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Newsletter

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IHSG

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6th IHSG Conference

The 6th IHSG Conference will be held in Norway and Denmark in June 2007. Details of the conference programme and how to submit papers to this important conference can be found on pages 3 and 4. A diverse programme has been developed by the conference organisers that will interest all who are interested in seed production of temperate and tropical forage species. Information on the keynote speakers can be found on page 5.
Details of the CALL FOR PAPERS can be found on page 4.

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Contents

President's Column

At present we really appreciate that our country, Denmark, is located in a cold, wet (and dark) climate! I guess we're all curious to know, if we will get a white Christmas this year – most likely we will not! At the same time I know, that our colleagues in New Zealand and elsewhere in the Southern hemisphere, are preparing for seed harvest!

At the moment I an receiving updates from New Zealand, as my colleague is working there, and it often strikes me, how easy it has become to communicate – using the email or web-based facilities. Advantages from sabbaticals are obvious: As you will see from the joint paper 'EConomical Optimal Nitrogen (ECO-N) application rate in herbage grass seed production' by René Gislum and Phil Rolston collaboration has been intensified – in an area where also scientists from France and North America are involved. Globally it seems that public concern on environmental issues already has or may have implications on the use of nutrients – especially Nitrogen, where we in Denmark have restrictions on the amount of Nitrogen the farmer can apply. It is crucial for the grower organisations and the seed industry to have data on the implications of any restriction on Nitrogen use. This requires a large dataset, and this may be far too expensive for one country/region to attain, and expertise to analyse this data needs to be built up.

In addition we need to realise that not many students are currently deciding to study agriculture! It seems that other business areas have far more success in attracting young people. At the same time some members of the 'old' group decide to retire or change career – therefore the need to collaborate in exchanging views, knowledge and information is steadily increasing.

In June 2007 The International Herbage Seed Group will organise the 6th International Herbage Seed Conference in Norway, and the chairman of the organising committee Trygve Aamlid invites you to participate. Information is found in this issue of the newsletter and on the IHSG homepage http://cropandsoil.oregonstate.edu/ihsg/conference2007/welcome.php, where you can register to receive news each time the homepage is updated.

The scientific programme is built on five sessions, and we invite you to send proposals for oral presentations and posters. This can be done by sending us a ½ page abstract describing the work you want to present. The abstract should be sent before 20 December and during January the organizing committee will compile the contributions to the final programme, and authors are notified 1 February, 2007 at the latest. Four keynote speakers have accepted our invitation, and I'm very pleased to introduce these four experts to you in this issue of the newsletter.

During the 2003 conference in Gatton, Australia it was emphasised that the International Herbage Seed Group also includes research and development on 'warm season herbage seed crops', and it was expressed that a number of scientific areas are common. We particularly want to encourage colleagues in this area to participate, and I'm very pleased, that among the four invited speakers is the forage breeder, John Miles, from The International Center for Tropical Agriculture (CIAT), who has developed '*Mulato*', a warm-season grass cultivar, which you will find described in the paper by Michael Hare, Ubon Ratchathani University, Thailand. I had the chance to visit Michael Hare in November, 2005, and I was most impressed by the work he does in establishing smallholder farmer seed production.

I hope you will enjoy this issue of the newsletter and that it will encourage you to join the 6th International Herbage Seed Conference in Norway.

Wishing you all a Merry Christmas and a happy 2007!

Birte Boelt

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6th International Herbage Seed Conference

WELCOME

Dear Herbage Seed Colleague !

On behalf of the organizing committee it is a pleasure to welcome you to the 6th International Herbage Seed Conference in Norway and Denmark.

With only 3-4000 ha harvested annually, Norway is a rather small seed producing nation. However, most of the acreage is concentrated in Vestfold county, which has a group of very experienced and enthusiatic growers producing seed of about 10 grass and clover species with timothy , meadow fescue and red clover as the main ones.

The venue for the conference, beautiful Gjennestad Horticultural College (www.gjennestad.no) is located in the midst of this county. After two days in this area, the delegates will have the chance to study about 30 seed production and turfgrass trials at Landvik Research Station before crossing the Skagerrak and continuing the post-conference tour in Denmark, by far the biggest seed producing nation in Europe.

As leader of the organizing committee I will do my best to give you a memorable week in Scandinavia. However, the success of the conference depends on the delegates attending. Therefore I look very much forward to seeing YOU in Norway in June 2007 !

With my best regards

Trygve S. Aamlid

SCIENTIFIC PROGRAMME

Sunday 17 June

15.00	Registation desk opens
Afternoon and evening	Arrival at Sandefjord airport Torp (direct flights from London, Copenhagen, Amsterdam). Shuttle service to Gjennestad college.
20.00	Supper & welcome party

Monday 18 June

07.30-08.30	Breakfast
08.30	Official opening by IHSG president Birte Boelt and conference chairman Trygve S. Aamlid, Norway.
09.00	Introductory session: Seed production and seed trade in a globalized world. Keynote speaker: Ole Bech Bondesen, Denmark.
09.30-12.00	Session 1: Herbage seed for the future: Biodiversity, GMOs and the role of seed yield capacity in herbage breeding programs. Keynote speaker: Odd Arne Rognli, Norway.
	Oral presentations and posters
12.00-13.00	Lunch.
13.00-15.30	Session 2: Breeding and seed production of tropical/warm season species. Keynote speaker: John Miles CIAT
	Oral presentations and posters
16.00-20.00	Bus excursion to seed fields and on-farm seed production trials in Vestfold county: Timothy, meadow rescue, red clover, Kentucky bluegrass.
20.00-23.00	BBQ on a seed production farm Hosts: Norwegian seed companies and Norwegian seed Growers Association.

Tuesday 19 June

07.30-8.30	Breakfast
08.30	Seed production in the northern light: Implications of temperature and daylength for flower induction and seed yield. Keynote speaker: Ola M. Heide, Norway.
09.00-12.00	Session 3: Seed crop establishment: Rotations, cropping systems, cover crops, sowing times, row spacings, sowing rates, control of weeds and volunteer grasses, effects of seed dormancy and seed vigour.

Oral presentations and posters

12.00-13.00 Lunch.

13.00-16.00 Session 4: Optimizing input factors in herbage seed production: Crop fertility, plant protection, and environmental impacts.

Oral presentations and posters

16.00-18.00 Session 5: Harvest and post-harvest issues: Harvest timing and methods, straw management, seed drying, cleaning and storage.

Oral presentations and posters

18.30 IHSG Business meeting.

20.00 Conference dinner.

Wednesday 20 June

07.00-08.00 Breakfast.

08.15 Departure from Gjennestad by bus.
Visit to one or two seed growers on our way to Landvik Research Station.

12.30-18.00 Arrival Landvik, lunch.

13.00-18.00 Field day in seed production and turf trials at Landvik.
Hosts: Lars T. Havstad and Trygve S. Aamlid, Norway.

18.30-22.00 Voyage along the Norwegian south coast on board the veteran sailing vessel 'Solrik'. Meal on board.

22.15 Buses depart for Quality Hotel Kristiansand (for those not going on post-conference tour to Denmark) and Kristiansand ferry habour.

01.15 Night ferry to Hirtshals, Denmark.

CALL FOR PAPERS

Conference delegates are encouraged to submit papers within the following five categories:

Session 1: Herbage seed for the future: Biodiversity, GMOs and the role of seed yield capacity in herbage breeding programs.
Session 2: Seed production of tropical species.
Session 3: Seed crop establishment: Rotations, cropping systems, cover crops, sowing times, row spacings, sowing rates, control of weeds and volunteer grasses, effects of seed dormancy and seed vigour.
Session 4: Optimizing input factors in herbage seed production: Crop fertility, plant protection, and environmental impacts.
Session 5: Harvest and post- harvest issues: Harvest timing and harvest methods, straw management, seed drying, seed cleaning and seed storage

Papers will be presented as posters or 15 minute oral presentations. Delegates may wish what kind of presentation they prefer, but the organizing committee reserves the right to put together a final program for each session. Papers will only be accepted on the condition that at least one of the authors attend the conference.

Time schedule and deadlines for preparation of manuscripts:

20 December 2006: Title and short abstract (1200 characters) submitted by form below to the leader of the organizing committee, Trygve S. Aamlid.

1 February 2007: Final program for each session, including message to delegate if paper is accepted and whether it should be given as an oral presentation or as a poster. All authors will receive 'Instruction for authors'.

1 May 2007: Deadline for submission of final paper to be published in the Conference proceedings.

Link to Registration Form: http://cropandsoil.oregonstate.edu/ihsg/conference2007/callforpapers.php

Keynote speakers at the 6th International Herbage Seed Conference

Ola M. Heide:

Seed production in the northern light: Implications of temperature and daylength for flower induction and seed yield.

Ola M. Heide was, for some years, professor of botany / plant physiology at the world's northernmost university in Tromsø (69°N), but for most of his carrier, he has been working at The Norwegian University of Life Sciences (UMB) at Ås, Norway. Growing up in Northern Norway with the facinating northern light and the tremendous variation in daylength from one season to another, his major research interests have been plant photoperiodic measurement, plant hormones, endogenous rhythms, winter dormancy, and temperature and daylength control of vegetative growth and reproductive development in a number of plant species. By adopting the terms 'primary' and 'secondary' induction, Prof. Heide's lifetime research has paved the road for our present detailed understanding of temperature and daylength control of flowering, and thus seed set, in most of the commercially available temperate grasses. He has spent several sabbaticals abroad, most of them working with Lloyd Evans and Rodney King at CSIRO, Australia. Prof. Heide has published about 150 original papers in peer-reviewed journals and a number of reviews and book chapters. Although now formally retired, he is still active, both on his own research projects, as a consultant for other scientist, and as a highly valued speaker at national and international meetings and conferences.

Odd Arne Rognli:

Biodiversity, GMOs and the role of seed yield capaciaty in herbage breeding programs.

Odd Arne Rognli graduated from the Agricultural University of Norway (presently: The Norwegian University of Life Sciences, UMB) in 1979 with a M.Sc. in plant breeding and genetics. In 1985 he received a Ph.D. from the same university, both of his theses dealing with ecotypical variation and seed production in smooth-stalked meadow grass (*Poa pratensis*) and timothy (*Phleum pratensis*). After having worked mostly with conventional population genetics and breeding methods, Dr. Rognli spent sabbaticals at the John Innes centre in England, working with genetic mapping, marker-assisted selection, gene flow and the potential consequences of an introduction of transgenic grasses. Working mostly with the *Lolium/Festuca* genome, he has also specialized in genetic mapping of reproductive traits and how to use these maps in the selection for seed yield capacity. Dr. Rognli keeps a high profile in the political debate on GMOs, and is currently the leader for UMB's research team on population genetics, biodiversity and plant molecular biology.

Ole Bech Bondesen:

Seed production and seed trade in a globalized world.

Ole Bech Bondesen is – until 31 December this year – the head of the secretariat of The Danish Seed Council, which was formed in 1973. The objective of The Danish Seed Council is to represent the common interests of the Danish seed growers and the seed trade to the national and international authorities.
Ole Bondesen is trained as an agronomist, and this scientific background combined with many years experience from the council, he often has prepared the detailed reports, which later on was found to have a major influence on the negotiations between the seed industry and national and international authorities (EU). The seed council also plans and coordinates the seed industry's involvement in research and development activities on seed production, and the secretariat collects information on seed production and market development. In this respect Ole Bondesen has attained numerous workshops and conferences – often as an invited speaker – and these visits have been combined with meetings with local authorities and colleagues in order to gather information. Each year the secretariat provides a report with numerous statistics on all aspects of seed production and market development – on a national and international level.

Dr. John Miles:

Breeding and seed production of tropical/warm season species.

Dr. John Miles is a forage breeder with International Center for Tropical Agriculture and works in the group of Agrobiodiversity.

In the mid 1980's, Dr. John Miles started a breeding program at CIAT in Colombia to try to develop apomictic hybrid Brachiarias that were resistant to spittle bug but also capable of producing high yields of good quality feed. The first two hybrids introduced to Southeast Asia by CIAT were part of a four-year Brachiaria variety trial in Thailand commencing in 1996. The Thai Department of Livestock Development (DLD) was looking for alternatives to B. *ruziziensis* for dairy production in the seasonally wet-dry climates and moderate-fertility soils of northeast Thailand. Of the 49 numbered accessions, subsequently renamed Mulato) was the most promising. The potential of Mulato for South East Asia is the vigorous growth, relatively good quality feed and excellent dry season productivity.
DLD, Faculty of Agriculture, Ubon Ratchathani University, conducted seed production trials with 7 farmers in 2003 with average yields of about 100 kg ha^{-1} – and as you can read in this issue of the ISHG newsletter - this production has now developed seed yields in the rage of 200-500 kg ha^{-1} and a commercial seed multiplication is established (please visit the paper by Michael Hare).

Applied Research leads to successful export seed production of South American forages in Ubon Ratchathani province, Thailand

M. D. Hare

Introduction

In 1995, the Faculty of Agriculture, Ubon Ratchathani University, received research funding from the Thailand Research Fund (TRF) to study improved forages for dairy cows in Thailand. Following 10 years of continuous research, three forage species from South America, Ubon paspalum, Ubon stylo and Mulato II, have been found to be suitable to grow in Northeast Thailand. A village seed production programme was initiated to produce seed for farmers in Thailand and recently a seed export market has developed with seed being sold back to Central and South America, the place of origin of these new forages.

Research and development of the forages to reach commercial export seed production followed a clear long-term plan set out by the research project team in the Faculty of Agriculture.

- Field research on applied agronomic management and seed technology.
- Pilot project feasibility studies.
- Selection and training of farmers in seed crop management, harvesting and cleaning.
- Providing technical support to seed growers.
- Contracting farmers to buy the seed at a guaranteed price and being the main buyer of seed.
- Processing, storing and marketing the forage seeds.
- Creating markets for forage seeds.

Origin of the three forage species

Ubon paspalum (*Paspalum atratum*) is a wild species native to the states of Mato Grosso do Sul, Goias and Minas Geriais in central-western Brazil (Quarin *et al.*, 1997). An accession of this wild species, BRA 009610, was originally collected near the village of Terenos, Mato Grosso do Sul State, Brazil, by Dr. J. Valls in April 1986 (J. Valls pers. com.). In November 1994, Ubon Ratchathani University received 100 grams of BRA 009610 from Dr. Werner Stur of the Forages for Smallholders Project based at IRRI, Philippines (a project funded by AustAid and managed by CSIRO (Australia) and CIAT (Colombia)). Fifty grams of this seed were used for the initial evaluation research (Hare *et al.*, 1999a) and the other 50 grams were used for seed multiplication (Hare *et al.*, 2001a).

Following 3 years of evaluation work in Northeast Thailand, *P. atratum* was consistently found to be the best grass on seasonally wet-seasonally dry soils and in 1997 it was released for forage use by Ubon Ratchathani University as cultivar Ubon (Hare *et al.*, 1999a).

Ubon stylo (*Stylosanthes guianensis* var. *vulgaris* x var. *pauciflora*) is a blend of four lines (GC 1463, GC 1480, GC 1517, and GC 1579) derived from *S. guianensis* var. *vulgaris* x var. *pauciflora* by selection for long-term resistance to anthracnose by Dr Bela Grof at the Embrapa Beef Cattle Research Centre, Campo Grande, Brazil in the 1990s (Grof, *et al.* 2001). Seeds of these four lines were physically mixed in order to create greater genetic diversity for durable resistance to anthracnose. Three of the components (GC 1463, GC 1517 and GC 1579) are single-plant selections made in the Philippines by Dr Grof from the hybrid population CIAT 11833 which was selected in the Colombian Llanos by Dr John Miles at CIAT. The fourth component (GC 1480) is from accession CIAT 2340, which originates from the Casanare region of Colombia. Selection for anthracnose resistance was carried out in the Philippines and in regional trials conducted in Brazil.

In November 1999, we received from Dr Bela Grof 20 grams of seed. We grew 2622 seedlings which we planted into a 510 m^2 area on the university farm in May 2000. Twenty-six kgs of seed were harvested from this area in February 2001. We used this seed for dairy trials, where we found that dairy cows grazing Ubon stylo produced high milk yields without any extra feeding of concentrates (Thummasaeng *et al.* 2004).

The *S. guianensis* var. *vulgaris* x var. *pauciflora* blend has been registered in Australia as ATF 3308 and released as cultivar Nina in 2003 (Cook *et al.* 2005). However, in Thailand, farmers growing seed and forage call it “Ubon stylo” and so we have continued to use this name since releasing it in 2002.

We used this seed for dairy grazing trials, where we found that dairy cows grazing Ubon stylo produced high milk yields without any extra feeding of concentrates (Thummasaeng *et al.*, 2004). In small plot trials, Ubon stylo produced significantly more dry matter than hamata stylo, the commonly grown stylo in Thailand. Following 3 years research at the university we found Ubon stylo to be the best stylo legume on upland soils. It produced equal dry matter yields to Tha Phra stylo but because of its greater resistance to anthracnose, greater palatability, rapid seed germination and high seed yields (Table 1), we decided to produce more seed in our village farmer seed production programme.

Faculty of Agriculture, Ubon Ratchathani University, Ubon Ratchathani 34190, Thailand.

Table 1. Effect of cultivar on seed yields and seed weight of stylo.

Cultivar	Seed yield (kg/ha)[1]	TSW (g)[1]
Ubon stylo	958.6	2.50
Tha Phra stylo	365.0	2.59
LSD (P<0.05)	425.0	0.06

[1] Corrected to 10% seed moisture content

Mulato II (*Brachiaria ruzizensis* x *B. decumbens* x *B. brizantha*) is a tetraploid, interspecific hybrid bred at CIAT, Colombia. The International Center for Tropical Agriculture [Centro Internacional de Agricultura Tropical (CIAT)] in Cali, Colombia, began its *Brachiaria* breeding programmes 18 years ago to attempt to increase resistance to spittlebugs (Hemiptera: Cercopidae) (Miles *et al*. 2006) and improve nutritive quality and dry matter production of *Brachiaria* spp. through interspecific hybridisation and selection. The major achievements of the programme have been stable tetraploid sexual germplasm (Miles *et al*. 2004) and the release of two brachiaria hybrid cultivars, Mulato and Mulato II. After extensive selection in field trials throughout the 1990s, cv. Mulato (*B. ruziziensis* x *B. brizantha*), the first interspecific *Brachiaria* hybrid was released in 2000 through Grupo Papalotla, a Mexican seed company.

A second hybrid cultivar, Mulato II (*B. ruziziensis* x *B. decumbens* x *B. brizantha*), was developed from an original *B. ruziziensis* x *B. decumbens* cross followed by 2 generations of hybridisation by exposure to *B. brizantha* pollen in the field and released by Grupo Papalotla in 2004. In trials in Central and South America, Mulato II produced more dry season forage and had better milk production over time than Mulato and other *Brachiaria* cultivars (CIAT 2004). It also produced more seed than Mulato.

Like conventional cultivars of *B. decumbens* and *B. brizantha*, both hybrids are apomicts (reproduce asexually by seed), and hence are true-breeding (Miles *et al*. 2004 and J.W. Miles, personal communication, 2006).

In 2003, Grupo Papalotla made the business decision to come to Thailand to produce brachiaria hybrid seed. The decision to produce seed in Thailand was because of forage seed quality, smallholder experience and professionalism and public sector involvement in forage seed production (Hare and Horne 2004). Grupo Papalotla also wanted to break into the Asian market for forage seed. In addition, there was an expectation that seed yields of brachiaria hybrids may be higher in Thailand, because of intensive agronomic management and hand harvesting of seed from small fields, than in Brazil and Mexico under extensive management and machine of sweeping seed from the ground from large fields. Low seed yields in Brazil and Mexico (less than 200 kg/ha) meant that the price of brachiaria hybrids seeds was 3-4 times higher than that of seeds of other commercial *Brachiaria* spp. in Latin America.

Forage seed research and development

Ubon paspalum

A series of problem solving research studies were undertaken on method of sowing, time of planting, closing date, methods of hand harvesting seed and juvenility and long-short day requirement for flowering (Hare et al. 1999b; 2001a; 2001b).

Ubon stylo

Studies on closing date from that cutting Ubon stylo seed crops in September produced significantly more seed than cutting in October and 50% more seed than the control plots. (Table 2).

Table 2. Effect of closing on Ubon stylo seed yields and seed weight

Time of closing	Seed yield (kg/ha)[1]	TSW (g)[1]
Control	844	2.52
September	1294	2.46
October	725	2.43
LSD (P<0.05)	513	0.078

[1] Corrected to 10% moisture content.

Mulato II

High seed yields of Mulato II are extremely difficult to achieve because all the new hybrid brachiarias appear to have very low seed set of between 2-10%. They produce a lot of seed but most of this seed is either light or empty. This apparently is a genetic factor and it is difficult to overcome by agronomic management techniques.

Field trials commenced at Ubon Ratchathani University, Thailand, in 2003 to investigate agronomic management of brachiaria hybrids in order to increase seed yields. A series of trials studied the effects of method and time of planting (Hare *et al*. 2007a), closing date defoliation (Hare *et al*. 2007b) and harvesting methods (Hare *et al*. 2007c) on seed production of cvv. Mulato and Mulato II.

The method of placing nylon bags over the seed heads to collect seed produced the highest seed yield (Table 3). The nylon bag yield was significantly higher than the second best method of twice daily knocking (88% more). The South American method of ground sweeping fallen seed appears not suitable for Thailand.

Ubon stylo

At seed harvest, the farmers allow nearly all the seed to fall to the ground and then beat any remaining seed out of the seed heads with sticks. The vegetation is cut to ground level and removed. Seed is swept from the ground and cleaned by the farmers in the field In February each year, the project purchases the seed in the village and pays out cash the same day. The seed is then scarified through a rice thresher at the university to remove soil and seed coats to improve seed purity and seed germination.

Farmers produce more than 900 kg/ha of seed each year. Seed harvesting is a dirty and dusty job as the seed has to be swept from the ground and cleaned through screens in the field. However, with the high seed yields, the farmers find Ubon stylo seed production to be a lucrative cash crop (Table 5).

Table 3 Effect of harvesting method on Mulato II seed yields and seed viability

Harvest method	Seed yield*(kg/ha)	TSW*(g)	Seed viability(%)
Knocking once daily	230.2	8.79	92.0
Knocking twice daily	271.2	8,68	92.0
Knocking every 2 days	254.6	8.94	89.3
Nylon bag	509.4	9.03	90.5
Swept from ground	87.3	8.20	84.0
LSD P<0.05	73.2	0.38	5.8

* corrected to 10% seed moisture content

Table 4. Ubon paspalum village seed production.

Year	No of farmers	Quota per farmer (kgs)	Amount of seed (kgs)	Amount of money paid (baht)
2003	22	250	5,500	440,000
2004	22	100	2,200	176,000
2005	42	110	4,620	369,600
2006	30	220	6,600[1]	528,000[1]

[1] Estimated targets for 2006

Table 5. Ubon stylo village seed production

Year	No of farmers	Amount of seed produced(kgs)	Amount of money paid (baht)	Amount of seed exported(kg)
2003	4	541	54,100	-
2004	2	651	65,100	-
2005	10	2,070	207,00	1,800
2006	15	5,590	559,000	4,000
2007[1]	30[1]	7,500[1]	750,000[1]	4,000[1]

[1] Estimated targets for 2007

Smallholder farmer seed production

Ubon paspalum

Since 2003, a total of 12,320 kgs of seed have been produced and 985,600 baht paid in cash to the farmers in Bark Kud Waay village (Table 4).

Seed is harvested by tying seed heads and knocking the seed out into bamboo trays.

1,800 kgs and 4000 kgs of Ubon stylo seed were exported in 2005 and 2006, respectively to Grupo Papalotla, Miami, USA. Grupo Papalotla then sold this seed in 10 countries in Central and South America.

Mulato II

A Memorandum of Understanding was signed on April 27, 2004 between the Faculty of Agriculture, Ubon Ratchathani University and a Mexican seed company, Grupo Papalotla, to produce seed of Mulato II in villages in Northeast Thailand for export to Central and South America.

Smallholder village farmers sign contracts with the project at the beginning of each wet season to produce and sell all Mulato II seed harvested. Each farmer receives a seed production brochure and 0.5 kg of seed to plant a seed nursery. The farmers transplant seedlings into cultivated fields in May and June each wet season, in rows 1 m x 50 cm apart.

At seed harvest, the farmers tie the seed heads into living sheaves and knock the seed out in trays every day. Seed is dried slowly in the shade for 3 days and then sun-dried for 1-2 days before cleaning.

In 2004 and 2005, respectively, 2,070 kgs and 1292 kgs of high quality seed (7.3 % moisture, 99.9 % purity and 83 % viability TZ test) were produced by farmers in one village. 1,500 kgs and 1,000 kgs respectively, were exported in 2005 and 2006 to Grupo Papalotla, Miami, USA.

400 village farmers in Ubon Ratchathani and Amnart Charoen signed contracts to produce Mulato II seed this year. The project target is 15,000 kgs in 2006.

If this pilot project lives up to expectations, Grupo Papalotla expects to produce up to 1000 tones of Mulato II seed annually in Thailand. The major markets will initially be in Mexico and Brazil followed by other countries in Central and South America, but the company also intends to develop a seed market in Asia. A small market will develop in Thailand (perhaps 100 tones per year), with Mulato II replacing other species because of its superior dry matter production, particularly in the dry season.

Conclusion

Our focus at Ubon Ratchathani University is primarily research and so we have limited our seed production to what we believe we can sell annually. The forage research team is endeavouring to provide a real and sustainable market for the three forages, that does not depend on government funding. The joint venture with the Mexican seed company will further decrease our reliance on public sector funding. We have set up a revolving fund that pays the farmers promptly on the day of seed purchase and employs staff to carry out research and development work.

The development of Ubon paspalum from being a wild native plant in Brazil to a commercial forage in Thailand has been rapid. It only took a little over 10 years for this wild accession to become a proven forage crop in Thailand, which shows the potential impact forage germplasm collection can have on the future agriculture needs of mankind. Ubon stylo and Mulato II were developed through breeding programmes in South America and within 5 years of their release they have proven to be exciting new forages for Northeast Thailand.

The applied research and subsequent development of the three South American forages at Ubon Ratchathani University was achieved intially through personal contacts between scientists and then the trust that a commercial overseas private seed company placed in our research programme at Ubon Ratchathani University to deliver seed in large quantities for export.

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EConomical Optimal Nitrogen (ECO-N) application rate in herbage grass seed production

René Gislum[1] and Phil Rolston[2]

From a practical herbage seed growers point of view the application of nitrogen (N) has the purpose to increase the seed yield and maximise economical profit. Most results with N and seed yield has focused on maximising the seed yield. As a result of increased prices of N, increased focus on production that minimises the negative impacts on the environment and an increased awareness of the growers to maximise their profit, focus is now on defining Economical Optimal N (ECO-N) application rates. Important issues are how to handle more than one application of N when ECO-N is calculated and how ECO-N is affected by fluctuating prices of the harvested seeds and N.

Nearly all Danish experimental results in grass for seed production have a quadratic relationship between N application rate and seed yield. In New Zealand trials during the 1990's a linear relationship used to be common, but lately both quadratic and flat relationship have been experienced. Results from Oregon shows a linear increase until maximum where after there is a flat response curve for some of the results (J. Hart, pers. comm.). For the flat response curve it is easy to define ECO-N as it is equivalent to the lowest application rate used in the experiment. For the quadratic and linear-flat relationship it is possible to calculate the ECO-N. In both cases the ECO-N will be lower than the N application rate that would give maximum seed yield as a result of the diminishing return response towards the point of inflexion.

In cases with more than one application time of N e.g. in red fescue and tall fescue seed production in Denmark or e.g. perennial ryegrass or Italian ryegrass seed production in New Zealand there is usually an interaction between the two or more applications. This means that the effect of one of the applications is dependent on the other applications. An example could be the interaction between autumn and spring N application in Danish red fescue seed production. The purpose of autumn N application is to establish a high potential seed yield by increasing the number of tillers whereas the purpose of spring N application is to secure a high utilisation of the potential seed yield. If either the autumn or the spring N application rate is below optimum the final seed yield will also be lower than optimum. In this case it is very important that ECO-N in the autumn and in the spring are calculated separately.

In Denmark a database with earlier and present experimental results carried out at the Danish Institute of Agricultural Sciences has been established. The purpose of this was to draw conclusions on the basis of several experiments and investigate different interactions. This database has also been used in calculations of ECO-N under Danish growing conditions. In New Zealand results from field experiments from 2004/05 until present has been used to calculate ECO-N.

The use of applied N rates and seed yield to calculate ECO-N is the simplified method. Several other factors such as water, other nutrients, cover crop and climate have an effect on the response curve. This is best illustrated by plotting the applied N rates against seed yield for the Danish and New Zealand results (figure 1). The variation in seed yield within the same N application rate is enormous. This variation will naturally raise the question if it is possible to calculate a general or national ECO-N. There is no doubt that ECO-N calculated for each cultivar, soil type, climate conditions etc. would be more valuable for the grower, but this would request an unrealistic large amount of experiments. The idea behind a more general ECO-N is that the grower could use it as a guideline to decide the N application rate. However, it is important that the grower adjusts ECO-N to the specific cultivar, soil type etc. An example is the difference in N accumulation between diploid and tetraploid perennial ryegrass. Most of the Danish data material consists of results from diploid perennial ryegrass. With a tetraploid type it would be advisable to increase the N application level above ECO-N. The reason is the higher biomass production and thereby a higher N accumulation of tetraploid types compared to diploid types.

The economical profit for the growers depends on the price of seeds and N. The question is "does ECO-N depends on the price of seeds and N". Calculations of ECO-N in both the Danish and New Zealand experiments shows that ECO-N is not affected by fluctuation prices of the seeds and N, if the fluctuations are within reasonable market value. However, the final economical profit for the grower is affected. The reason for the limited effect on the ECO-N is again an effect of the diminishing return response close to the point of inflexion.

The future work on ECO-N should include more parameters in the model and to test the possibilities to use a model that is not symmetrical. But it is without doubt that the work will continue. Growers need to increase their economical profit and a correct N application strategy is one method to do that.

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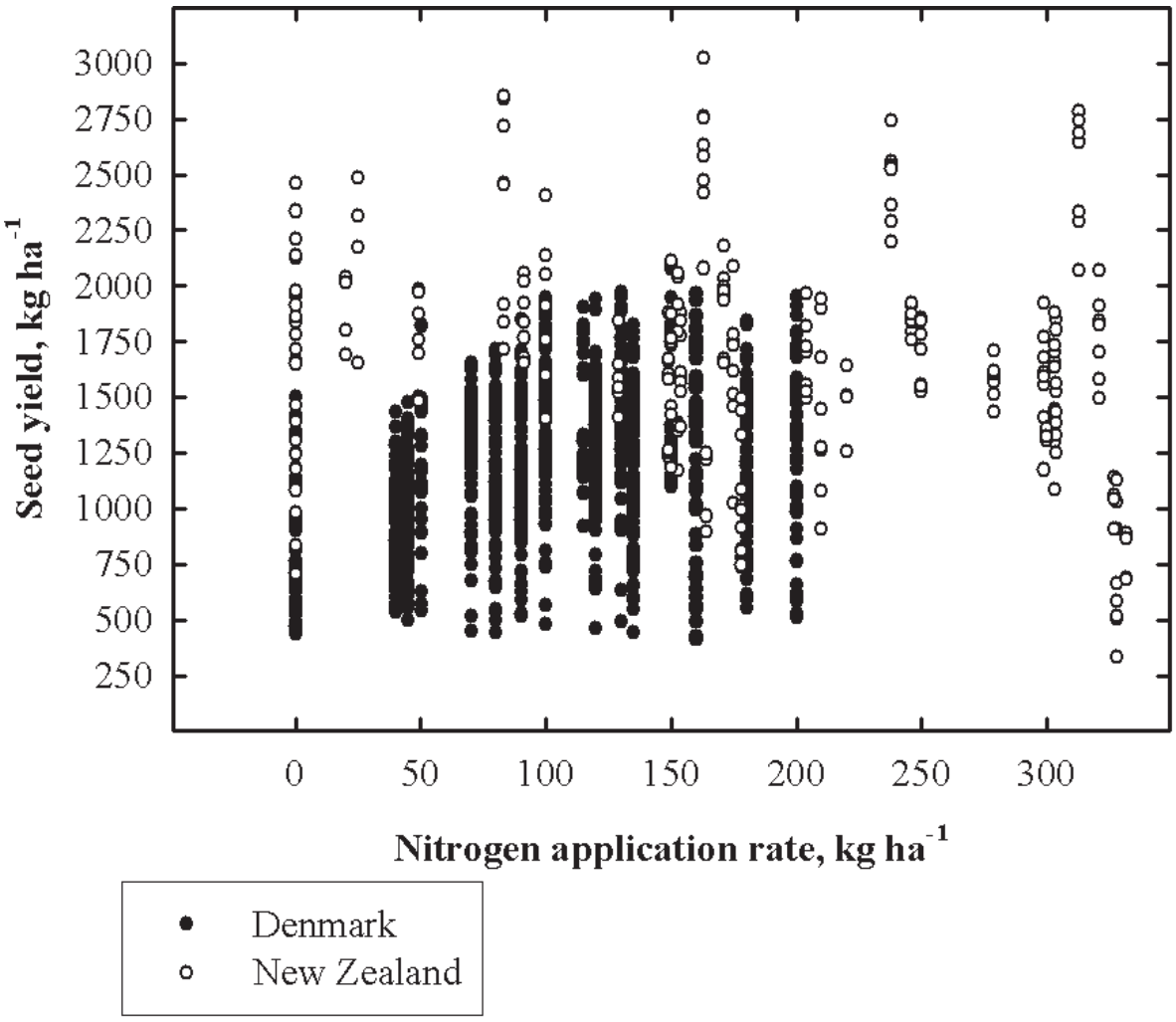

Figure 1. Nitrogen application rate (kg ha^{-1}) plotted against seed yield (kg ha^{-1}) in Danish (closed circles) and New Zealand (open circles) experiments. Results are from perennial ryegrass field experiments and consist of different cultivars, locations and years.

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Conference News

5th International Symposium on the Molecular Breeding of Forage and Turf

Dear Colleagues,
It is a great pleasure to announce that the 5th International Symposium on the Molecular Breeding of Forage and Turf (MBFT) will be held in Sapporo, Hokkaido, Japan during 1st - 6th July 2007. 0Previous MBFT Symposia were held in Japan in 1998, Australia in 2000, the USA in 2003 and the UK in 2005.

Grassland produces feed for livestock, maintains soil fertility, protects and conserves soil and water resources, creates a habitat for wildlife, and provides recreational spaces for sport and leisure while contributing to the general benefits at the same time as maintaining sustainable economic outputs. Turf species contribute considerably to our environment by adding beauty to surroundings, providing a safe playing surface for sports and recreation, and preventing erosion. In addition to food and environment, bio-energy is global concerns. Renewable biomass energy is increasingly being accepted as a possible alternative to fossil fuels and some forages are promising for energy crop.
Breeding programs in forages have produced improvements in both forage yield and quality. Forage and turf in the future must utilize resources (nutrients and water) more efficiently and must also confer measurable benefits in terms of environmental quality and renewable energy. With a widening range of traits, techniques for more accurate, rapid and non-invasive phenotyping and genotyping become increasingly important. The large amounts of data involved require good bioinfomatics support. Data of various kinds must be integrated from an increasingly wide range of sources such as genetic resources and mapping information for plant populations through to the transcriptome and metabolome of individual tissues. The merging of data from disparate sources and multivariate data-mining across datasets can reveal novel information concerning the biology of complex.
The objective of this symposium is to deliberate on issues relating to molecular breeding technologies of forage and turf including assessment of genetic diversity, discovery of novel genes involved target characters, genetic mapping, establishment of molecular marker assisted selection, comparative genomics, bioinformatics, transgenic, and risk assessment.
Hokkaido located in the northernmost area of Japan has about 70% of the grassland in Japan, and grassland farming in Hokkaido is very important for its agriculture. Sapporo is one of Japan's major cities with a population of 1.88 million and plays a central role in the transportation, administration and economy of Hokkaido. Sapporo is a popular tourist spot. Summer is a season with clear blue skies and an abundance of refreshing greenery.
We cordially invite you and your colleagues for MBFT Symposium to be held in Sapporo. The venue for the symposium is newly built Sapporo Convention Center. Conference facilities are fully equipped with the latest in services and technology.
We are looking forward to meet you and your colleagues to deliberate on molecular breeding of forage and turf.
Toshihiko Yamada
Toshinori Komatsu
Chairs, Local Organizing Committee
Details at http://www.knt.co.jp/ec/2007/mbft/

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VIII International Rangeland Congress will be held in Hohhot, Inner Mongolia, China 29 June 2008.

Details at www.rangelandcongress.com

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'Plant Breeding for organic and low-input farming systems:dealing with genotype-environment interaction'
The Eucarpia Working Group Organic Plant Breeding will hold a conference in Wageningen, netherlands on November 7-9, 2007, on Plant Breeding for organic and low-input farmingsystems with special emphasis on how to deal with genotype-environment interaction. There will be a call for papers and posters. Details can be found on the Eucarpia www.eucarpia.org and ECO-PB www.ECO-PB.org websites.

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