International Herbage Seed Group

Newsletter

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IHSG

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Editor's note: With the harvests almost complete in the Northern hemisphere, in the South a cold dry winter is prevailing. In this issue, we look at the Danish nitrogen regulations, a significant era regarding seed research in NZ, some recent publications and an update regarding the 9th IHSG conference in in Pergamino, Argentina in October 2017. This is issue 54 of the newsletter. Details of the contact person in your area are listed at the end of the newsletter and on the IHSG website. Please remember to send articles to either of the newsletter editors or to your area contact person to be included in future newsletters.

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Presidents Column

Welcome to the 54th IHSG Newsletter.

It is time to start planning your attendance and participation at the 9th IHSG Conference in Pergamino, Argentina in October 2017. In our part of the world financial year often starts on 1 July and we need to flag our forward travel plans. A call for abstracts will be made in November this year. The scale of crop production in Argentina is an eye-opener. Herbage seed production to support large scale cattle farming is large. Mix this with some Argentine/South American culture, beef BBQ's and red wine from the Andes and we have an exciting event that I am looking forward too.

In the last six months I have an opportunity to see seed production in Thailand and Nepal. In Thailand, Michael Hare showed us the tropical village based seed production programme that he helped develop and nurture in east Thailand and we met with local village farmers who grow *Bracciariha* and *Paspalum* varieties. In Kathmandu Prof John Hampton and I representing the Lincoln Uni Seed Research Centre ran a week long seed course with 20 participants at the Grasslands Institute of Nepal Agriculture Research (NARC) with extension staff supporting rural cooperatives to produce certified herbage seed varieties, especially winter annual forages including oats. The contrast between large scale Argentine production with seed fields 100+ha with Asian village seed producers were fields may be measured in in square meters and most activities are by hand is an eye-opener.

In science funding the only constant seems to be change. In most parts of the world, science funding is competitive and it's hard to make a stand-out funding application when seed research is such a small and often under-valued science. We know that "food security starts with seed security" and that "herbage seed is a delivery vehicle for new forage genetics" that are a key component in much larger value milk and meat industries. The challenge to achieving funding is to build links into those bigger industries that allow you to have objectives in much larger programmes around food.

The cold winds of change have blown in New Zealand and AgResearch has decided to exit its 50 year programme of seed production research as a supporting component of forage breeding. As a consequence Jason Trethewey is now with Lincoln Agritech (Lincoln University) working on precision agriculture and variable rate N nitrogen and I have joined the Foundation of Arable Research (FAR) to work beside Richard Chynoweth. The deck chairs have been rearranged but all the kiwi players are still in the seeds orchestra.

The re-writing of our two seed production books; the out-of-print Tropical Seeds and the out-of-date Temperate Seeds has taken a step forward with two of the original editors agreeing to lead the re-writes. A big thanks to Don Loch of Queensland and John Hampton for accepting these roles. If the editors shoulder tap you for a contribution I encourage you to accept their invitations.

Best wishes for the harvest in the northern hemisphere and winter data collation and writing or skiing for our southern hemisphere colleagues.

Phil Rolston, President IHSG

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9th International Herbage Seed Conference

Pergamino, Buenos Aires, Argentina. 23-26 October 2017

The International Herbage Seed Group (IHSG) aims to encourage cooperation between workers actively engaged in herbage seed production research all around the world. Created in 1978, it continues to gather researchers and producers in the field of herbage seed in periodical international meetings. Previous conferences have been held in Europe (Denmark, Germany, Italy and Norway), USA (Oregon and Texas) and Australia. In an attempt to bring participants from different parts of the world closer, conferences have been moved to developing countries, first in China (2015) and next to Argentina, pursuing also in bridging the gap between temperate and tropical seed research.

The 9th IHSG Conference will meet in Pergamino, Argentina from October 23 to 26, 2017 at the UNNOBA main campus. With the ambition to create a collaborative space to gather agronomists, researchers, seed producers and seed companies, it will include both papers and poster discussion and visits to seed production fields, processing companies and research centers in the area. After the conference, a tour will be offered to show Argentina´s herbage seed production to international researchers and workers involved in seed topics.

Abstracts for the following areas of research are welcome for submission:

1- Genetics and physiology for understanding seed yield potential
2- Breeding for seed yield in herbage/turf species
3- Agronomic management to achieve high seed yields
4- Plant protection: weeds, pest and diseases
5- Seed production in developing countries: issues and models for production
6- Seed quality impacts from the field
7- Seed technologies to enhance seed performance
8- Extension, tech transfer and training, the next generation of seed researchers and seed agronomists.

Call for abstracts and other related information can be reached at IHSG´s webpage at www.ihsg.org or at IHSG2017@gmail.com

We look forward to seeing you in Pergamino in 2017!

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A change in the Danish nitrogen regulation towards higher application rates

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The Danish nitrogen (N) regulation started 1985 where the first Action plan on N, phosphorus (P) and organic matter (NPo action plan) was implemented. Additional targets followed which had the purpose to reduce surplus N and especially nitrate-N from Danish agricultural production. The targeted reduction in nitrate leaching has primarily been achieved through the implementation of a 'maximum allowed N application rate' to each crop species. The 'maximum allowed' refers to the N rate a farmer can apply without having to pay a very high tax of the N applied. The 'maximum allowed N application rate' for each crop species is further divided for some crops according to soil type and management.

During the implementation of the first action plan, benchmarks for maximum N application rates were equivalent to 'economical optimum N fertiliser application rates' (ECO-N). ECO-N is a calculation utilising economic returns for product sold (i.e., seed yield) and the cost of N. However, ECO-N calculations are of course an "*ex ante*" calculation as the actual yield, crop unit price and N are unknown at the start of the season when N is bought.

At the time these N restrictions were not seen as a major interference with the farmer's freedom, as N rates were based on ECO-N. However, with successive action plans, N application rates reduced by 10 to 20% - these N application rates had a severe negative effect on yields for some farmers. For the 2014 - 2015 growing season, the maximum allowed N application rate is 80% of the ECO-N, which for perennial ryegrass and red fescue seed crops is 139 and 123 kg N/ha, respectively. This application rate will be reduced in response to use of N fixing crops, organic N and spring soil N content. In comparison the ECO-N is calculated at 180 and 151 kg/ha in perennial ryegrass and red fescue, respectively.

Total N allocation per farm is calculated based on crop species, soil type, management, previous crop history, the use of manure/slurry and number of hectares. It is up to farmers to distribute N within the farm which gives the possibility to strategically apply N to those crops offering the most favourable economic return. Therefore, in practice grass seed crops have been favoured by farmers who have reduced N application in other crops in their crop rotation while increasing N application rates in grass seed crops. As such, the calculation of the economic loss for grass seed growers from N regulations is difficult to estimate due to redistribution of N within a farm. However, if we assume that farmers are only using their maximum allowed N application rates, then the economic loss is

estimated to be approximately EUR 4 million annually for perennial ryegrass and red fescue seed crops alone.

New government – new initiatives

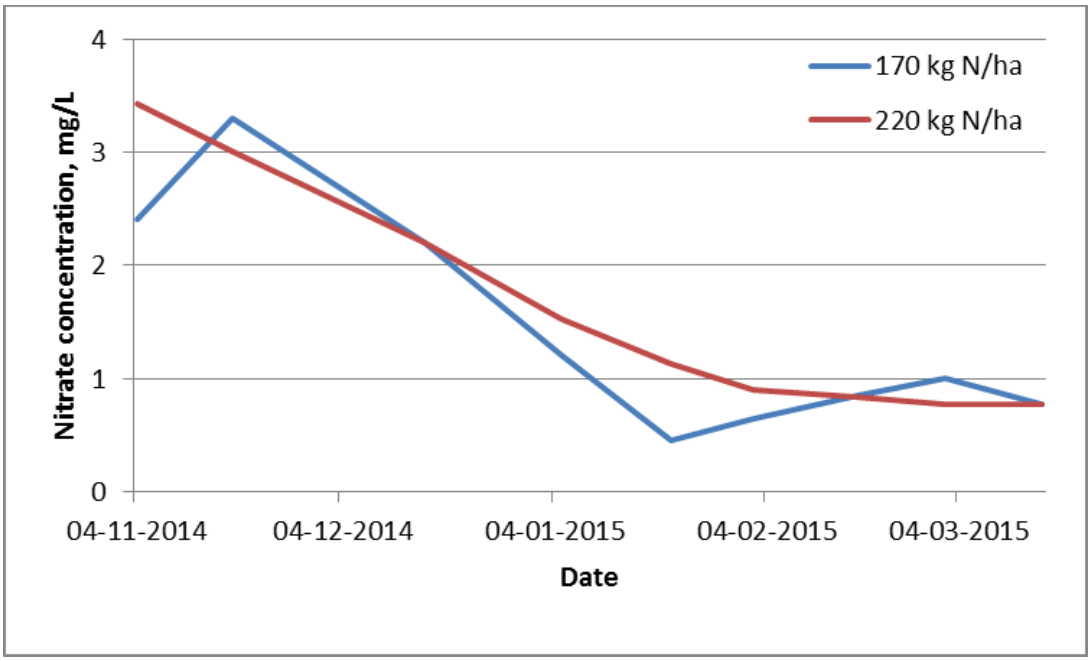
A new Danish government in 2015 has had a large impact on agricultural policies with a greater focus on agriculture as a business, rather than an environmental burden. Some might argue, much like the New Zealand way of 'business'. The course is set to see that the maximum allowed N application rate is to equal ECO-N by 2018/19, which from an administrative point of view should be easy to implement. However, the environmental goal of reducing N surplus from agricultural production is still required to be achieved.

The solution is the implementation of a differentiated N regulation based on the soils ability to avoid/reduce leaching (inversely N retention). The strategy implies that some soils in Denmark would have substantially lower N application rates compared to ECO-N while others would be able to apply ECO-N. The work on how this regulation will work in practice for the farmers and how it will be administrated is on-going; similarly, as researchers our job is to have solid data and results to support and ensure that the right decisions are taken within this new N regulation system.

The good and true environmental story of growing grass seed crops

The work on N utilisation in Danish grass seed production has been on-going for a number of years. Part of this work has focused on measuring N leaching from grass seed crops in research plots and at farmer's fields. This data has been used to develop the empirical N-LES model which shows that grass seed crops have lowest N leaching of all crops assessed.

These results have been supported by our own measurement of N leaching using ceramic cups in research plots of perennial ryegrass and red fescue (Figure 1). The results clearly show that N concentration in the water collected by the ceramic cups at 90 cm is very low when N application rates are within the range of ECO-N. Here at Flakkebjerg, the soil is a clay loam to the depth of 125 cm, with a transition to sand at 125-150 cm. With N application rates higher than ECO-N applied in spring to Red Fescue, i.e., 120 kg/ha, the N concentration of leachate (significantly) increases. Overall although, the fact that N leaching is negligible in a grass seed crop is the single best argument in the environmental vs. agricultural discussion that is on the political agenda in many countries nowadays.



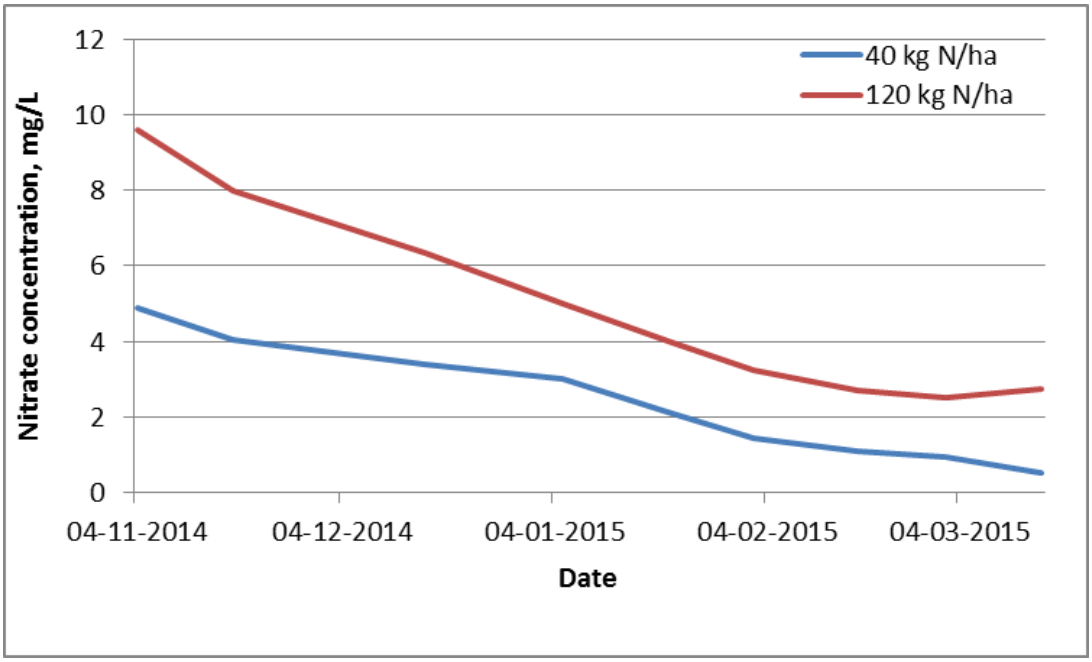


Figure 1. Nitrogen (N) concentration at 90 cm below soil surface in perennial ryegrass (top) and red fescue (lower) receiving different N application rates.

What are our challenges?

The main challenge we face in Denmark at the moment is the low recovery of applied N in harvested seed and straw. If we are only able to remove ~60% of the applied N in seeds and straw, there remains 60 kg N/ha in stubble and roots which may potentially be leached to groundwater if not

taken up by the following crop. Therefore we have the challenge to prove that grass seed crops have a low overall N leaching potential in a crop rotation system and not only as a single crop.

The work on sensors/images to estimate N demand in combination with the critical N dilution curve is on-going. The focus is now on using UAV's with camera and LIDAR laser to estimate N status and biomass of grass seed crops. This will hopefully be tested and used in farmer's fields in the spring 2017 and results will be shown and discussed at the IHSG conference in Argentina 2017.

Photo: overview of some of the field experiments at Flakkebjerg. It's a mix of species and cultivars and different experiments with different purposes e.g. N, PGR and pesticides.

New Zealand: AgResearch ends 50 years of seed production research

April 2016 marked the end of 50 year's of herbage seed production research by AgResearch and its predecessor organization DSIR Grasslands. The Director of DSIR Grasslands, the late Dr Ray Brougham saw a need for seed production research to support the new cultivars that were being bred by the organization. Peter Clifford and Ken Brown who were already working with DSIR Grasslands were re-directed into Seed Research; Peter on legumes and pollination and Ken on grass seed production. Peter Cliffords' work, particularly on white clover seed production bridged gaps between research and practice, with growers understanding that 1000 kg/ha crops were achievable.

Phil Rolston was recruited in 1974, as a weed scientist to study the problems of volunteer white clover contamination in new white clover cultivars. In 1992 DSIR Grasslands staff were transferred into the new pastoral Institute of AgResearch. Jason Trethewey was recruited in 2005 as a carbohydrate biochemist to study resource allocation and partitioning in ryegrass seed crops. A decision by AgResearch to move from forage breeding to pre-breeding has resulted in the closure of the herbage seed production research programme. This coincided with Phil Rolston's retirement from AgResearch after 42 years. Seed research in the Canterbury region of New Zealand will continue; with FAR (Foundation for Arable Research) a farmer levy organization being a major driver of applied seed production research (Richard Chynoweth); the Lincoln University Seed Research Centre undertaking R&D, industry and undergraduate/post graduate training (Prof John Hampton/Phil Rolston/Jason Trethewey) and seed company research from PGG Wrightson Seeds (Murray Kelly and Richard Merrilees) and other companies, and trials operator NZ Arable (Bede McCloy).

Jason Trethewey is now with Lincoln Agritech working as a precision agriculture scientist investigating variable rate N nitrogen, N leaching and N management in pastures and crops (Jason.Trethewey@lincolnagritech.co.nz) and Phil Rolston has been appointed by FAR as a Senior Research Advisor for Herbage and Vegetable Seeds (Phil.Rolston@far.org.nz).

Recent publications

2015 Seed Production Report at Oregon State University and USDA-ARS Cooperating (eds Nicole Anderson et al.) published April 2016 For an online copy use this link: http://cropandsoil.oregonstate.edu/seed-ext

The contributions in the 2015 Report include:

- five research reports on ergot disease (*Claviceps purpurea*), biology and control;
- slugs,
- choke disease (*Epichloe typhina*) in orchard grass/cocksfoot;
- *Poa annua* control in carbon seed ryegrass and tall fescue;
- Trinexapac-ethyl timing and rate in crimson clover;
- Dock (*Rumex*) control in red clover.

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Defining seed development growth with thermal time in ryegrass.

A recently published paper by Chynoweth and Moot is the first time classic thermal time development models have been quantified in ryegrass using three cultivars with a 30 day spread in flowering date. Seed filling followed a consistent sigmoidal growth pattern with a lag phase of 127°C days, and linear duration of 390°C days. Time to 95% of final seed weight was 517°C days. The duration of the linear phase of seed growth, defined as the time from 5 to 95% of final seed weight, was similar for all sowing date, cultivar and TE treatments at 390°C days.

The authors also conclude that the results suggest seed yield of perennial ryegrass was not source limited. The stem was confirmed as a strong competing sink relative to the developing seed. Thus, selection for larger ovules at anthesis could increase sink size and therefore overall seed yield, if it is a heritable trait in perennial ryegrass.

Chynoweth R. J. and Moot D. J. 2016. Seed growth of three perennial ryegrass cultivars sown on two dates and treated with trinexapac ethyl straw shortener. *Grass and Forage Science* (on line version: doi: 10.1111/gfs.12236).

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