

## **Seminar within the network “Legumes for Sustainable Agriculture” SLU Skara 21st of March 2013**

Sixteen persons attended the seminar, representing SLU in Alnarp, Umeå, Uppsala and Skara, the Swedish Rural Economy and Agricultural Societies, and Eurofins Food & Agro Testing Sweden AB.

### **Earlier work so far, what is needed to follow up (symposium, strategic document etc), Georg Carlsson, SLU Alnarp.**

Georg presented the initial aims when starting LegSA in 2010: to improve collaboration and communication among Swedish legume scientists and to improve the communication and visibility (internally and externally) of legume research at SLU. As from 2012, LegSA is a network both within SLU and for people outside SLU and outside Sweden interested in research about legumes.

Participants in several previous LegSA meetings have highlighted the possibility to form an action plan for promoting the use of legumes and stimulate research aiming to overcome current limitations of legume-based production systems. One suggestion for starting such an initiative is that KSLA arranges a legume symposium for scientists, farmers, advisors and decision makers. Another goal for LegSA during the coming years could be to arrange a PhD course about legumes.

### **Short presentations by participants**

About one half of the day was devoted to presentations and discussions about participants' research. Here are the titles and short summaries of the presentations:

*Break crop effects of faba beans and peas – Lena Engström, Mark och Miljö, SLU Skara*  
The residual N effect (increased N uptake compared with after oats) in spring barley after harvested faba beans was 20 kg N/ha and after unharvested beans 45 kg N/ha. Yield of barley after harvested and unharvested beans increased by 650 and 1500 kg/ha respectively. There was no effect the second year after the beans. The residual N effect in winter wheat after peas was 20 kg N/ha and yield was 700 kg/ha greater than after oats. Consequently the fertiliser N rate can be reduced by 30 kg N/ha when faba beans and peas are preceding crops to cereals.

*Inoculation of lucerne – Ulf Axelsson, Hushållningssällskapet Skaraborg and Anders Jonsson, Mark och Miljö, SLU Skara*

Three soils and different *Sinorhizobium* sources are studied in an ongoing project. Results obtained so far show different effects of inoculation on plant growth, depending on *Sinorhizobium* source and soil.

*Molybdenum uptake in clover – Ulf Axelsson, Hushållningssällskapet Skaraborg and Anders Jonsson, Mark och Miljö, SLU Skara*

The presentation described risks with excessive Mo uptake. The results showed the highest Mo concentrations in white clover and lowest in lucerne.

*Aphanomyces root rot in pea – detection in soil and effect of boron, Katarzyna Marzec-Schmidt, Mark och Miljö, SLU Skara*

Alternative methods for risk of pathogens in soils were presented and motivated.

Boron can strengthen cell walls in plants, and application of boron at high doses was found to decrease *Aphanomyces* root rot in pea.

*Seed mixtures for protein leys – Jan Jansson, HS Sjuhärad and Elisabet Nadeau, HMM, SLU Skara*

Among the seed mixtures studied, mixture of red clover Nancy and timothy Ragnar resulted in the highest protein content at relatively low N application. Protein content can also be increased by applying high N levels.

*Lucerne as a protein crop – Jan Jansson, HS Sjuhärad and Elisabet Nadeau, HMM, SLU Skara*

Large variations were found in establishment and yields among 13 varieties of lucerne. The presentation highlighted the need for further investigations about possible relationships between inoculation, nodulation, establishment and yield.

*Ensiling of lucerne and red clover – Elisabet Nadeau and Annika Arnesson, HMM, SLU Skara*

Red clover and lucerne are difficult-to-ensile crops and the use of chemical additives decrease fermentation losses during ensiling.

*Synergism between Rhizobium and antagonistic bacteria in field beans- Sadhna Alström and Björn Andersson, Institutionen för skoglig mykologi och patologi, SLU Uppsala*

A new project was presented, that will test the hypothesis that positive effects of multifunctional rhizobia can be strengthened synergistically in the presence of antagonistic bacteria, with improved N<sub>2</sub> fixation, plant nutrition and disease protection as reward. Their synergism will reduce the spread of seed-borne fungi in field bean during the growing season and also reduce the levels of seed borne inoculum.

*Physiological and molecular mechanisms involved in P use efficiency for symbiotic nitrogen fixation in legumes, Adnane Bargaz, Department of Biosystems and Technology, SLU Alnarp*

A new study will investigate effects of P deficiency and drought stress on yield stability, stress tolerance and nutrient uptake in cereal-legume intercropping systems and varietal mixtures, both in greenhouse and field conditions.

*Yield stability in varietal mixtures of faba bean - Georg Carlsson, Department of Biosystems and Technology, SLU Alnarp*

The ongoing project, performed at three field sites during two years with three faba bean varieties, has shown potential benefits with respect to grain yield and occurrence of chocolate spot disease in certain varietal mixtures.

*Intercropping faba bean and maize for silage- Eva Stoltz, Hushållningssällskapet/HS Konsult AB*

Five different treatments with monoculture or intercropping at different N fertilization levels were studied. Intercropping gave positive effects on faba bean height, mineral content and leaf spot disease.

*Legumes as protein feed for dairy bull calves – Birgitta Johansson, HMM, SLU Skara*

Four sets of calves were studied to compare feed intake and growth rate when fed with legumes (and dry distillers' grains) in comparison to soya bean meal (SBM). All calves had at least the same growth rate as calves fed SBM. The only exception was a group of calves fed clover rich silage with small amounts of rapeseed cake and barley, which showed impaired growth.

## **Research agenda for organic agriculture**

A short presentation of EPOK (Centre for Organic Food and Farming) was given, including the background for the new research agenda for development and increased sustainability. The agenda consists of three themes that describe overall challenges: 1. Robust systems; 2. Added value for the environment and society; and 3. Competitiveness and thriving rural communities. These themes are further described in five focal areas with examples of research questions. Information about coming calls for research about organic agriculture, likely to be announced during 2013, included: SLU Ekoforsk; Formas together with SLF; the Ekhaga foundation (Ekhagastiftelsen) and the Swedish board of Agriculture (Jordbruksverket).

## **Group work: Research in organic production driving the transition towards increased use of legumes in agriculture.**

To follow up from the presentations and the research agenda for organic agriculture, the participants were divided in three groups and given the task to suggest research needs linked with the overall goal “promoting the use of legumes in agriculture”. Below is a summary of the topics that were suggested and discussed, grouped into topics related to specific research questions and topics related to communication and promotion of using legumes in practice.

### *Research questions*

- Cropping systems. Cultivation and harvest techniques for: establishment and harvest of intercrops (e.g. broadcasting seed mixtures vs. sowing different species in rows or strips); early crop establishment; inoculation; production of clover (and grass) seeds; separating harvested biomass into a protein (leaves) and a fiber (stems) fraction.
- Production stability (safe production – through all themes): sustainability, hardiness and disease resistance in red clover; Disease resistance, earliness and hardiness in faba bean (winter beans in Sweden?). Need for plant breeding and preventive actions at the cropping system level.
- Inter-cropping, mixtures for better disease resistance, yield and quality (eg. mineral content).
- Crop rotations for even and healthy crop production and minimum environmental impact. N use efficiency at the crop rotation level.
- Diversified crop rotations – need for legume-free break crops to reduce disease pressure?
- Old/new legumes, perennial species with “new” qualities (hardiness, vitamins, tannins), e.g. *Galega*, *Melilotus*, *Lotus*, *Onobrychis*...
- Conservation methods: security; quality; feed efficiency (taste).
- Human consumption.
- Legumes for horses.
- Intercropping vs. Monoculture (control, system, crop rotation, climate).
- Soil-borne pathogens, effects of/on mixtures.
- Seed production – quality.

### *Interdisciplinary and participatory actions, communication*

- Syntheses, systems analyses.
- Include/invite farmers in LegSA activities
- Understanding market mechanisms (profit) for the implementation of new ideas – communication of good examples
- Dissemination of results, farmer participation in the network

## **Conclusions**

Following the discussion of suggested topics for research and communication, the participants discussed future activities and ambitions for the network. Elisabet will look into organizing a NOVA PhD course about legumes, potentially linked with an existing NOVA network about *Sustainable production systems*. Georg raised the question about applying for funding for interdisciplinary and participatory research, including workshops with scientists and stakeholders, syntheses and systems analyses. The overall aim would be to improve communication about services that legumes provide and increase the use of legumes in agriculture.

The next annual meeting will be held in Umeå in the first months of 2014.