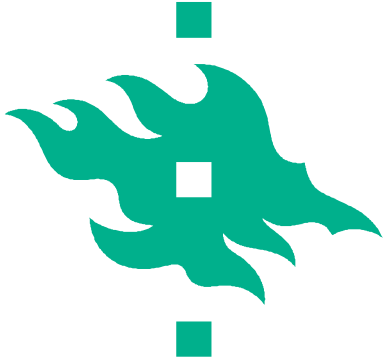


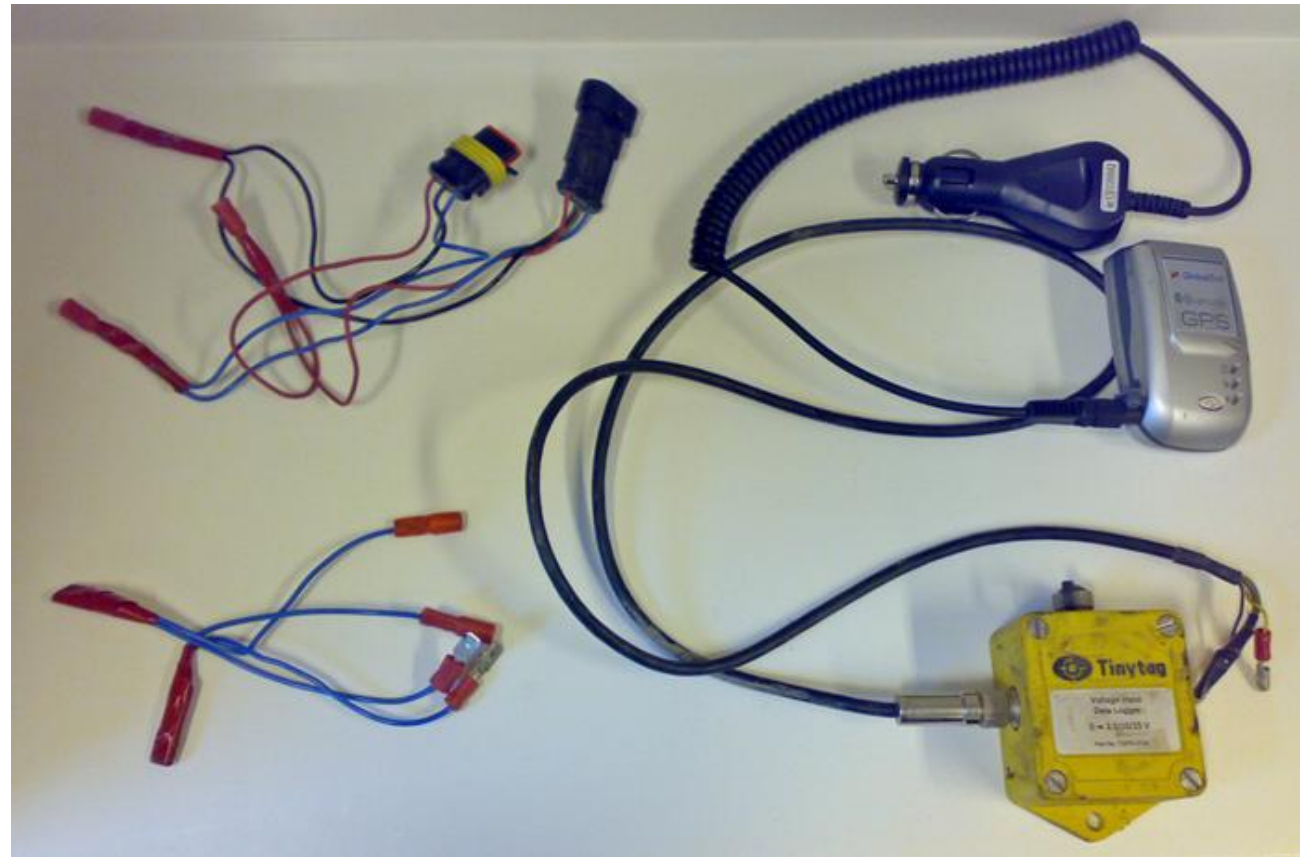
# Fuel consumption measurements, summer 2010

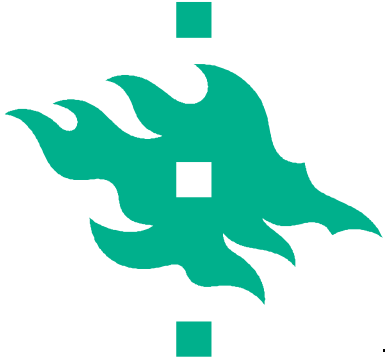
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- A simple and cost effective way to detect the fuel consumption of agriculture machinery was tested at Helsinki University experimental farm in Viikki
  - The fuel level in tank was measured with machine's own fuel sensor
  - The voltage of the sensor was recorded with a voltage datalogger
  - Movements of the machines were measured and recorded with a personal GPS-tracker
  - Manual bookkeeping was made in addition to the measurements
- The aim of the study was to express the fuel consumption in litres per hectare (l/ha)
- Measurements took place in various operations



# Measuring system



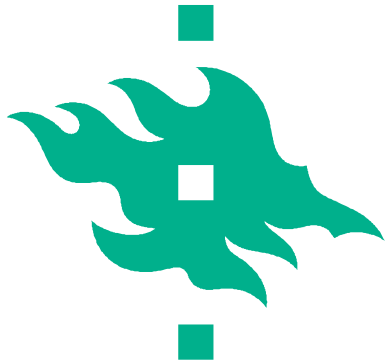


# Measuring system

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- The voltage datalogger was installed in suitable location close to the fuel sensor connectors
- The GPS-tracker was placed in the cab of the machine

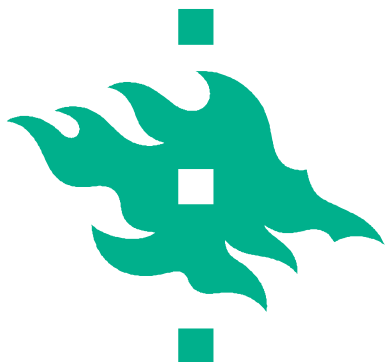




## Analysing the results

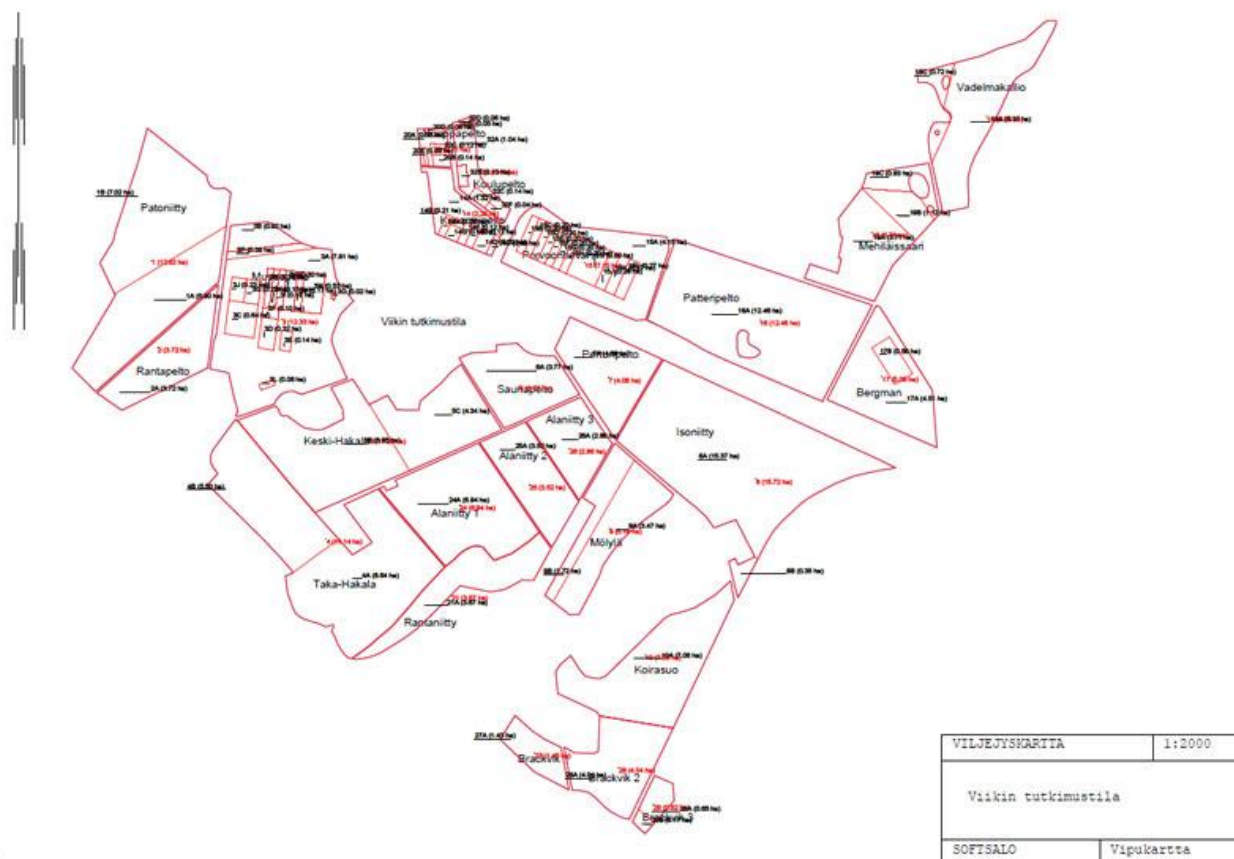
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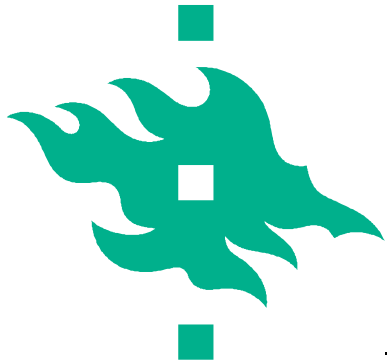
- The voltage and GPS-data were exported to excel
  - The amount of consumed fuel was calculated by using the calibration curve of each machine
  - The GPS-data was used to detect the average speed and location of the machine
  - Idle and road transport periods were filtered out of the results → the working hours were obtained
- The actual area of the field plots was obtained from the farm bookkeeping
  - The actual fuel consumption was calculated by the area figures from the bookkeeping
  - Theoretical area was calculated from the speed
    - Working efficiency was obtained



# Field plots of Viikki experimental farm

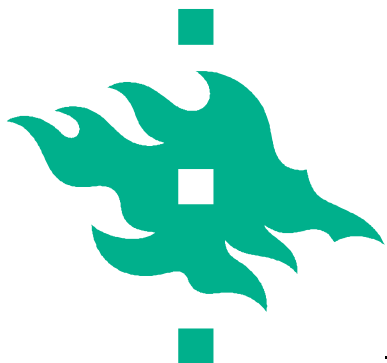
Kasvulohkot 2010





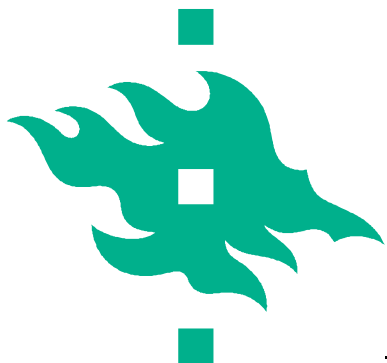
# Machine movements, sowing





# Machine movements, sowing

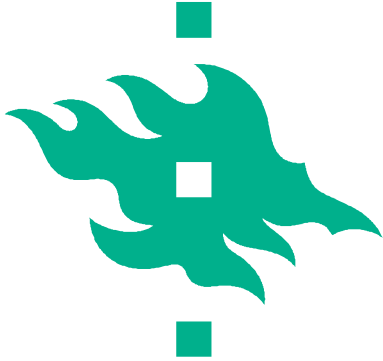




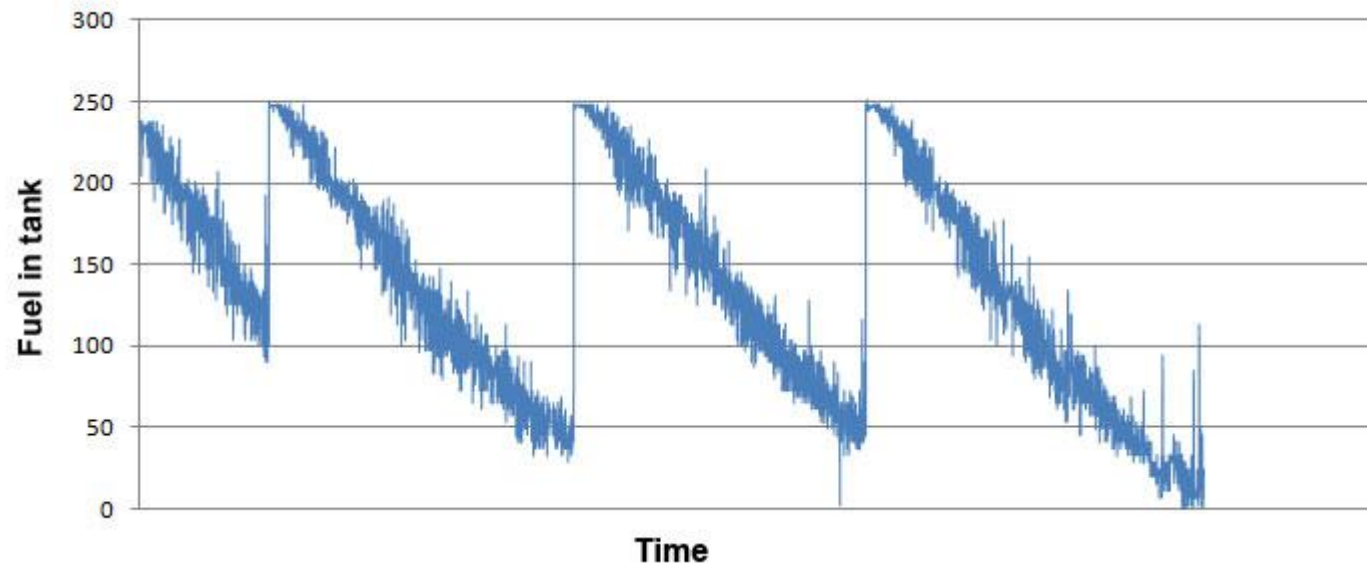
# Machine movements, cutting grass

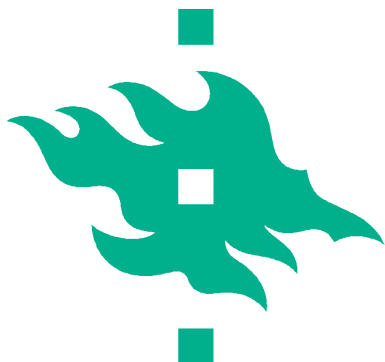






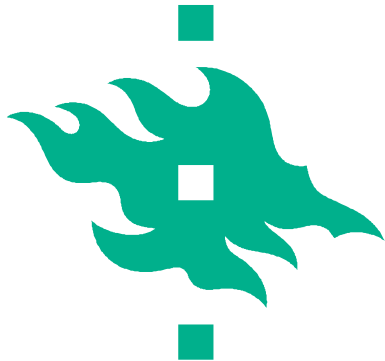
# Tank fuel level, treshing





# Results

Work	Fuel consumption, l/h	Fuel consumption, l/ha	Working Efficiency, %
Harrowing 1	20,0	8,3	-
Harrowing 2	17,3	7,9	-
Sowing 1	15,7	5,4	69
Sowing 2	18,4	5,2	83
Cutting grass	10,6	4,1	87
Baling	9,6	5,0	-
Treshing	17,9	10,6	76



# Discussion

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- Accuracy: fuel consumption of treshing
  - Measured **10,6 l/ha**
  - From the bookkeeping **10,0 l/ha**
- The system proved to be working
- Analysis require a lot of work
- For guiding purposes a real-time display is needed



This material has been produced in ENPOS project. ENPOS is acronym for *Energy Positive Farm*.

The project partners are

- University of Helsinki, department of Agricultural Sciences – Agrotechnology
- MTT Agrifood Research Finland - Agricultural Engineering
- Estonian University of Life Sciences

Project home page is at <http://enpos.weebly.com/>

The project is financed by the EU Central Baltic IV A Programme 2007-2013

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**ENPOS** Energy Positive Farm



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