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Cover crop experiences in Estonia

Merili Toom
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Cover crops (catch crops) are established following the main crop harvest (at the beginning of August)

Autumn cover crops are incorporated into the soil in autumn, shortly before the ground freezes

- White mustard
- Buckwheat
- Phacelia
- Field pea
- Field bean

Winter cover crops are grown over winter and incorporated in the soil during spring)

- **Overwintering species** protect the soil during winter and accumulate additional biomass and N in the following spring
- **Frost sensitive species** accumulate high amount of biomass and N before destroyed by frost (possibility to use also in reduced tillage or no-tillage organic farming systems)

- Forage radish
- Winter turnip rape
- Winter rye
- Hairy vetch
- Berseem clover

Winter cover crop experiment

- The research was conducted during three growing seasons (2016–2017; 2017–2018 and 2018–2019)
- The cover crops were sown on August 3
- Biomass (above- and below-ground) of all the cover crops was determined in autumn prior to frosts and biomass of the over-wintered species was measured additionally in the following spring
- Spring barley (without fertilization) was used as following cash crop

Cover crop species
Brassicas

Winter turnip rape
(*Brassica rapa*
L. var. oleifera)

Winter hardy in northern climate

- Fast growing
- Deep root system

Forage radish (Tillage radish)
(*Raphanus sativus* L.)
var. *longipinnatus*)

Winter-killed in northern climate

Cover crop species
Legumes

Berseem clover
(*Trifolium alexandrinum* L.)

Winter-killed in northern climate

- Annual legumes
- Fast growing
- High N-fixation ability

Hairy vetch
(*Vicia villosa* Roth.)

Winter-hardy in several northern regions

Cover crop species
Grass (cereal)

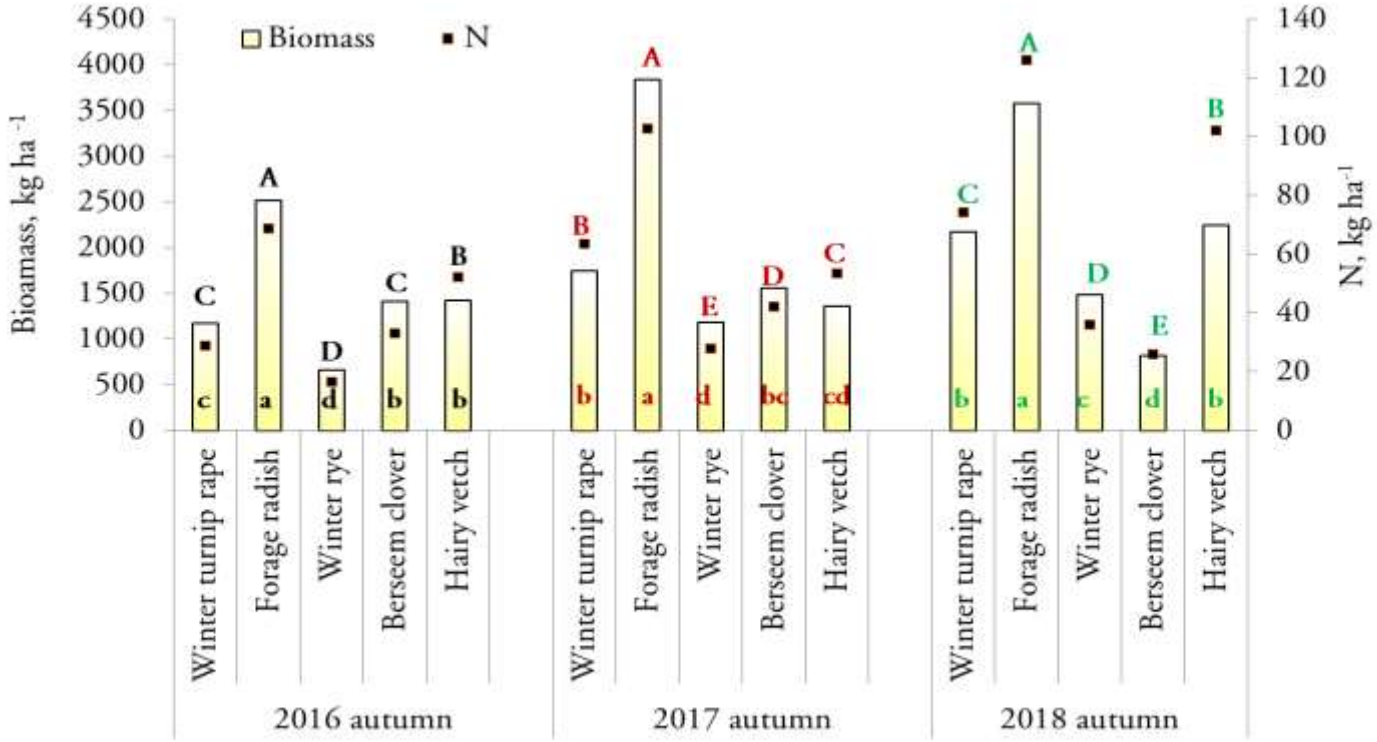
Winter rye (*Secale cereale* L.)

Winter hardy in northern climate

- Deep fibrous root system
- Good weed suppressor

Biomass and N accumulation of cover crops in autumn of 2016–2018

- **Forage radish accumulated the highest biomass (2515–3841 kg ha^{-1}) and N (69–126 kg ha^{-1})** in all trial years
- Winter turnip rape had lower biomass
- Hairy vetch had higher biomass than berseem clover in 2018 and had higher N accumulation in all trial years
- Winter rye had relatively low biomass



The biomass (above- and below ground) production and nitrogen content of cover crops (dry matter kg ha^{-1}) in autumn 2016–2018. Within years, bars marked with different letters are significantly different ($p < 0.05$; ANOVA, Fisher LSD test) (**lowercase letter – biomass; uppercase letter – N**).

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Cover crops in autumn prior frosts

Berseem clover plants desicated after air temperature dropped below 0 °C

Forage radish was more tolerant to cold temperatures

Winter rye

Hairy vetch

Winter turnip rape

Forage radish in the winter and spring

January 2018

- Forage radish decomposed by the end of April
- Ground was relatively weed free
- The channels created by the roots remained open at the soil surface, improving infiltration, surface drainage, and soil warming

April 2018

May 2018 before incorporation

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Hairy vetch, winter turnip rape and winter rye overwintered well in all trial years

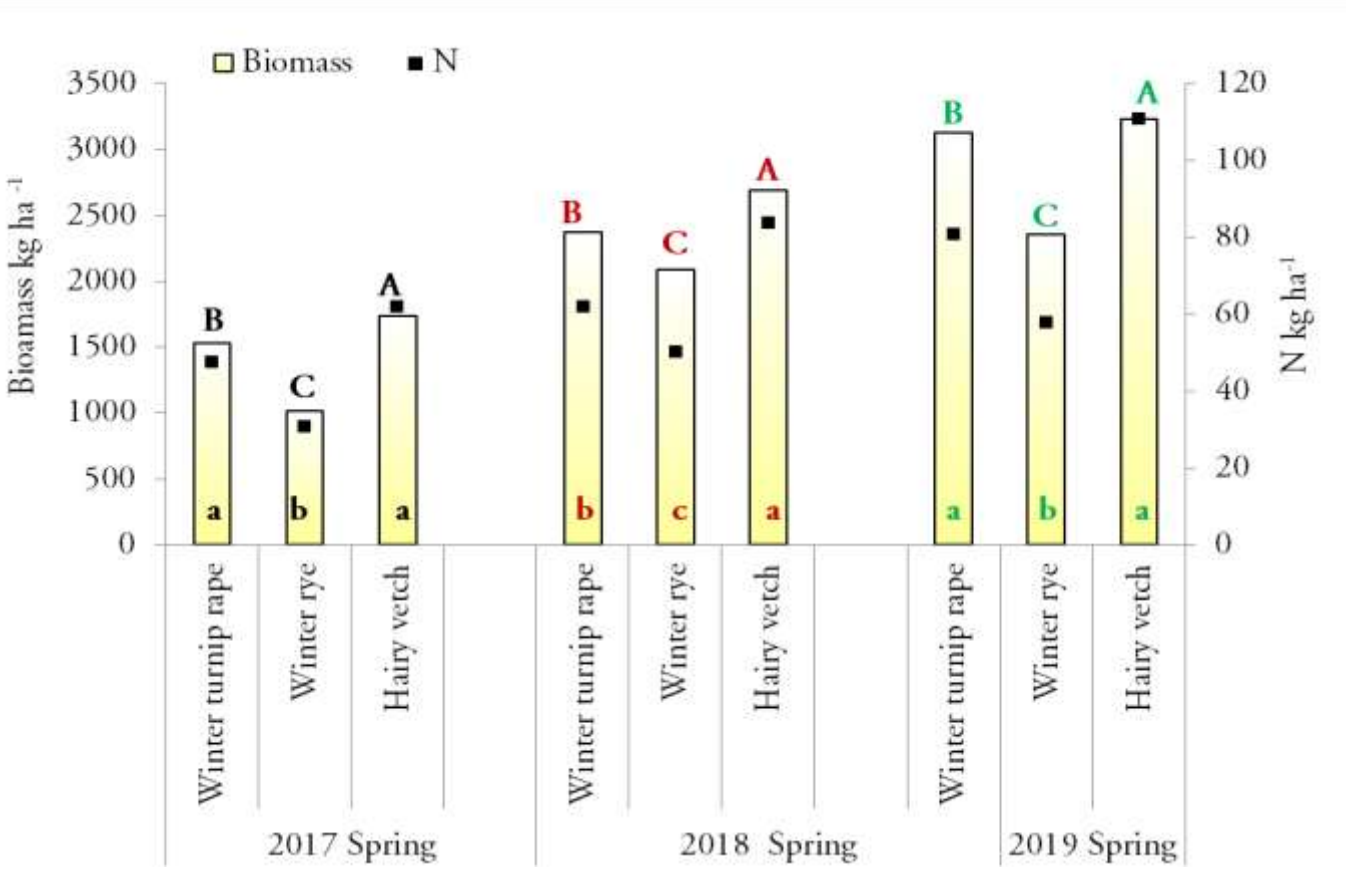
Hairy vetch

Winter turnip rape

Winter rye

Biomass and N accumulation of cover crops in following springs of 2017–2019

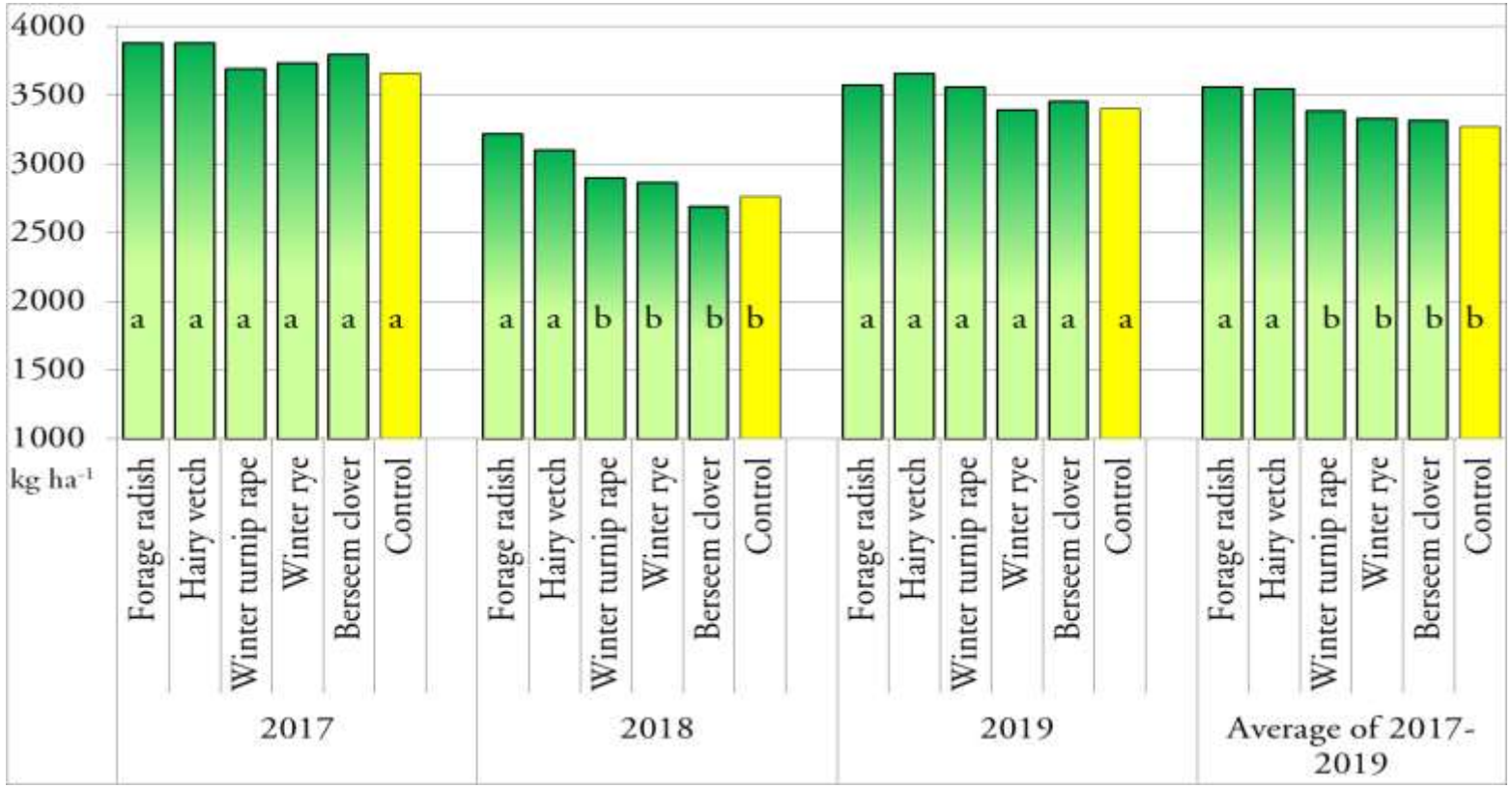
- Hairy vetch accumulated the highest amount of N **(62–112 kg ha^{-1})** in **all trial years**
- Winter rye accumulated lowest amount of biomass and N in all trial years



The biomass (above- and below ground) production and nitrogen content of cover crops (dry matter kg ha^{-1}) in spring of 2017–2019. Within years, bars marked with different letters are significantly different ($p < 0.05$; ANOVA, Fisher LSD test) (**lowercase letter – biomass; uppercase letter – N**).

The effect of cover crops on the yield of the following spring barley

- In 2018 forage radish and hairy vetch significantly increased spring barley yield
- In other trial years there was a tendency for barley yield to increase after the same cover crops
- On average over the three years, forage radish and hairy vetch increased the yield of subsequent barley
- continuous cover cropping improves soil quality and yield of the cash crops



The yield of spring barley (kg ha^{-1}) in 2017, 2018, and 2019, and the average of these years compared to control (without cover crop). Within years, different lowercase letters are significantly different ($p < 0.05$; ANOVA, Fisher LSD test).

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Cover crops in potato production

Trials started in autumn of 2021
The objective of the study: to evaluate the effect of cover crops on potato yield and quality

Cover crop species:

Brassica (biofumigation effect)
Forage radish
White mustard
Winter turnip rape

Legume and other species
Hairy vetch
Hairy vetch + forage radish
Hairy vetch + forage radish + phacelia

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The use of cover crops by Estonian farmers

Cover cropping is gaining attention, but
is not widely used by Estonian farmers

Main reasons:

Lack of knowledge
Lack of time
Related costs (Is not subsidised)

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The use of cover crops by Estonian farmers

Winter-killed species (field pea, phacelia and buckwheat)
Ploughed into the soil before winter

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The use of cover crops by Estonian farmers

Winter-killed and winter-hardy species for winter ground cover

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The use of cover crops by Estonian farmers

Cover crops sown in spring

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Cover crops in home gardens

Oat sown after main crop harvest

winter-killed oat mulch

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Cover crops in home gardens

The mixture of oat, field bean and buckwheat in greenhouse sown after tomato harvest

Winter-killed cover crop mixture

The mixture of oat, phacelia and buckwheat sown after vegetable harvest

Thank you for your attention!

merili.toom@etki.ee