or fitopurification instrument and usage of municipal residues (wastewater sludge and wood ash) for “rehabilitation” of tree stands

Деревья как инструмент рекультивации и фитоочищения и использование муниципальных остатков (осадки сточных вод и пепла древесины) для «реабилитации» рощи.

Dagnija Lazdina, Senior Researcher, Silava

Дагния Лаздиня, Старший научный сотрудник, Silava



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Trees on roadsides

Transportation enhancements help by:

- minimizing necessary roadside maintenance;
- supporting trail construction and tourism;
- employing landscaping professionals and County Roadside Managers.
- supporting farmers who cultivate and sell plant material.

Small trees and bushes along highways and country roads:

- absorb dust and small particles;
- slow, absorb, and clean water that runs off the highway, resulting in reduced soil erosion, flood control and cleaner water supplies;
- serve as living snow fences, catching snow rather than letting it drift across travel lanes;
- provide important pollinator habitat.

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Trees on degraded areas – peat queries

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Trees on degraded areas – bare sand

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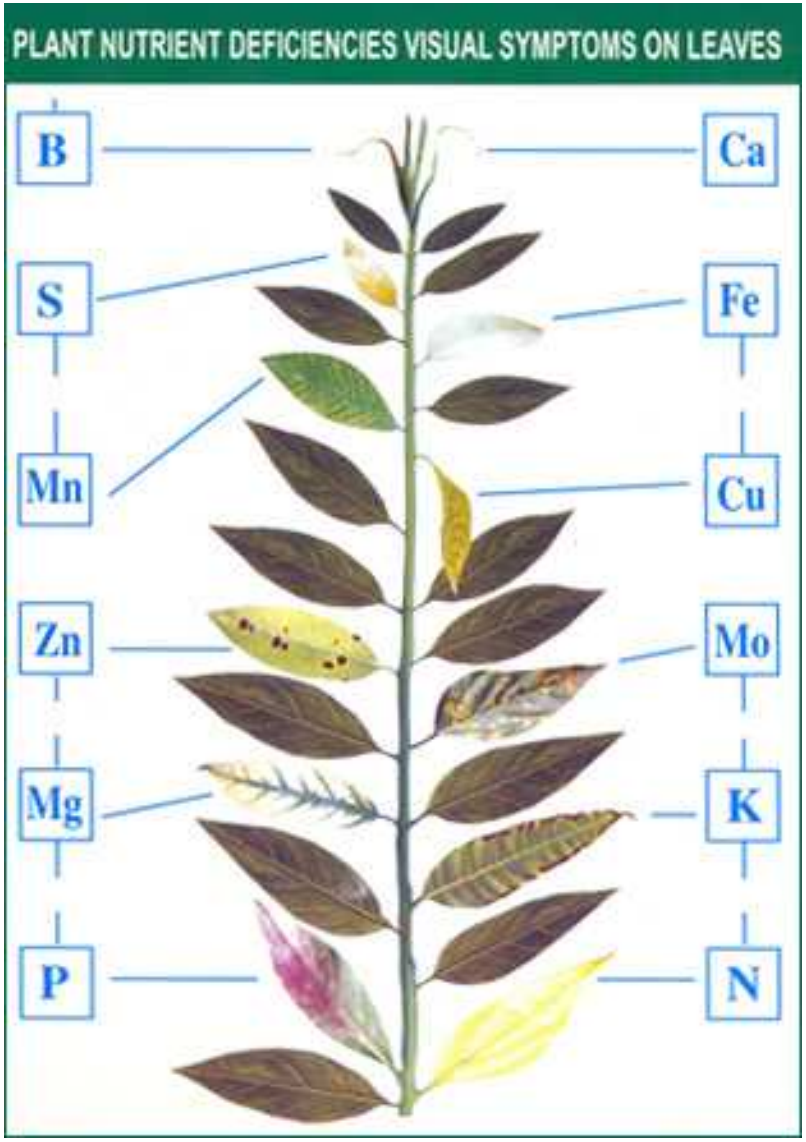
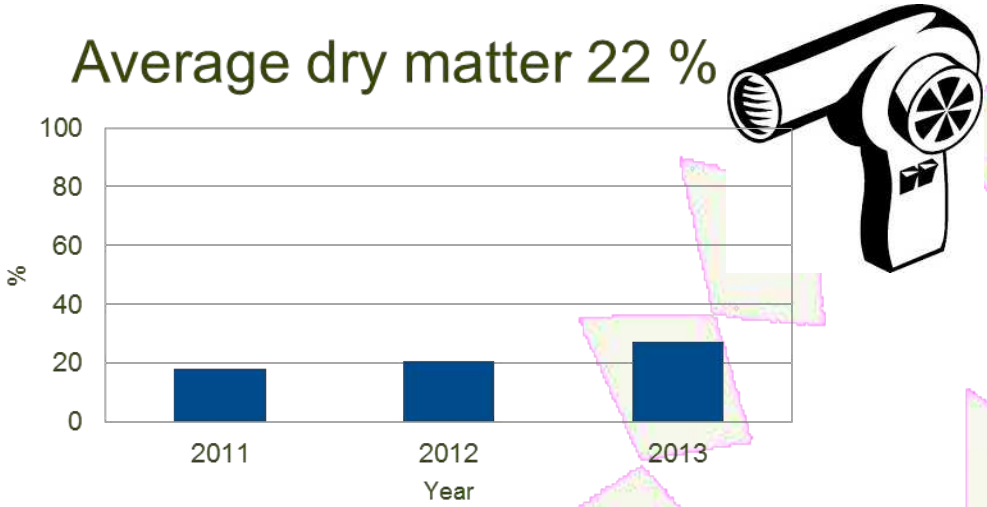
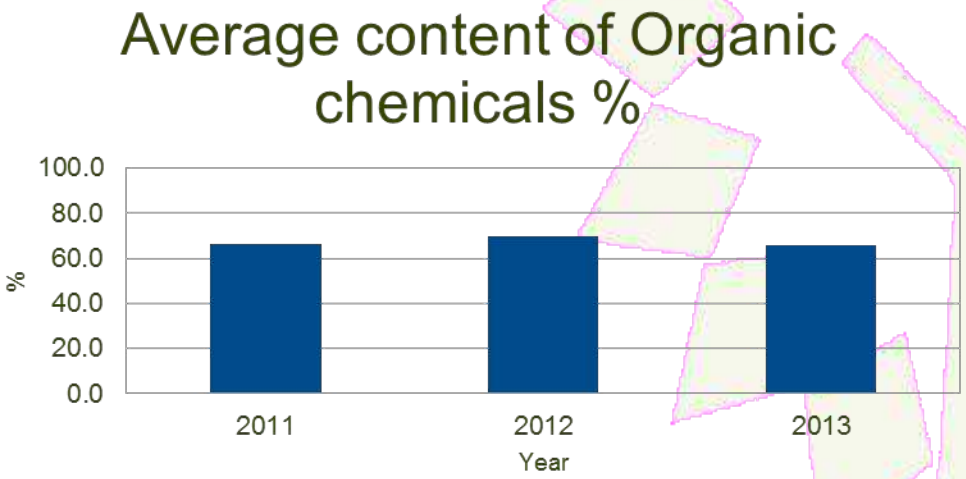
Waste water sludge = deposit of plant nutrient elements



http://eurocol.in/euroagri/micro-nutrients.html





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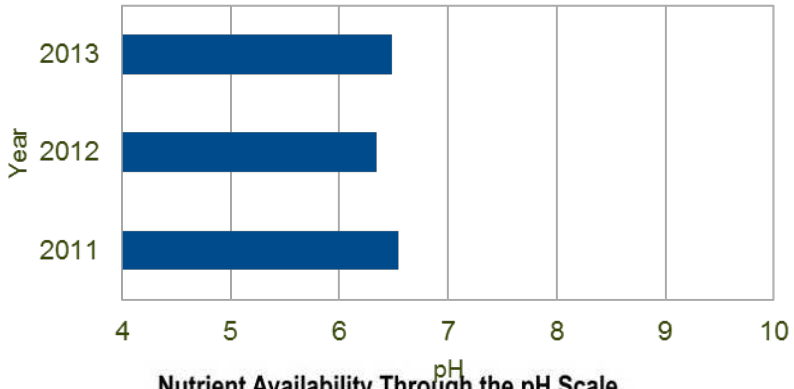
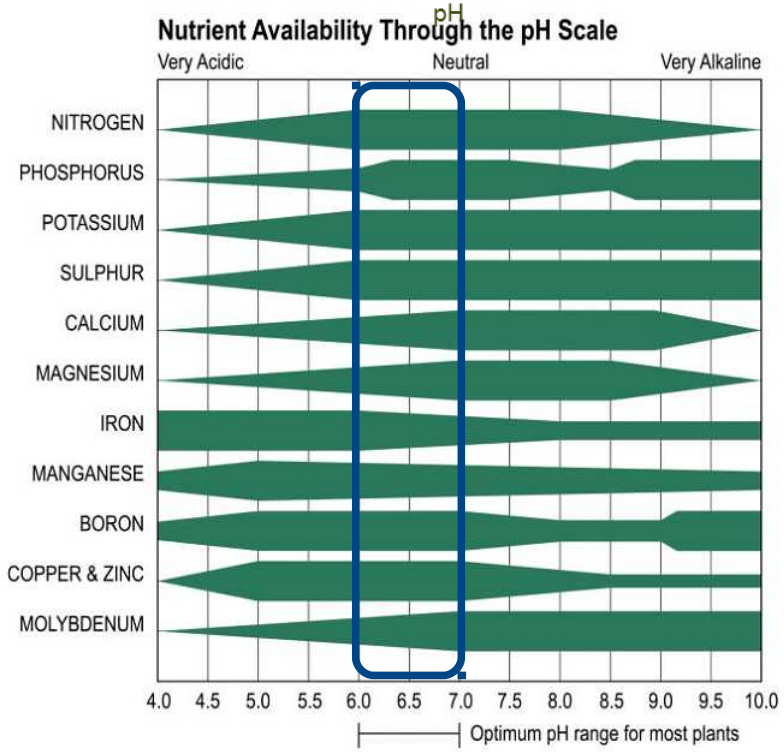
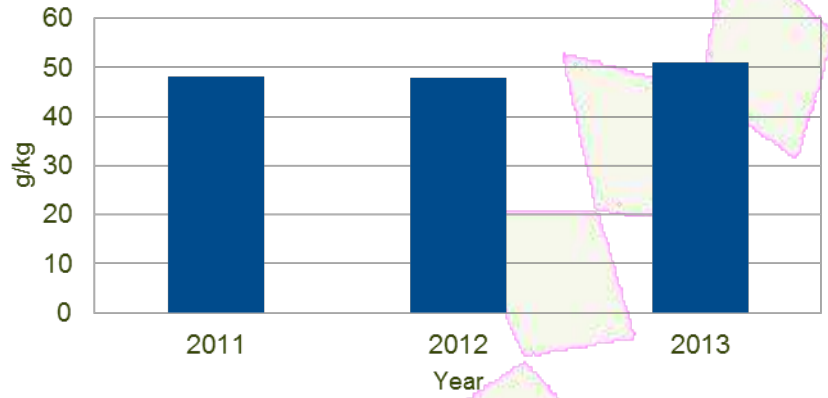
Is waste water sludge = waste?

Average pH value 6,45

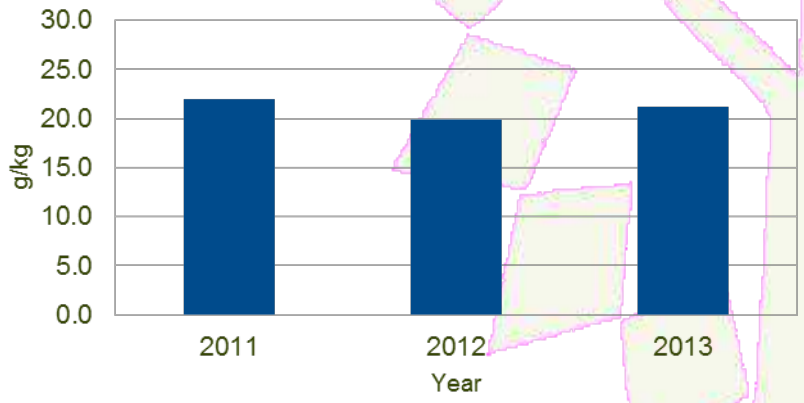




Average N total 49,1 g/kg



Average P total 21,0 g/kg



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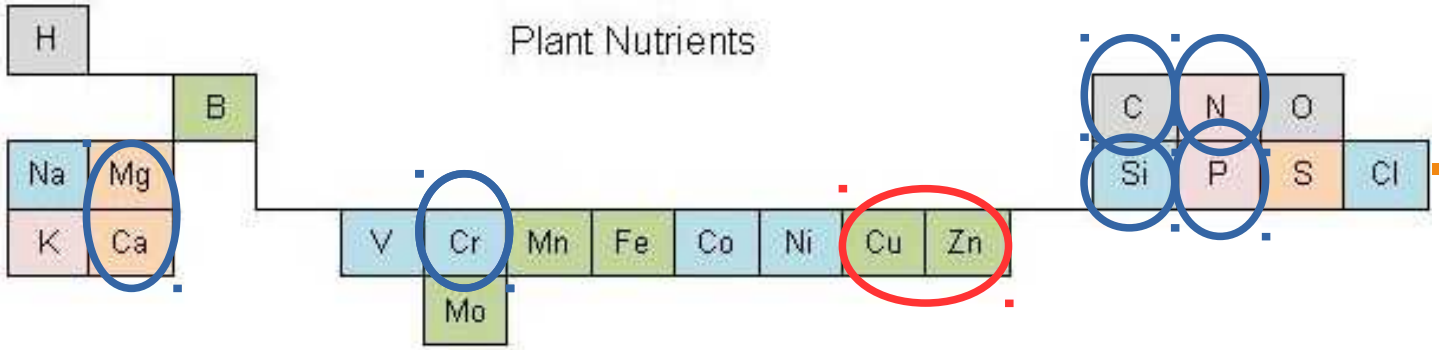
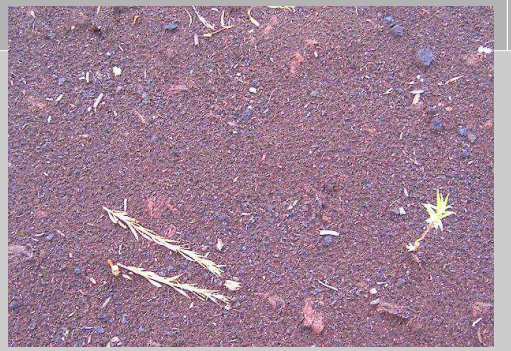


Latvia soils are lacking Cu, Zn and B

Organic		Major		Secondary		Micronutrients		Functional	
C	Carbon	N	Nitrogen	Mg	Magnesium	B	Boron	Na	Sodium
H	Hydrogen	P	Phosphorus	Ca	Calcium	Cu	Copper	V	Vanadium
O	Oxygen	K	Potassium	S	Sulphur	Fe	Iron	Co	Cobalt
						Mn	Manganese	Si	Silicon
						Mo	Molybdenum	Cl	Chlorine
						Zn	Zinc		

	Concentration of heavy metals in dry matter (mg/kg)						
Quality class of WWS	Cd	Cr	Cu	Hg	Ni	Pb	Zn
I	<2	<100	<400	<3	<50	< 150	< 800
II	2,1-5,0	101-250	401-500	3,1-5,0	51-100	151-250	801-1500
III	5,1-7,0	251-400	501-600	5,1-7,0	101-150	251-350	1501-2200
IV	7,1-10	401-600	601-800	7,1-10	151-200	351-500	2201-2500
V	>10	>600	> 800	>10	> 200	> 500	> 2500
2011	1,72	60,19	173,20	1,67	20,42	38,82	685,24
2012	1,20	55,34	175,05	1,78	25,38	37,14	632,74
2013	1,00	83,76	214,60	1,74	26,62	33,23	765,28
Total Result	1,32	65,83	186,68	1,73	24,05	36,51	691,97

Experiment estasblished 2006

Treatment	First year	Second year	Third year
Control			
Waste water sludge			
Mineral fertilizers			

Fourth season - summer

Control - unfertilized

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After six years

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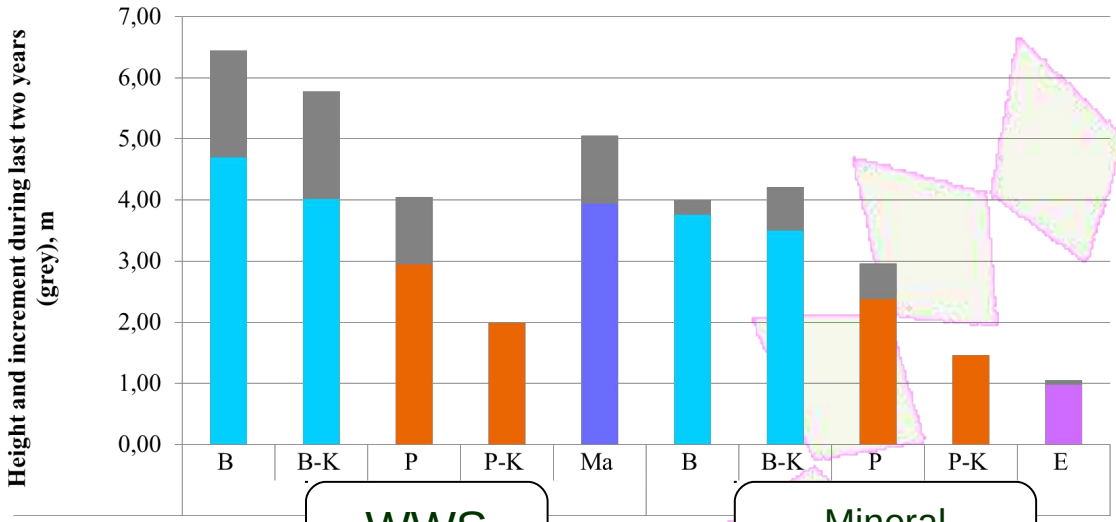
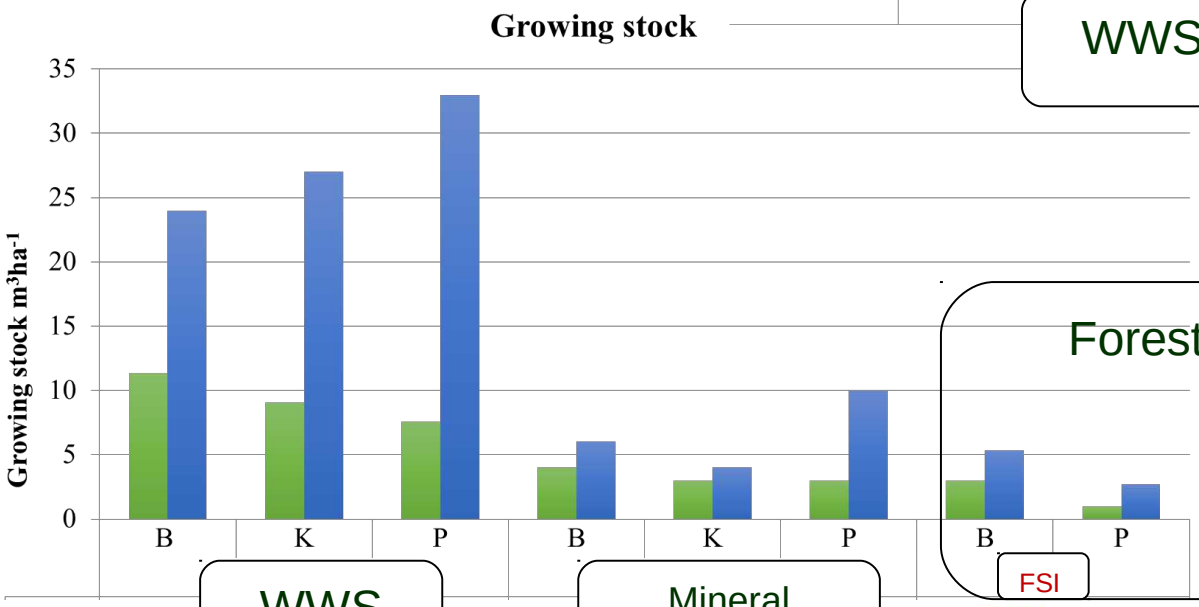
Production

B –birch
B-K birch ingrowed
P-pine
P-K-pine ingrowed
Ma- black alder
E - spruce



WWS

Mineral fertilizer



WWS

Mineral fertilizer

Forest in similar growing conditions

FSI

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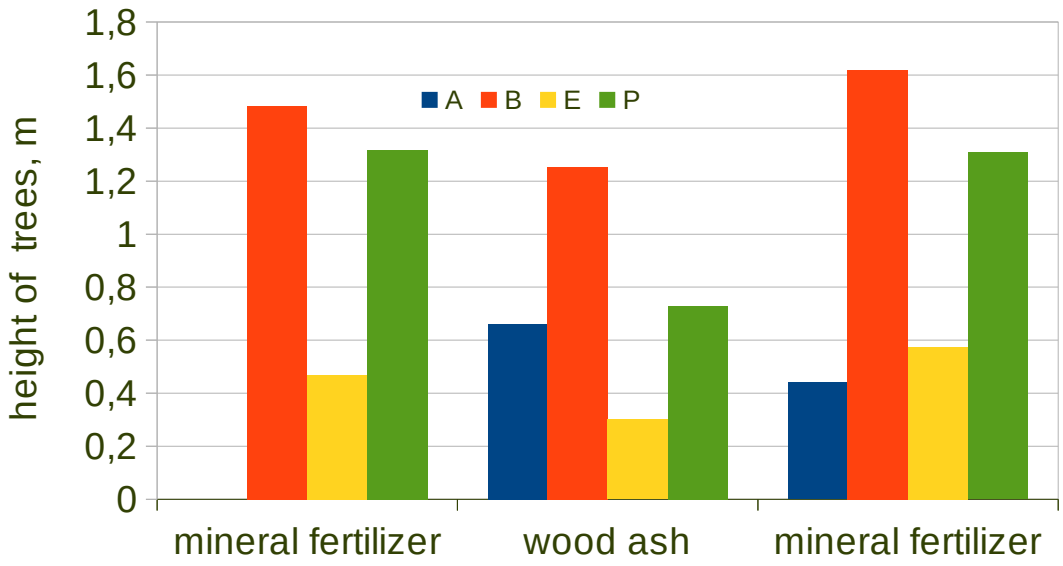
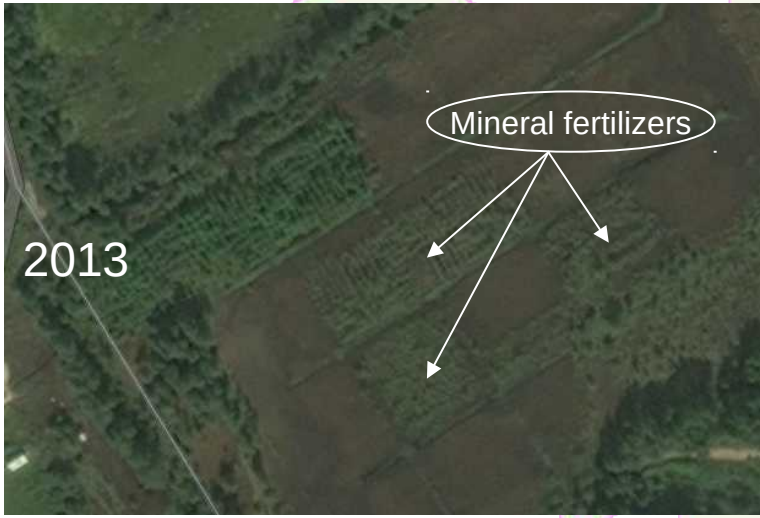
Four years after fertilization with wood ash and mineral fertilizers





specie	Mineral fertilizer	Wood ash	Mineral fertilizer
Aspen	0	**60**	1
Birch	**266**	**265**	153
Spruce	9	2	2
Pine	22	21	25

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WOOD-EN-MAN (Wood for energy – a contribution to the development of sustainable forest management)



50 t per ha (5 kg m^{-2}) A *Vacciniosa turf. mel.*, B – *Myrtillosa turf. mel.* un C – *Myrtillosa turf. mel. / Caricoso-phragmitosa* forest sites.



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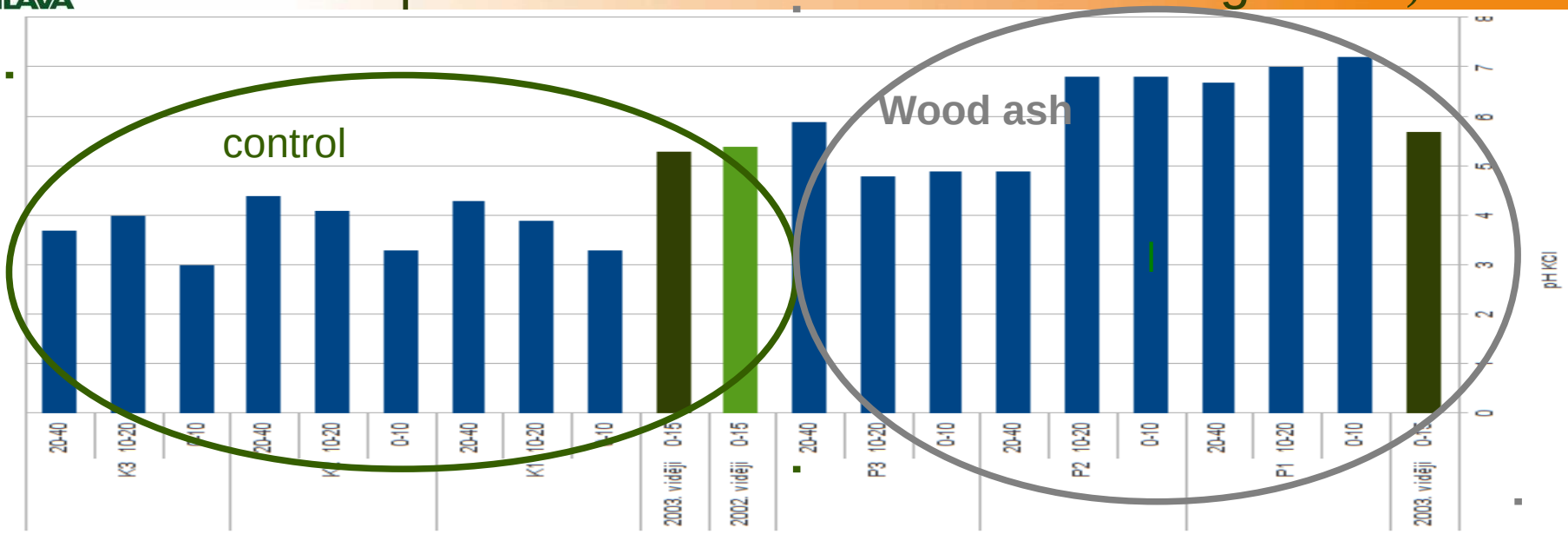

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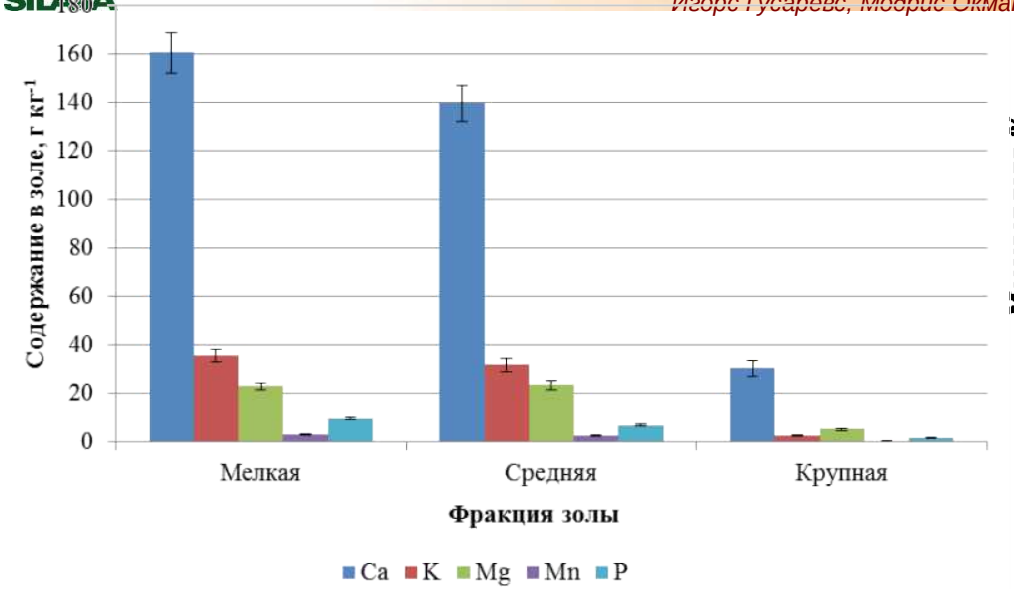
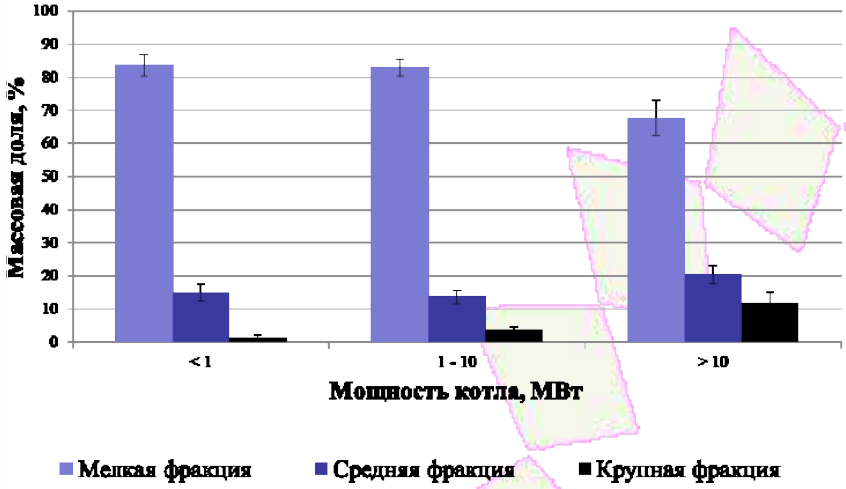
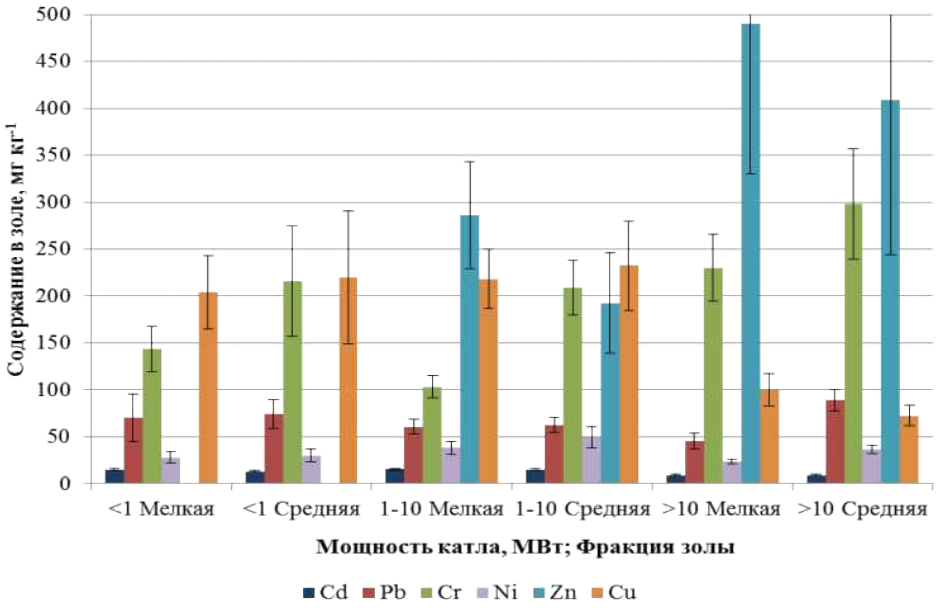
Wood ash in Latvia

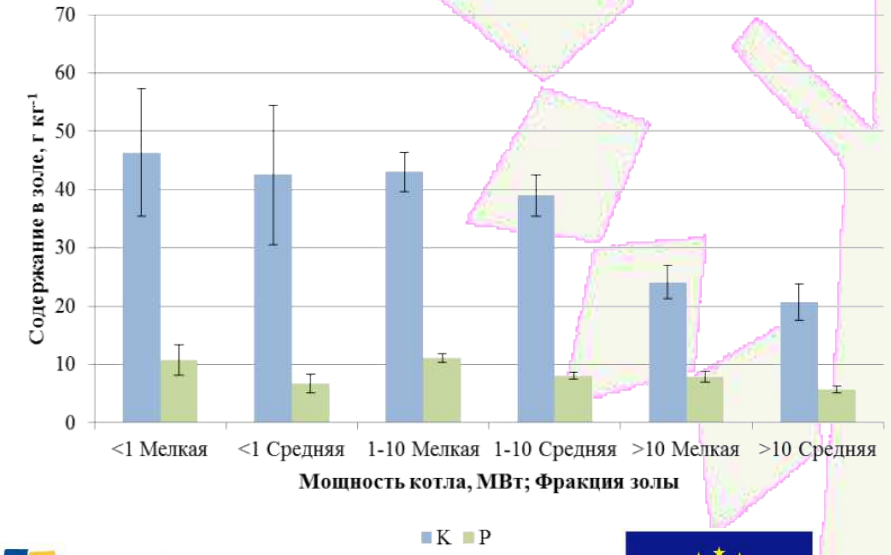
Агрохимические особенности древесной золы полученной на деревообрабатывающих и энергетических предприятиях Латвии

Игорс Гусаревс, Модрис Окманис, Дагния Лаздиня









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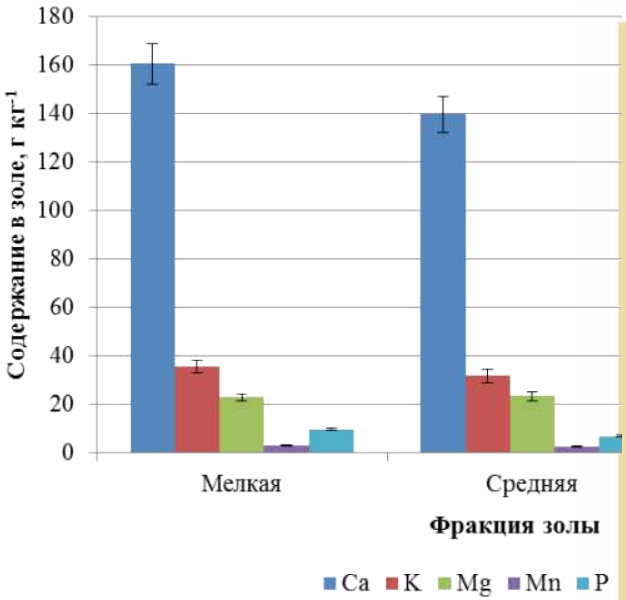
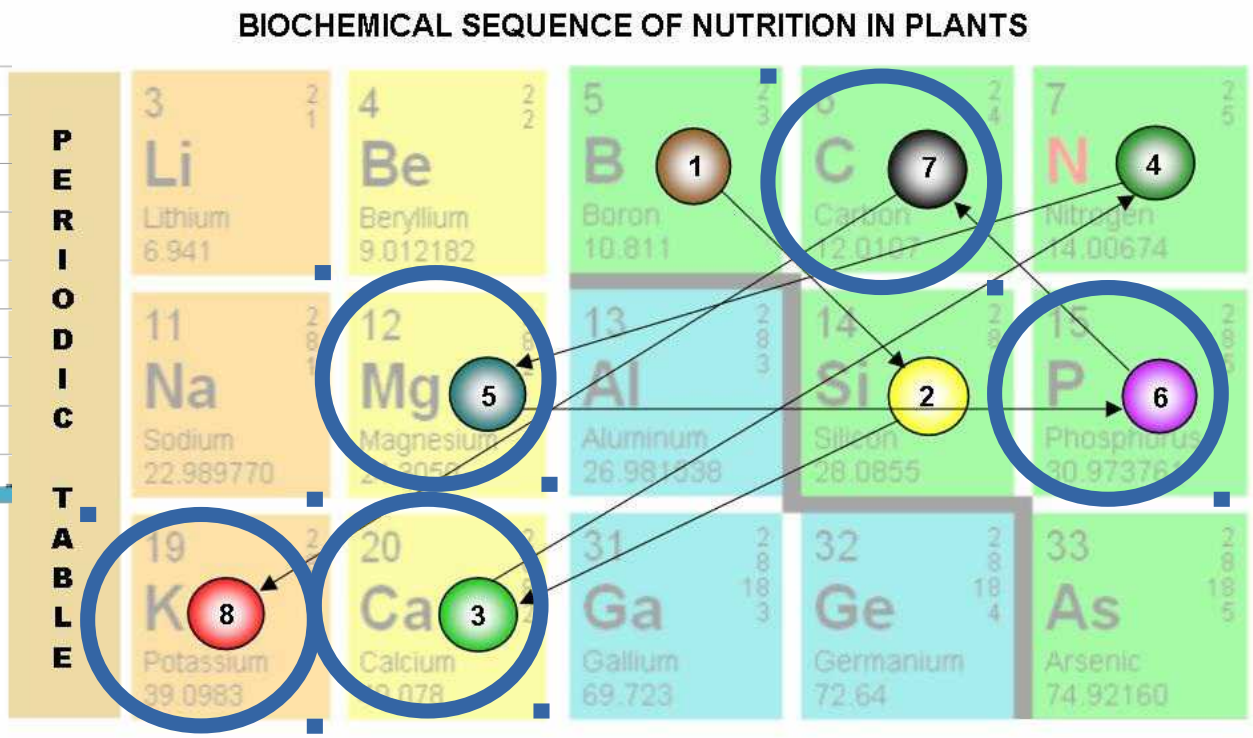
Wood ash – for liming or fertilization?





Plant biochemical sequences begin with:

1. ***Boron***, which activates →
2. ***Silicon*** which carries all other nutrients starting with →
3. ***Calcium*** which binds →
4. ***Nitrogen*** to form amino acids, DNA and cell division.

Amino acids form proteins such as chlorophyll and tag trace elements, especially →

5. ***Magnesium*** which transfers-energy via →
6. ***Phosphorus*** to →
7. ***Carbon*** to form sugars which go where →
8. ***Potassium*** carries them. This is the basis of plant growth.

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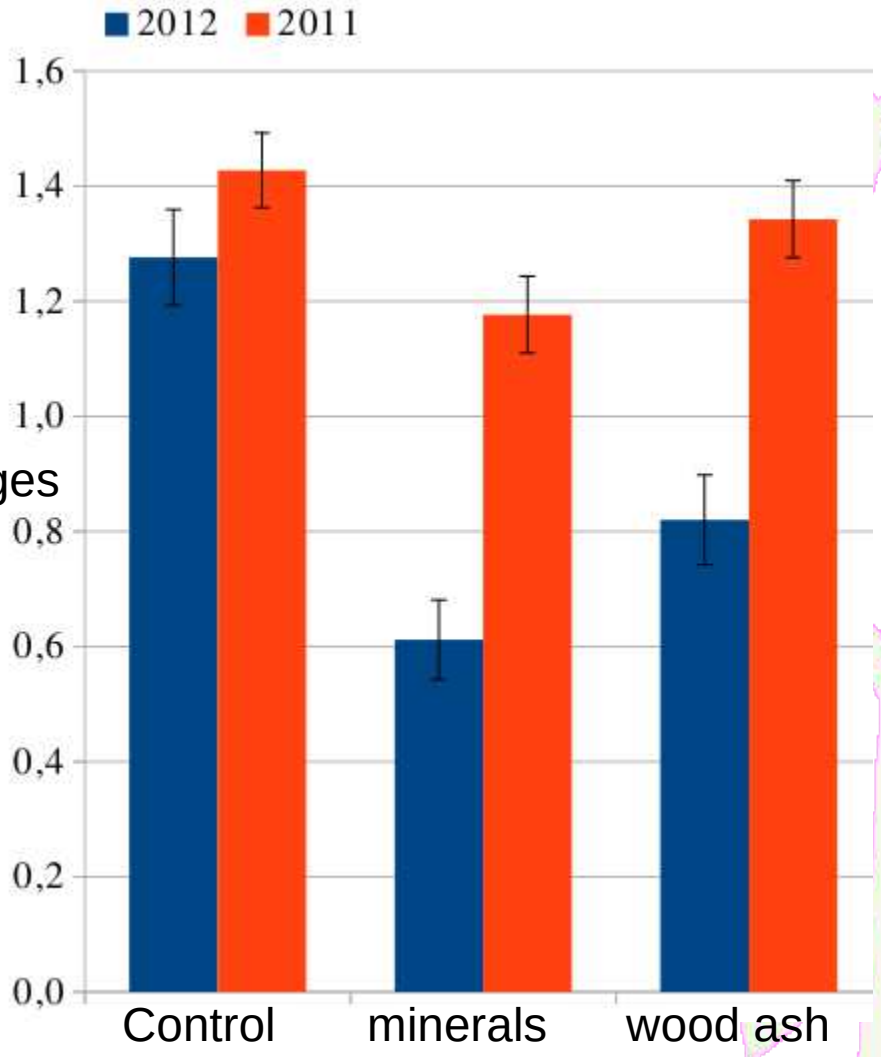
Fertilization of damaged forest stands

damages



60-150 kg K ha^{-1}
(2-4 T wood ash or 150 kg minerals....)

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Fertilizers

mēslojums	N, kg ha^{-1}	P, kg ha^{-1}	K, kg ha^{-1}
Wood ash 3 t_{od} ha^{-1}	0.7	**19.3**	**164.7**
Waste water sludge 10 t_{od} ha^{-1}	324.80	136.00	19.60
1,5 t_{od} ha^{-1} wood ash + sludge 5 t_{od} ha^{-1}	**162.75**	**77.65**	**92.15**
Biogass production residue 30 t ha	9.75	**19.00**	70.00
Optimum	***100-200***	***20-40***	***100-200***




Wood ash and waste water sludge mixture

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Fertilization of plantations

Amounts of main nutrients applied by fertilisers in plantations

Amount of fertiliser	N, kg ha^{-1}	P, kg ha^{-1}	K, kg ha^{-1}
wood ash 6 $t_{DM}ha^{-1}$	1.4	38.6	329.4
WWS 10 $t_{DM}ha^{-1}$	324.80	136.00	19.60
optimum	100-200	20-40	100-200

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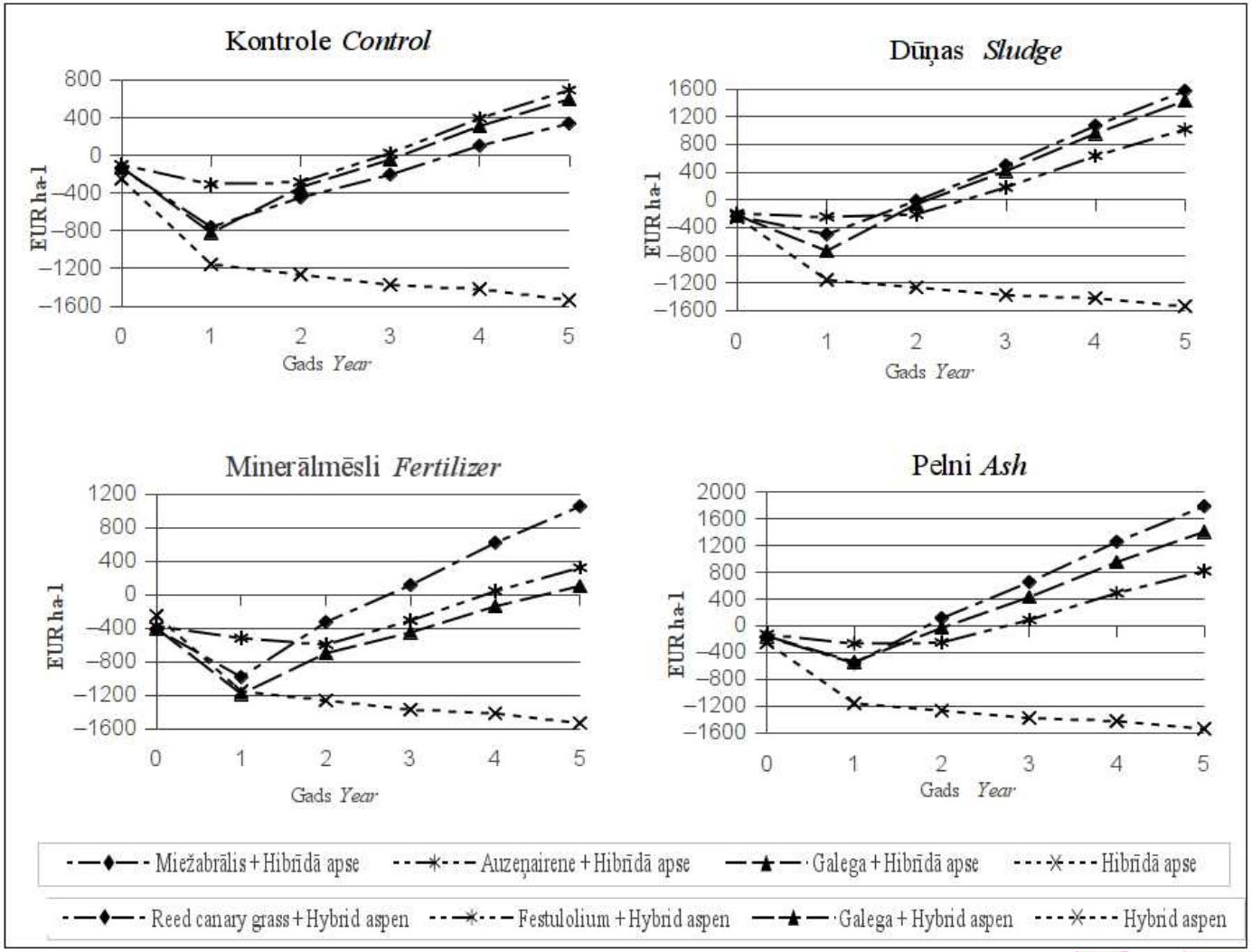
Resources to extend biomass production

(Rancane, Makovskis, Lazdina, Daugaviete, Gūtmane, Berzins. 2014, Agronomy research)

The combined growing of trees and grasses on the same area, give possibility to save costs and earn an incomes in first years, which cover starting expenses.

Reed canary grass, festulolium, and galega could be successfully grown for biomass and seed production between trees rows in the agroforestry system in Latvia. The use of different bio-energy and municipal waste products as fertilisers in general provided higher biomass and seed yields.



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Thank You for attention!

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Optimum !!!

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