Dalība konferencē "Biosystems Engineering"

Igaunijā, Tartu, 2011. gada 12. maijā

Komandējuma mērķis – sniegt ziņojumu par projekta "Daudzfunkcionālu lapu koku un enerģētisko augu plantāciju ierīkošanas un apsaimniekošanas modeļu izstrāde" (vienošanās Nr. 2010/0268/2DP/2.1.1.1.0/10/APIA/VIAA/118) ietvaros paveiktiem pētījumiem. Pirmajā dienā zinātnieki un praktiķi iepazīstināja ar jaunākajām nostādnēm un pētījumiem atjaunojamās enerģijas ieguves un izmantošanas jomā saistībā ar vides jautājumiem.

Pirmajā dienas daļā plenārsapulcē tika sniegti ziņojumi par tēmām "Lauksaimniecība un bioloģisko sistēmu inženierija", Ekonomiskās krīzes un lauksaimniecības produkcijas restrukturizācija Igaunija 19.un 20. gadsimtā", "Smagās tehnikas ietekme uz augsnes sablīvēšanos".

Darbs pēcpusdienas sesijās notika atbilstoši sekojošām tēmām: "Enerģētika un atjaunojamās enerģijas"(*Power engineering and renewable energy*), "Lauksaimniecības mašīnas un tehnoloģijas" *(Agricultural Machinery and Agrotechnology)*, „Transportlīdzekļi, degvielas un tehnoloģijas" *(Vehicles, Fuels and technologies)*.

LVMI Silava zinātnieki ar interesi noklausījās sekojošus ziņojumus: *Renewable energy from biomass; Entrophy of energy crops*, *Determination of energy plant Chooping Quality and Emissions while Burning Chaff*, kuru galvenās atziņas, ka lauksaimniecības zemēs audzētā cietā kurināmā ieguvei galvenā kultūra ir miežabrālis, kura audzēšanas un sagatavošanas procesa siltumnīcas efekta gāzu izmešu apjomi, salīdzinot ar saistīto CO_2, ir ievērojami mazāki, bet rupjākās frakcijās smalcināta koksne sadegot veido mazāku vides piesārņojumu un zemākus CO_2 izmešus. Lietuvā tiek veikti pētījumi par ātraudzīgo kārklu izmantošanu atjaunojamās enerģijas ieguvē izmantojot dažāda veida biomasas smalcinātājus.

Vakarpuses sesijās apskatītas sekojošas tēmas: Materiāli un ražošanas tehnoloģijas *(Materials and Production engineering)*, Bioenerģētika *(Bioenergetics)*, Ergonomika un inženierzinātņu izglītība *(Ergonomics and engineering education).*

Interesantākie ziņojumi: *Preliminary investigation of technological, physical, and economical parameters of herbaceous biomass briquettes* un *Briquetting of municipal solid waste by different technologies in order to evaluate its quality and properties,* apskatot iespēju brikešu ražošanai izmantot dažādus izejmateriālus (koksnes skaidas, kartona atliekas, cementu, PET pudeles, audumu, biomasu) variējot to kombinācijas.

Konferencē piedalījās zinātnieki no Igaunijas, Latvijas, Lietuvas, Čehijas, Somijas, Ungārijas, Krievijas, Ukrainas.

Konference dalībnieku kopbilde (foto M.Daugaviete)

LVMI Silava pārstāvji prezentēja iepriekšējo gadu pētījumu rezultātu apkopojumu " *Possibilities to utilize waste water sludge and wood ash as fertilizer for Salix cultivation on acid peat soil*" (posteris – pielikumā). Ziņojums izvērstā veidā tiks publicēts žurnālā "Agronomy Research".

Konferences diena noslēdzās ar labās prakses piemēru demonstrēšanu un laboratoriju apmeklējumu, kas renovētas izmantojot Eiropas fondu finansējumu.

Dagnija Lazdiņa, Toms Zālītis

Possibilities to utilize waste water sludge and wood ash as fertilizer for Salix cultivation on acid peat soils

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Project "Elaboration of models for establishment and management of multifunctional plantations of short rotation energy crops and deciduous trees" supported by European Regional Development Fund

Cut away peatland, afforested without fertilizers

Main problem – unfavourable peat properties:

- pH 2,5- 3,5;
- considerably high concentration of N;
- low content of K and P;
- lack of micro-nutrients.

Two problems becomes more actual during the last years –

- production of solid biofuel from wood
- utilization of ash and organic wastes, including the waste water sludge.

Purpose of the research is to model simultaneous solution for both of these problems through utilization of the them as a fertilizer and to find useful indications for the utilization of the waste water sludge and wood ash as fertilizers.

Opportunities to increase efficiency of applications of the waste water sludge by combined spreading together with wood ash are addressed in this study.

- Greenhouse experiment in pots:

Short code of variant	Description
T	control, peat
T4Ko1	four portions peat with one portion of compost
T4Ko1A10	four portions peat with one portion of compost with wood ash (10 g l^{-1}) equivalent to 10 tDM ha^{-1}
T4Ko1A20	four portions peat with one portion of compost with wood ash (10 g l^{-1}) equivalent to 20 tDM ha^{-1}
T1Ko1	peat and compost in equivalent doses
T1Ko1A10	peat and compost in equivalent doses with wood ash (10 g l^{-1}) equivalent to 10 tDM ha^{-1}
T1Ko1A20	peat and compost in equivalent doses with wood ash (10 g l^{-1}) equivalent to 20 tDM ha^{-1}

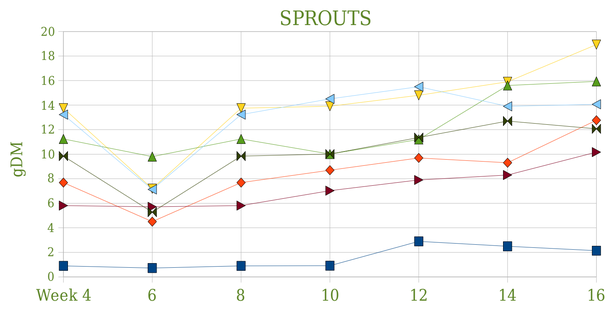
- Chemical analyses (N, P, K and pH_{KCl}) had been done in LSFRI 'Silava' Laboratory of forest environment.
- Growth of willow characterized by:
  - increment in height;
  - increment of dry matter of sprouts and roots during vegetation season.
- Prior to weighting sprouts and roots were dried till constant mass in 105°C.

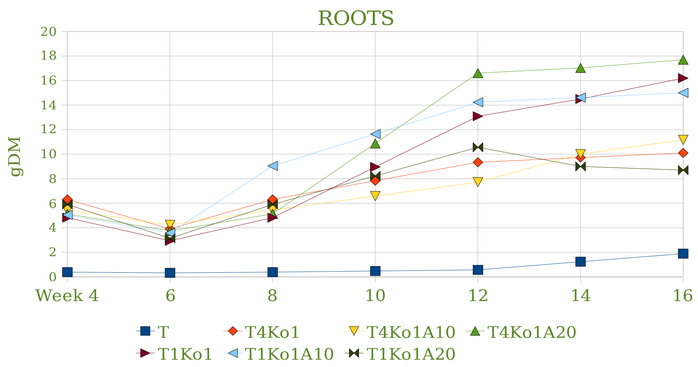
Potential outputs of wood ash

- Soil fertilized and liming material
- Compost bulking material and odour "catcher"
- Natural replacement of lime for hygienization of wastewater sludge
- Substrate addition in horticulture
- Raw material for extraction of minerals

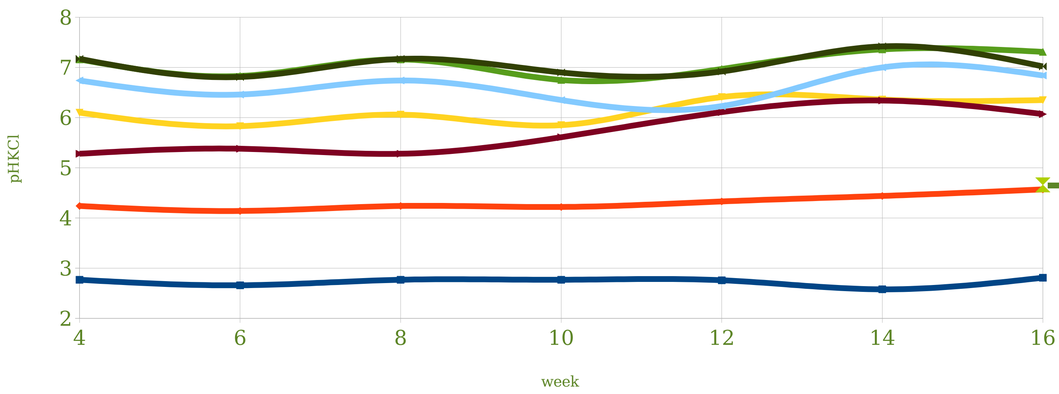
Results

- Wood ash and compost additions into substrate in different proportions showed significantly different effect on development of willows sprouts and roots.

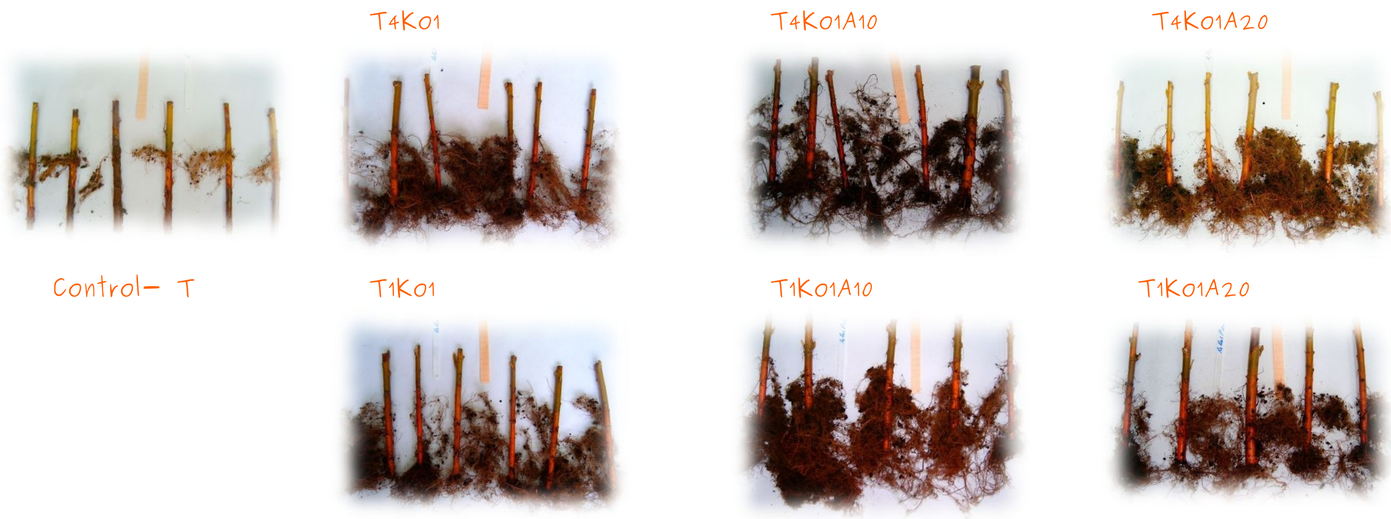




- Addition of wastewater sludge compost to peat in equal proportion by volume decreased peat acidity for 1-2 unit.
- Addition of wood ash (equal to 10 and 20 t_{DM} ha^{-1} decrease soil acidity by 3-4 units.



- Development of willows roots in substrates:



- Compost and wood ash additions enriched substrate mainly with phosphorus. Positive correlation of concentration of phosphorus and soil alkalinity were found. At the end of vegetation season significant changes of concentration of nitrogen and phosphorus in substrates ($P<0.001$) were observed as well changes in proportions of certain elements, especially in top layer of peat.

Willow biomass Pearson correlations with growth media - substrate pH and macronutrients..

Parameter	Root DM g	N g kg^{-1}	P g kg^{-1}	K g kg^{-1}	pH_{KCl}	Compost addition	Wood ash addition
Above ground biomass DM g	0.284	-0.453	0.78*	-0.687	0.751	0.399	0.741
Root DM g	1.000	-0.346	0.531	-0.208	0.402	0.517	0.198
*Correlation is significant at the 0.05 level (2-tailed)							

CONCLUSIONS

- Wastewater sludge has comparably small liming effect.
- Fertilizing effect of sludge can be increased by the admixture of wood ash and dolomite. These materials reduce acidity of soil and provide additional nutrients.
- The use of dolomite as a liming material, dose 10 t ha-1, secures change of pH by 0.6–1.2 units in peat soil. Significant changes of pH found only in few centimetres deep upper layer of soil. Application of equal dose of wood ash provides faster effect of neutralization change of pH by 3.1–3.8.
- Because of correlation of concentration of exchangeable phosphor in the substrate with all biological parameters the phosphorus are limited macro- element on peat soil.

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