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Ryegrass, clover & 2013 workshop

IHSG

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Editor's note: The northern hemisphere is in the midst of the summer harvest while in the south, the smoke is continuing to rise from the chimneys. In this issue we look at the benefits of annual ryegrass as a cover crop in mid-western USA and Berseem clover seed production in Mediterranean environments. Also included is further information and updates on the September 2013 IHSG workshop in Canterbury, NZ. Already with 80 delegates registered. This is issue number 48 of the newsletter. Details of the contact person in your area are listed on the back page of the newsletter and on the IHSG website http://www.ihsg.org/. Please continue to send articles, updates or short papers to your area contact person to be included in future newsletters.

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Contents

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President's Column

Eight years – it has been a great privilege to be IHSG president through-out this period. During my tenure, I have had the honour of meeting old and new colleagues and friends, from those who have assisted with contributions to our newsletter, to those involved in planning past and future workshops/conferences. Of special importance to me are the two successful conferences which we held in Norway (2007) and Texas (2010). I am always looking forward to catch up and learn what has happened since we last met. With the large hospitality among IHSG members this often relates both to work conditions and family. In each of those conferences new countries or regions have been represented for the first time, which for me is a good sign of the interest in our activities. You have all assisted in making IHSG what it is today: A forum for all with an interest in herbage seed to meet, share, discuss and socialise in – and for that, I thank you all. It is my honour to be passing on the presidency to Phil Rolston, President Elect, who will take over during the workshop in New Zealand. I hope we can all make Phil's time as memorable as mine.

From time to time, we must remind ourselves of the goals of our organisation. The International Herbage Seed Group (IHSG) was established 35 years ago with the following objectives:

i. To encourage co-operation and communication among those involved with herbage seed in any capacity;

ii. To encourage the interchange of herbage seed research results and publications;

iii. To promote the interchange of ideas and information by means of regular publications, meetings and conferences.

Even today, I believe these objectives are as relevant as they were when they were first formulated in 1978!

Nowadays the internet and e-mail makes communication only a click of a button away. For the communication between members, the IHSG-website (www.ihsg.org) offers a number of services. However, for our continued success, please remember to update your contact information. One exciting feature that you may not be aware of is that all IHSG members have the option of adding new publications and activities. This facility could be used more in order to improve the access to new herbage seed related publications. In this portal, you will also find information on previous IHSG activities – among these, for instance proceedings of IHSG conferences right of the first IHSG conferences held in 1987 to the latest in 2010, and all electronic issues of the newsletter are available.

In this issue of the IHSG newsletter, our contributors continue to provide inspiring information on different uses of grasses and legumes. In previous issues, we have been introduced to the use of grass/endophyte associations with the aim of reducing bird strikes on airfields in New Zealand and developing seed production of local populations of grasses for ecological restoration in the mountain areas of Norway. However, looking into a continental US example, we read about the impressive progress which has been made by the Oregon Ryegrass Seed Growers Commission in using annual ryegrass as a cover crop in the Midwestern US. Further, you will be introduced to Egyptian clover and how important this has become in the Mediterranean basin. I hope these two very interesting examples will stimulate more to come for future newsletters.

Furthermore, in this newsletter you will find a detailed programme and information about the upcoming IHSG workshop - only just one month away. The local organizing committee has planned a number of activities where researchers, advisors and farmers have the possibility to meet and exchange ideas. Please bring your experience and ideas of how to improve “R&D adoption by seed growers – making good science work on farm”.

During the workshop, a business meeting will be held. One important issue on the agenda is where our next conference is to be held. I hereby invite hosting candidates for the 2015 IHSG conference to provide further information, including but not limited to suggested venues, dates, budget, as well as potential administrative support from host institutes or local seed industry. Please send information to me (Birte.Boelt@agrsci.dk) no later than 5th September, 2013.

Finally, I hope to see you during the next IHSG workshop in New Zealand. Signing out for the final time, I wish IHSG a prosperous future.

Birte Boelt

President

Annual Ryegrass and the Value of Cover Crops in the Midwestern US

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Annual ryegrass (*Lolium multiflorum* Lam) is a cool season grass that, prior to 1995, was used primarily for "over-seeding" large areas during winter in southern US states. Seeded in the fall, as warm season native grasses begin to go dormant, annual ryegrass provides both basic ground coverage and livestock forage.

About 90 percent of the US supply of annual ryegrass seed is grown in the west coast state of Oregon. In 1995, Oregon growers were experiencing annual ryegrass seed surpluses and lower than desired sale prices. That's when the Oregon Ryegrass Seed Growers Commission began a modest, grower-funded research and education project to develop new markets and boost sales of annual ryegrass seed. The area selected was the "Midwest" states of Indiana and Illinois, in the heart of the "corn belt," but also important for soybean farming.

The idea for this new market was to help re-introduce a "no-till" agriculture practice combined with use of annual ryegrass as a "cover crop" each winter. Hearkening back to an older tradition, when farmers had greater biodiversity in the field, cover crops provide valuable nutrients and organic matter to the soil, while reducing the loss of topsoil to erosion.

Background

After World War II, American agriculture embraced greater mechanization and the use of synthetic fertilizers. That period is also characterized by improved yields, larger farms and less crop diversity. For the next 50 years, tractors became more powerful, plows dug deeper and fertilizer inputs increased. Much of this once-fertile Midwest soil lost a lot of its vigor, lost substantial organic matter and microorganisms, and has experienced natural and machine-caused compaction. Using what is called "conventional" tillage and limited crop rotation, farming became increasingly reliant on specialty seeds and fertilizers to retain highly productive corn and soybean yields. Consequently, these lands have become very susceptible to topsoil losses and - as seen this past summer - crops have little tolerance for drought conditions. Because of these and other factors, no-till agriculture in the Midwest began to attract notice in the 1980s but few farmers employed cover crops before 2000.

The Oregon Ryegrass Commission's limited budget prescribed a targeted, small-scale effort. At first, organizers sought the cooperation of a few universities and a dozen farmers in two Midwest states (Illinois and Indiana) to develop some test plots using annual ryegrass. There was some doubt whether the grass would even survive in the Midwest climate, known for its cold, snowy winters. For maximum effectiveness, it was important that the cover crop be able to withstand the winter. Coming out of dormancy in springtime, the annual ryegrass would then grow until sometime in April (depending on weather and geographic location), when it would be eradicated with herbicide (usually glyphosate) prior to planting corn or soybeans.

Key to the success of the effort was Mike Plumer, an Extension educator at the University of Illinois, who had many years of experience with no-till on his own farm and took a keen interest in annual ryegrass as a cover crop. Because of the region's lack of modern experience with no-till and cover crops, the early successes and failures with annual ryegrass gave Midwest agronomists and farmers important lessons about planting other cover crops as well. Major components in any cover crop program include the variety used, the planting date, seeding rate, method of planting, proper fertilizing, winter survivability and killing the cover crop in the spring before planting corn or beans.

Ideally, annual ryegrass is seeded with a drill after harvest, but the window of above-freezing weather is small, so many farmers now establish their cover crop earlier with airplanes or "high-clearance" equipment modified to seed from wide booms (Fig. 1) into a standing crop.

Figure 1. Van Tilberg Hi-Boy Seeder

Annual ryegrass has a better chance of surviving the winter if it has more than 50 days of growth beforehand. Having established at least 3 leaves prior to cold weather improves its survivability rate considerably (Fig. 2). The best condition is for a blanket of snow over the annual ryegrass all winter, to insulate it from bitter wind chills.

Figure 2. Annual ryegrass seedlings

While the Midwest states have been a focus of attention, reports from farmers in states to the northwest, as well as some in Canada's southern Great Lakes region also report reliable success with annual ryegrass. Part of the Commission's program included university-controlled, replicated trials in different states using numerous varieties of annual ryegrass. At present, there are about seven proprietary varieties that are hardy enough to withstand average Midwest winters. Growers are advised to select the seed based on their farm's location and farm management objectives. The nonprofit Midwest Cover Crop Council has a cover crop decision making tool online to help farmers select based on a variety of factors. See http://mcccdev.anr.msu.edu/VertIndex.php

Benefits of Annual Ryegrass

1. **Drought Resistance**. The first discovery about annual ryegrass value as a cover crop was its dual capacity for deep rooting and breaking up compacted soil. In Oregon's Willamette Valley, annual ryegrass roots grow quite shallow because the normal water table is near the surface. In the Midwest, it surprised everyone that while top growth quit in the fall at less than 6 inches (15 centimeters (cm.), annual ryegrass roots continued to grow all winter below the frozen soil (provided the grass did not succumb to harsh conditions.)

2. **Breaking Soil Compaction.** Natural hardpan (fragipan) or manmade compaction prevents corn and soybean roots from getting deep moisture. In the Midwest, these soils are found predominately in southern Ohio, Indiana, Illinois, and in Kentucky and Missouri. The depth of crop rooting depends on factors including compaction, soil type and the number of years the land has been in cultivation or no-till.

Figure 3. Corn roots in Annual ryegrass

Annual Ryegrass creates small channels, or macropores, as they grow. When killed in the spring, the roots decay, allowing corn and soybean roots to use the same channels to reach moisture under the hardpan (Fig. 3)). It takes approximately four years of continuous no-till with annual ryegrass to get through 4 – 6 in. (10 – 15 cm.) of hardpan.

Also discovered in those early years was that the older, public varieties of annual ryegrass, like Gulf, will not do as well as the newer winter-hardy varieties in the Midwest, unless ample snow insulates the vegetation all winter. Lack of snow coupled with sub-zero (Fahrenheit) temperatures and brisk wind can kill off the young grass.

3. **Increased Yields**. One of the consistent farm cooperators since the start of the cover cropping project in 1995 is Ralph "Junior" Upton, whose hilly, erodible Illinois farm (1,800 acres; 728 hectares) has had annual ryegrass and other cover crops on about half of those fields since the mid 1980s. By reducing or eliminating erosion and compaction, corn yields have improved considerably, as has the percentage of organic matter in the soil. In the first year (with "normal" rainfall) of a replicated university study (2005 – 07), Upton showed a 50 bushel per acre difference (3.13 Metric tons/hectare (Mg/ha) between plots traditionally planted in annual ryegrass and those conventionally tilled. The following year, exceptionally dry, those same acres showed an even larger differential (4.39 Mg/ha). In the 2012 drought, Upton's farm produced less than half the normal yield. And yet, his corn harvest averaged 80 bushels/acre (5.01 Mg/ha) with a high of 130 bushels/acre (8.15 Mg/ha). Meanwhile, neighbors around him using conventional tillage averaged 0 – 30 bushels/acre (0 – 1.88 Mg/ha). Since the 1990s, organic matter on his farm has increased from less than one percent to about 3.5 percent on cropland where annual ryegrass is planted in the winter.

4. Nutrient Recycling. While alive, annual ryegrass scavenges available nitrogen from the soil. After it is killed in the spring with herbicide (glyphosate), the residue releases that stored nitrogen to corn in late June or early July (Fig. 4). Using annual ryegrass can provide up to 90 lb/a (90 kg/ ha) of nitrogen. Over time, the deep rooting also enhances the translocation and availability of phosphorus and potassium from deeper soils.

Figure 4. Corn emerging through annual rygerass residue

With the cost of nitrogen (NH3) estimated to reach $1,000 (US) or more per ton (about 900 kg) growers see cover crops as an economic asset. Planting annual ryegrass can reduce nitrogen inputs, and the savings will more than pay for the cost of the seed and planting. Additionally, cover crops require fewer equipment passes through the fields, thus saving fuel and additional compaction.

Farmers who have livestock are increasingly required to apply manure in a more environmentally friendly fashion. Using annual ryegrass helps to keep the nitrogen in the soil profile instead of washing off the land and into nearby streams, rivers and lakes. A combination of governmental regulations and cash incentives are in place, part of a long-term effort to reduce eutrophication and hypoxia, caused in part by nutrient leaching off farmlands.

5. Quicker Transition to No-Till

When converting land to no-till, it commonly takes about five years for key soil properties (aggregate stability, organic matter, increased infiltration, pore space, microorganism population, fungi, etc) to return. Adding annual ryegrass or other cover crops reduces this transition period by about half.

6. Weed Control. Planted in the fall, before winter annuals have germinated, annual ryegrass grows vigorously to form a dense cover that competes successfully with winter annual weeds, thus eliminating the need for herbicide use at that time.

7. Soybean Cyst Nematode Control. High populations of soybean cyst nematodes result in lower soybean yield. Preliminary research studies indicate that with a healthy annual ryegrass crop after harvest, cyst eggs will hatch in the fall. Annual ryegrass is not a host plant, thus the nematodes starve. This results in a very low count, if not elimination, of this pest the following year. Fields in the southern half of Illinois, Indiana, Ohio, and Missouri are likely candidates because there is ample time in the fall to develop a healthy stand of annual ryegrass before freezing weather.

8. Grazing. Growers who plant annual ryegrass after wheat or corn silage may be able to take a cutting of haylage in the fall and possibly in the spring, then no-till plant beans or corn into the annual ryegrass. Growers in southern Ohio, Indiana Illinois, Kentucky and Missouri may be able to graze the annual ryegrass over winter or take a cutting of haylage in the spring.

9. Pollination. Corn normally pollinates in early July, but in 2012 Midwest temperatures were consistently above 100°F (37°C) for weeks during that time. That, coupled with no rain, stressed the corn plants and diminished pollination significantly. Because of its deep rooting, corn grown on land with annual ryegrass was able to find deep moisture and increase the odds of at least a partial pollination occurring. Another theory being studied is that natural plant respiration during that time kept the temperature of the ambient air, plant vegetation and surface soil lower, allowing more plants to pollinate.

10. Land Reclamation. In a recent study of coal strip mine reclamation in the Midwest showed that use of cover crops dramatically reduces the time needed for soil recovery. In that study, for example, "bond release" normally takes about 12 years, after which the land is deemed suitable for agricultural and other purposes. Using cover crops, this study showed a reduction in bond release time to only four years, three times faster.

Summary.

In the historically significant drought last summer, Midwest farmers sustained substantial crop losses. While an estimated 80 percent of farmers had insurance against crop loss, some of those who didn't lost everything.

While farmers employing no-till with cover crops were not exempt from reduced yields, their harvest far exceeded those of farmers still using conventional tillage. After planting deep-rooting cover crops, like annual ryegrass, in the fall of 2011, farmers watched in appreciation last summer as corn and soybean plants used those same root channels, extending to depths of 6.5 - 9.8 feet (2 – 3 meters), thus withstanding withering heat and lack of rainfall.

The added values of soil health, drought protection and higher yields have made cover crop investment very popular in recent years. Midwest acreage planted in cover crops has doubled and tripled every year since 2008, according to industry estimates. While promising, the total (about 2 million acres; 800,000 hectare) still represents less than one percent of all Midwest cropland.

Changing traditional farming ways takes time, and the Oregon Ryegrass Commission's strategy continues to emphasize education of farmers, seed dealers, governmental agencies and industry associations. Oregon seed growers also continue to invest heavily, including the investment of their own time to work on the ground with growers in the Midwest, believing that continued education is needed to sustain the growth in use of cover crops. Meanwhile, larger seed growers and seed dealers continue to develop new cover crop varieties for this market. Likewise, they're developing marketing campaigns and hiring Midwest agents to both sell product and educate the buyers.

At the start of the cover crop effort, in the mid 1990s, there was very little annual ryegrass seed sold into the Midwest for cover crop purposes (Fig. 5). Those experimenting with the crop were given seed and sometimes small cash incentives to plant it in the fall.

In 2010, about 15 years into the campaign, an estimated 5 million pounds (2.2 million kg) of annual ryegrass seed was sold there. Last year, that amount tripled (15 million lb; 6.8 million kg) and estimates are that the volume of seed could double again next year.

Meanwhile, the price for the seed has also increased, good news for growers in Oregon. But among the many cover crop choices, annual ryegrass continues to be among the most popular, because of its lower cost ($0.70 - $1.25 US/lb.) and its valuable properties: deep rooting, nitrogen scavenging and soil building.

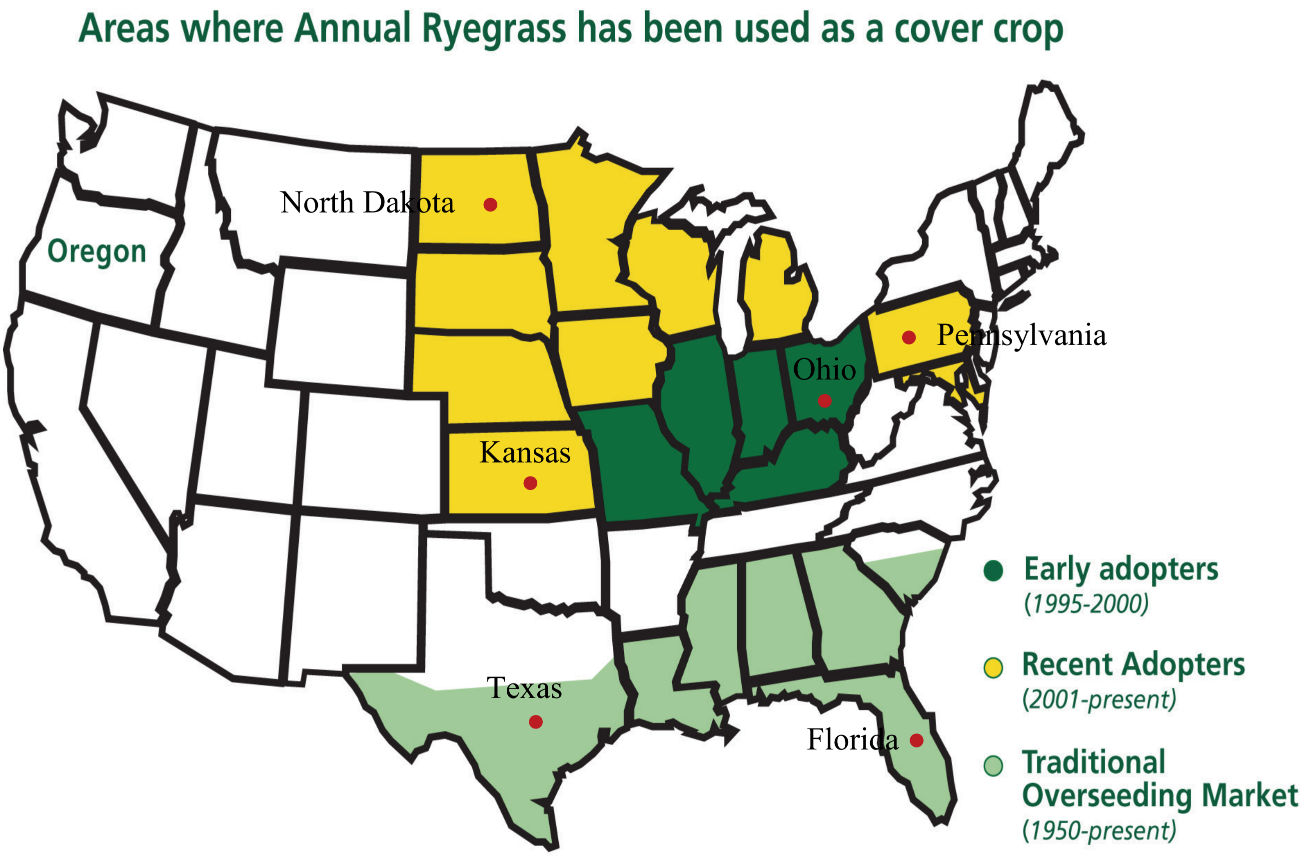

Figure 5. Areas annual ryegrass has been used as cover crop from 1950 - present

Berseem clover (*Trifolium alexandrinum* L.) seed production in Mediterranean environments

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Berseem clover (*Trifolium alexandrinum* L.), also known as Egyptian clover, is an annual forage legume widely grown under either rainfed or irrigated conditions in the Mediterranean basin, western and central Asia, and, most recently, the United States (Badr *et al*., 2008). In the Mediterranean the species is cultivated in pure stands or in mixture with annual ryegrass (*Lolium multiflorum* Lam.), oat (*Avena sativa* L.), or vetch (*Vicia sativa* L.). Usually the crop is autumn-sown and, thanks to its excellent regrowth ability (Giambalvo *et al*., 2011a), it is mainly used with rotational grazing from winter to late spring; it is rarely used for the exclusive production of hay. In Mediterranean rainfed environments berseem clover is valued for its capacity to prolong the availability of green fodder into the end of spring when other traditional forages, such as vetches or sulla (*Hedysarum coronarium* L.), have dried out, as well as for its high nutritional value and good palatability. Like other legumes, berseem plays an important agronomic role in cereal-based cropping systems, and particularly in organic farming, because it establishes efficient symbiotic relationships with nitrogen-fixing bacteria that have ensuing agronomic, economic, and environmental benefits (Giambalvo *et al*., 2005). In a study conducted under rainfed conditions in Sicily (southern Italy), the amount of N fixed by berseem was between 140 and 280 kg N ha^{-1} (Giambalvo *et al*., 2011b), whereas in California under irrigation Williams *et al*. (1990) found values ranging from 272 to 400 kg N ha^{-1} depending on the year and cultivar.

Varieties and seed production

Sixty varieties of berseem are currently recorded in the Plant Variety Database PLUTO of the International Union for the Protection of New Varieties of Plants (UPOV, 2012). The common EU Catalogue of varieties of agricultural plant species includes 36 varieties of berseem. In Italy, only two varieties had been registered in the national catalogue by 1987, but because the registration of varieties of berseem has been mandatory for seed commercialization since 1990, the number of new varieties is currently at 27. Since 2000, however, about 90% of the total certified seed production has been obtained from only 6–7 varieties.

In Egypt, the area seasonally occupied by berseem for forage production is about 1 million ha and the seed production needed to meet the annual demand is estimated at about 48000 Mg, mainly uncertified and uncontrolled seed; in addition, 30000 Mg of seeds are produced annually for export (El-Nahrawy, 2011).

In Italy berseem is grown in pure stand on about 25000 ha, mostly in the central and southern regions, but it is also widely used in mixture with grasses or legumes. The annual production of certified seed was on average about 1000 Mg from 1975 to 2000; beginning in 2000 production began to increase until it reached 3500 t in 2011. The mean seed yield is about 0.46 Mg ha^{-1}, with great variation by year (0.28–0.80 Mg ha^{-1}) mainly due to the high variability of the total amount and the distribution of rainfall.

Other Mediterranean countries (Algeria, Morocco, and Tunisia) produce berseem seed mainly for their own needs, but to our knowledge data on the amount of area harvested and yields are not available.

Seed crop management

Berseem performs best on medium-textured loams to heavy clays; sandy soils or soils with poor internal drainage are not suitable for growing berseem. At sowing, the soil should be free of weeds, smooth, and sufficiently firm, considering that the small seeds (about 3 mg each) have to be placed near the soil surface. An unpublished study carried out over 18 years on a deep, well-structured clay soil (Vertisol) under rainfed Mediterranean conditions (Sicily) found, on average, no differences in berseem seed yield with conventional tillage (plowing and harrowing), reduced tillage (harrowing only), and no tillage. In such conditions, no tillage would be preferable because it can decrease costs and avoid the negative impacts of tillage on the physico-chemical and biological properties of the soil. Moreover, the experiment showed that no tillage resulted in a slightly superior berseem seed yield compared with conventional tillage when water stress during the crop cycle was high. However, when soil water availability was adequate, berseem produced slightly more under conventional tillage.

The use of nitrogen fertilizer is not necessary because berseem clover usually satisfies its own N needs through symbiotic N fixation. When *Rhizobium trifolii* is absent or present in only small amounts in the soil, inoculation with appropriate strains of *Rhizobium* bacteria is essential.

No data are available on the uptake of other nutrients in berseem seed crop; in forage berseem crop, phosphorus is present at about 2.5–3.0 g per kg of dry weight (Graves *et al*., 1996; Brink *et al*., 2001). Graves *et al*. (1996) stated that fertilization with phosphorus is needed when the soil P level is less than 20 ppm.

The optimum seeding rate for berseem seed crop is about 20 kg ha^{-1} if the seed is drilled (Stringi *et al*., 1987), but 30–35 kg ha^{-1} may be necessary if seeds are broadcasted and/or when the seedbed is not adequately prepared.

In Mediterranean environments autumn-sown berseem is rarely grown as a specialized seed crop because seed yield is usually obtained from regrowths after one (or in rare cases two) forage utilizations. In this clover species, grazing or mowing are effective methods of controlling weeds, reducing plant stature and therefore the risk of lodging at maturity, and promoting better light penetration and a more uniform flowering; this generally leads to higher seed yields than those among crops that are not utilized (Stringi and Amato, 1985; Stringi *et al*., 1987; Graves *et al*., 1996). However, under rainfed Mediterranean conditions, delaying the clipping to late spring (e.g., for hay production) can reduce seed yield, as regrowth will occur in an unfavorable period for seed formation and development mainly because of increasingly drought-like conditions. An experiment conducted in Sicily showed that delaying the cut from mid-April to early May (the latter is the usual period for hay production in the trial area) reduced seed yield by about 30% on average (unpublished data).

In stockless farms, an early spring sowing (without cut or grazing) could be an option for a specialized berseem seed crop. However, a late-sown crop produces lower seed yields than a crop sown in autumn with a spring cut, mainly because of the shorter vegetative phase, the lower dry matter accumulation, and the postponement of the reproductive phase to drier and hotter conditions (Lowe and Bowdler, 1982; Amato *et al.*, 2003).

Berseem seed production in the Mediterranean environment is strongly influenced by soil

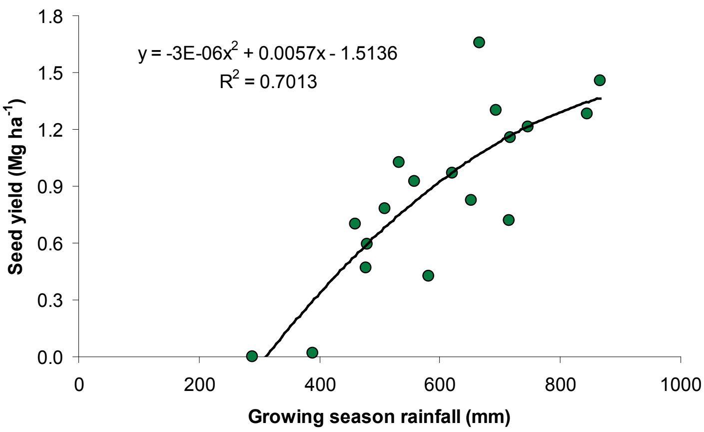

Figure 1. Relationship between rainfall during the growing season and the seed yield of berseem clover. Data are from a long-term (18-year) experiment conducted in Sicily, Italy.

water availability, particularly during spring growth. The results of a long-term experiment in Sicily highlighted a relationship between seed yield and the amount of total growing season rainfall (Fig. 1). In this experiment, the timing of supplemental irrigation was investigated: the addition of a small amount of water (40 mm) at the early bud stage or at the early flowering increased seed yield by about 30% (Fig. 2) compared to the rainfed crop. The same amount of water added at an earlier stage (soon after the spring cut) resulted in an increase in vegetative growth but did not influence the reproductive phase. Compared to a single supplemental irrigation undertaken at the ideal time, 2–4 irrigations produced a significant increase in biomass at maturity but not seed yield.

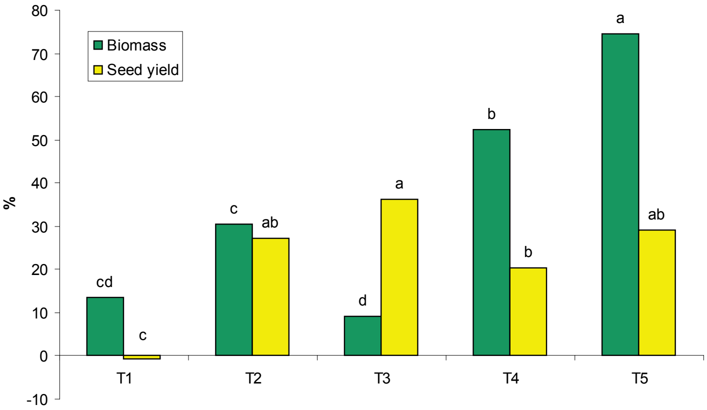

Figure 2. Effect of supplemental irrigation on total biomass at maturity and seed yield as variation (%) compared to a rainfed control. T1, one irrigation (i.) soon after the spring cut; T2, one i. at the early bud stage; T3, one i. at the early flowering stage; T4, one i. after the spring cut and one i. at the early bud stage; T5, one i. at the vegetative stage, one i. soon after the spring cut, one i. at the early bud stage, and one i. at the early flowering stage. Each irrigation consisted of 40 mm of water. Data were averaged over two trial years; figure compiled using data from Amato *et al.* (2005).

Berseem clover exhibits considerable genetic diversity among populations for self-compatibility (Roy *et al.*, 2005). In general, bee visits improve the seed set, so if pollinators are scarce, it is necessary to provide 2–3 bee colonies per hectare (Fig. 3).

Seeds are usually harvested by direct combining. In a study carried out in Sicily (unpublished data) the hard seed fraction in hand-threshed plants was between 20% and 30%; after mechanical threshing, an almost total absence of hard seed (<1%) was found. This indicates that seed abrasion or scarification occurs in mechanically harvested seeds and can explain the very low level of hard seed and the high level of seed germination (>95%) usually found in the commercial seed lots produced in the region.

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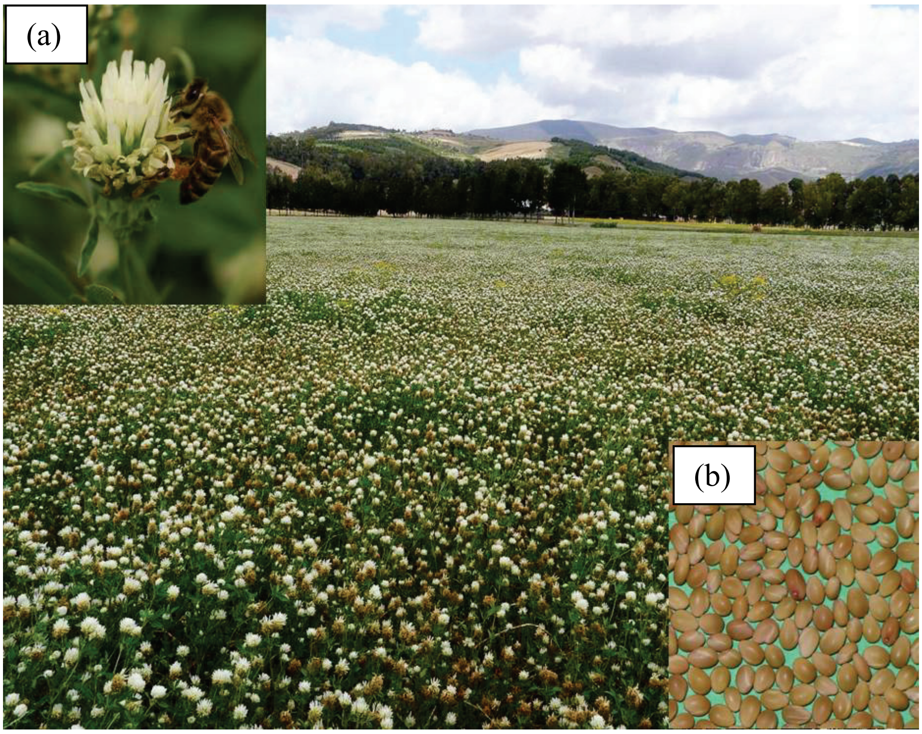

Figure 3. Berseem clover seed production field. Insert (a) bee on inflorescence; (b) Berseem clover seed

You are invited to New Zealand to attend the 2013 IHSG Workshop which follows the International Grasslands Conference (IGC) Sydney, Australia. It is only a short 3 hour flight from Sydney to Christchurch. The Workshop will be based at Methven, 100 km SW of Christchurch and in the heart of the Canterbury seed production area. 98% of New Zealand's' herbage, turf and vegetable seed production is based in the Canterbury Plains area. As a backdrop to Methven we have snow capped mountains and the Mt. Hutt ski field.

Workshop theme: ***"R&D adoption by seed growers-making good science work on farm"***

Topics covered:

- Environmental impacts and optimization of N inputs;
- Integration of livestock into high yielding seed crops;
- Integration of vegetable seed cropping and arable crops into herbage seed crops
- Irrigation response and variable rate irrigation technology;
- Integration of remote sensing & GPS technologies into seed crops.

Optional pre conference tour

Friday 20 – Sunday 22 September, 2013. Travel from Christchurch through the wine growing region of Waipara and stay the night in beautiful Kaikoura, New Zealand's whale watching capital. After a morning spent on a whale watching boat, drive through a hill country pass to the alpine village of Hanmer and soak for a while in the natural hot pools. The next day drive through the scenic Lewis Pass to New Zealand's wild West Coast, then return to Christchurch on the Tranz-

Alpine, truly one of the world's great scenic train trips. Travel across the snowy Southern Alps and experience patchwork farmland, ice-fed rivers, spectacular viaducts, and the beautiful Lake Brunner. Return to Christchurch in time for workshop registration on Sunday evening. Price ($1100 NZ incl) includes bus and train transport, accommodation, meals, whale watching and entry to the Hanmer Springs hot pools.

This trip is going ahead as we had already met the minimum numbers required.

Sunday 22nd Sept. Registration in Christchurch between 5 to 7 pm at Hotel Commodore; followed by official welcome; local kappa haka group with traditional welcome and buffet meal. The Hotel is 1 km from the Christchurch International Airport.

Mon 23rd.

0830	Depart from Christchurch at 8.30 am to the Lincoln area (20 km) visiting seed research groups
0915	Kimihia Research Station (PGGWrightson Seeds) presentation by John Duncan chair of NZGSTA
0935	Kimiha presentation on Seed Alliance- an approach to research by Prof John Hampton (Director Seed Research Centre, Lincoln University)
1000	View seed multiplication block at Kimihia & morning tea
1100	AgResearch – ryegrass seed research trials
1145	Lincoln University-annual legume seed production
1215	Depart for Rakaia
1300	Arrive Rakaia, lunch at Salmon Tails
1400	Depart for Barrhill, visit white clover seed production trials
1600	Depart for Methven
1630	Arrive Methven Resort


Methven Resort

Tue 24th FAR International Conference programme

9.00 – 9.20 am	*Working within nitrogen limits in a Danish farming system*
9.20 – 9.35 am	*The use of nitrogen fertiliser within grass seed crops in Canterbury, New Zealand*
9.35 – 9.50 am	*Nutrient management in herbage seed crops in Oregon*
9.50- 10.05 am	Panel discussion
10.05 – 10.18 am	*Irrigation management of white clover seed crops*
10.18 – 10.30 am	*Factors involved in producing high seed yield of forage brassica seed crops*
10.30 – 11.00 am	**Morning tea**
Chair	**New technologies for increased seed production**
11.00 – 11.15 am	*An introduction to plant growth regulators for use on grass seed crops*
11.15 – 11.30 am	*What does stem shortening actually do in perennial ryegrass seed production?*
11.30 – 11.50 am	*Current usage of plant growth regulators on-farm in Oregon*
11.50 – 12.10 pm	*The future of breeding herbage seed cultivars with a focus on white clover successes, and how these may influence seed production*
12.10 – 12.30	*The wish list of New Zealand seed producers – what's coming up in the next 10 years*
12.30 – 1.00 pm	Panel discussion
1.00 – 2.00 pm	**Lunch**
2.00 – 2.15 pm	Travel
2.15 – 3.35 pm	Farm visit –
3.35 - 3.45 pm	Travel time
3.45 – 5.00 pm	Farm visit –
5.15 pm	Closing remarks + happy 'hour'
6.00 – 7.30 pm	**BBQ dinner**

Wed 25th

	Topic
8.30 – 10:00	Seed yield limitation(overview followed by breakout groups) • Grasses • Legumes • Brassica forages • Tropical species
10:15	Introduction to posters
10:30	Morning tea & view posters
11:15	Research approaches in seed production; field versus greenhouse and lab based omics research; Trial scale; small versus large full size machinery approaches Overview followed by extended group

12:30 – 1:30	lunch
1:30 to 4:00	Focus on Precision Agriculture in seed crops, include field trip
4:00 to 5	Travel to Terrace Downs
5 to 6	AGM
6 pm	Dinner

Thurs 26th

	Topic
8.30 – 10:30	Plant Protection and pollination (overview followed by breakout groups) • Weed management • Disease management • Insect pest & pollinator management
10:30-11:00	Morning tea
11:00	Travel to Ashburton
12:00 – 1:00	Lunch
1:00 to 2:15	Field trip farm 1:- variable rate irrigation and water management for seed crops
2:15-2;45	travel
2;45- to 4 pm	Field trip farm 2:–integration of high value vegetable seed crops with traditional herbage seed crops
4 to 5 pm	End of conference workshop
	Travel to CHC

Workshop costs
The workshop registration cost (including GST) is $NZ 550 (including all meals, buses and related costs) but not accommodation.

Accommodation at Methven is $NZ 115/night for single rooms and a $NZ 130 for a double/twin bed room (ie $65/person). Accommodation in Christchurch at the Commodore is $NZ180/night single or shared. You are free to make alternative accommodation arrangements.

Registration Process
A link to the Workshop registration web site can be found on the IHSG web page.

Expressions of interest
If you are interested in attending please advise Phil Rolston, Jason Trethewey or Richard Chynoweth with your name and an email contact. Let us also know if you are interested in the pre-workshop tour.

Your local organizing committee have all attended some or all of our recent IHSG conferences in Australia, Norway and Texas: They are:

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Murray Kelly (PGG Wrightson Seeds) mkelly@pggwrightosonseeds.co.nz

Bede McCloy (NZ Arable) NZArable@xtra.co.nz

Hugh Wiggley (HSSFF- growers representative) handwigley@farmside.co.nz

Sponsorship

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