Danish Research Centre for Organic Farming

Midterm Status Report 2003 and Application for Continuation in 2004

For research projects financed by grants from
The Directorate for Food, Fisheries and Agro Business
under the Danish Ministry of Food, Agriculture and Fisheries

1. Research program

Research in organic farming 2000-2005 (DARCOF II)

2. Project title and number

I.11: CLOver and Grass Seed – production of high quality organic seed for forage mixtures (CLOGS)

3. Head of project

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6. Project period (month, year)

Start of project: 1 June 2000
End of project: 31 December 2004

7. Midterm description of the project, its results and progress, and application for continuation in 2004

A. Project summary

From January 2004 only organically produced seed can be used in organic farming systems within the EU. Optimal forage production relies on the access to improved cultivars of high quality clover and grass seed for forage mixtures. Currently the supply of organic forage seed in Europe is scarce. In Denmark a production of one of the main constituents of forage mixtures, perennial ryegrass (*Lolium perenne* L.) is established, however, another main constituent, white clover (*Trifolium repens* L.) is still in request.

This project has identified the main obstacles in the production of organic seed for high quality forage mixtures and investigations to improve management techniques are established or are under establishment. The main obstacles in organic clover seed production are pests (clover seed weevil); however, other management techniques (establishment, plant density, weeds, harvest) are also identified to influence seed yield. The main obstacles in organic grass seed production is the demand for increasing the proportion of organic feed in animal production leading to limited 'room' for seed production in organic crop rotations on organic husbandry farms. At organic arable farms an adequate nutrient supply (no access to animal manure) is the main obstacle in grass seed production. Common for organic grass seed production on arable and husbandry farms is an increasing infestation with weeds.

To optimise production (quality and yield) research is carried out to provide guidelines for organic growers on how to optimise establishment techniques, increase nutrient utilisation, minimise pest damages and utilise excessive clover and grass growth as forage. A substantial part of the project is implementation of the results, which will be achieved by a number of demonstration trials. Demonstration trials are established at Research Centre Flakkebjerg and others will be established in farmer fields during 2003 – 2004. Focus for these trials will be a rapid dissemination of results, which will support the incorporation of seed crops in organic crop rotations. In winter 2000/2001 Research Centre Flakkebjerg organised a workshop for organic seed growers and advisers with a high attendance. In early spring 2003 a small workshop for organic white clover producers were held.

Due to favourable climatic conditions, long tradition, and expertise in the specialised seed production it is expected that Danish seed growers will be able to supply a considerable proportion of the total organic production of clover and

grass seed in Europe. At present organic seed of perennial ryegrass and Italian ryegrass are available for export.

Table A.1: Work package list (from application)

No.	Work package title	Participants*	Budget (1.000 DKr)	Start	End	Deliverable No:
1	Main obstacles – organic grass, clover and legume seed production	VL, BR	280	2000	2004	D1, D2, D3, D4
2	Crop establishment techniques – row cultivation	BB, LD	800	2001	2004	D5, D6, D7, D8
3	Mixed cropping – utilisation of by-products	BB, RG, FVL	1.120	2001	2004	D9, D10, D11, D12
4	Pests – alternative cropping techniques to minimise damage in clover	LMH	1.120	2000	2004	D13, D14, D15, D16
5	Optimisation of crop rotation - incorporating seed crops	BB	430	2000	2004	D17, D18, D19

* Responsible participants are underlined

B. Objectives and expected achievements

The objective is to develop and optimise cultivation and management techniques to increase the production of high quality clover and grass seed for forage mixtures.

The project focuses on the species / cultivars that are important constituents of forage mixtures, but which are not yet organically produced, i.e. white and red clover, timothy, meadow fescue, cocksfoot and smooth stalked meadow grass.

The expected achievements are to provide guidelines for organic growers on how to optimise establishment techniques, increase nutrient utilisation, minimise pest damages and utilise excessive clover and grass growth as forage. A substantial part of the project is implementation of the results, which will be achieved by a number of demonstration trials in farmer fields or in the organic crop rotation at Research Centre Flakkebjerg (WP 2). Focus for these trials will be a rapid dissemination of results, which will support the incorporation of seed crops in organic crop rotations.

Due to favourable climatic conditions, long tradition, and expertise in the specialised seed production it is expected that Danish seed growers will be able to supply a considerable proportion of the total organic production of clover and grass seed in Europe. By that they will contribute to the solution of EU regulation 2092/91 which states that as from 1 January 2004 only organically produced seed can be used in organic farming systems.

C. Midterm results and progress

C.1 Description (summary) of main results and conclusions

WP1

Work package 1 focus on the identification of obstacles in organic forage seed production and the objectives are to

- identify grass species / cultivars which are important constituents of high quality grass / clover seed mixtures but in which no organic seed production has been established
- identify factors determining the density of clover seed weevils in organic clover fields
- identify whether low clover seed yields are directly correlated to high clover weevil density or whether certain specific cultivation techniques may compensate for high weevil density and therefore reduce crop damage.
- Determine the potential for organic seed production of relevant green manure / catch crops in Denmark

When the project was initiated timothy, meadow fescue, red fescue, smooth stalked meadow grass and rough stalked meadow grass were grass species in request in organic forage seed mixtures. Among these smooth stalked meadow grass was considered to be the most difficult in organic production, due to a very slow establishment and hence poor competition against weeds. In spring 2002 and 2003 the supply of organic seed of meadow fescue and red fescue were sufficient for the home-market demand. Timothy is still in request, and smooth stalked meadow grass is still posing difficulties to the organic seed producers. Establishment techniques for smooth stalked meadow grass are now under examination at Research Centre Flakkebjerg. No obstacles are identified for organic timothy seed production and it is expected that the seed industry will be able to increase organic seed production in this species according to the request.

White clover is another species in request in high-quality organic forage seed mixtures. Organic production has been under establishment for approximately 6 years, however seed yield in organic production is only 25% of the average yield in conventional production. Clover seed weevils are identified to reduce seed yield in conventional production and since chemical insecticides has been developed the pest has been controlled. However, no information has been available on the exact yield reduction caused by this pest in organic clover seed fields. Registrations in organic clover seed fields have shown that

- weevils in white clover are found in all organic white clover fields, with the highest densities in traditional seed producing areas. Mean density was 10,3, ranging from 9 to 29 weevils per flower head
- in white clover dissection of flowers revealed that weevil larvae damage 12 – 77% of the seed pods with a mean of 33%. Available data from the previous years on density and damage are of the same magnitude: 9,6 weevils per head resulting in a mean reduction of 26% of the seed pods
- in contrast to white clover, weevil free fields with red clover seed are found in regions with no tradition for seed production. Mean weevil density is lower in red clover ranging from 0,2 to 6,5 weevils per head
- in white clover, un-pollinated flowers amount to approx. 10% (range 2 to 18%) of the total flowers in a head
- yield in white clover do not correlate well with the seed yield in fields harvested under sub-optimal conditions. Our data suggests that harvest loss may constitute a yield-reducing factor of the same magnitude as weevil damage in these fields.

A number of green manure and catch crops are used on organic farming; however, only in few of these organic seed is available. Some of the species have been grown for seed in conventional farming systems, but there are also some, that has never been evaluated for seed production in Denmark. Among these chicory and alfalfa have been screened in 2002 and 2003. Yields from 2002 are very encouraging. Seed yield in alfalfa was 551 kg/ha, and yield in chicory was 538 kg/ha. Kidney vetch is reported to be a promising green manure crop and therefore this species was included in the trial. Seed yield in kidney vetch was 696 kg ha^{-1} in 2002.

WP2.

In work package 2 establishment techniques are examined with regards to row cultivation, since this cropping system allow for mechanical weed control. The objectives are to

- Determine optimal combination of row distance and seed rate in two types of a grass species, which is representative of a number of species used for forage.
- Investigate the possibilities for in row fertilisation with organic manure and evaluate the effect of reduced nitrogen rates in grass seed crops.
- Develop establishment techniques, which allow for mechanical weed control between rows in perennial grass species with rhizomes.

- Examine the effect of row cultivation in clover intercropped with repellent plants or plants which attract parasitoids to the clover seed weevil (wp4).

In two types of Festulolium (one type assembling the fast growing, Italian ryegrass and another type assembling the slow growing, tall fescue) three row distances and three seed rates have been evaluated in three successive experimental years (2000 – 2002). The statistical analysis show that in the slow establishing type 12 cm row distance and highest seed rate (16 kg ha^{-1}) performed the highest seed yields, whereas in the fast growing type the three tested row distances (12, 24 and 36 cm) had no influence on seed yield, however, the lowest seed rate (8 kg ha^{-1}) resulted in lower yields.

In row fertilisation with degassed slurry has been performed in one grass species (2000 – 2002) and compared to liquid and granulated artificial fertilizer. Nitrogen has been applied in spring, and in rates between 60 and 100 kg N ha^{-1}. In average of 2000 – 2001 application of slurry decreased seed yield, however, the application has in both years been performed later than the artificial fertiliser in the control plot. In-row fertilisation did not increase seed yield, and in general the different nitrogen application strategies did not have any effect on seed yield. Investigations on green vegetative biomass were performed using remote sensing. The results show that in-row fertilisation did not enhance biomass development in spring. Using slurry as nitrogen source decreased biomass development, however, approximately one month after application biomass development was comparable to other nitrogen sources.

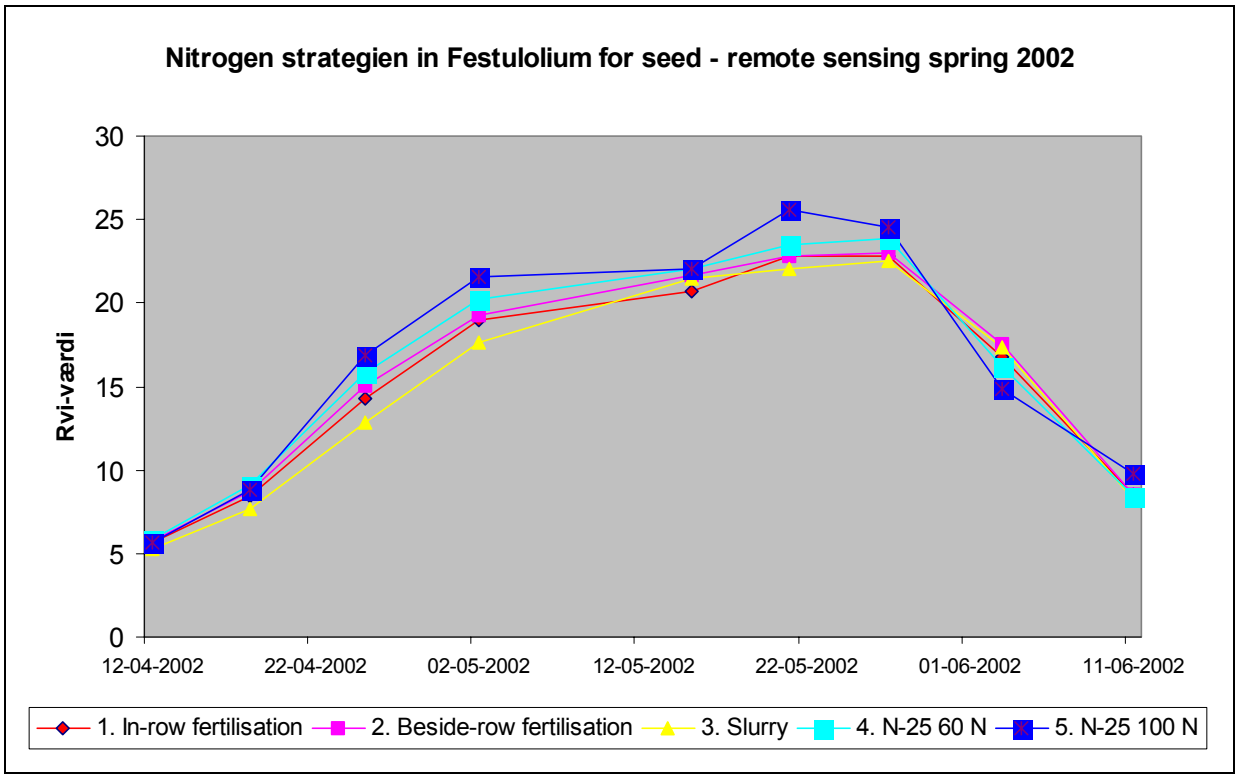

Figure 2. Development of green vegetative biomass in Festulolium for seed. Five different nitrogen application strategies are applied. Treatments 1-4 have a total of 60 kg N ha^{-1} and treatment 5 has a total of 100 kg N ha^{-1}.

Smooth stalked meadow grass has been established at 12 and 24 cm row distance (2000 – 2002), at two seed rates and in two cover crops (field pea and Persian clover). This investigation focus on the ability of the crop to compete weeds, and in first year fields there were many weeds. First year seed yields (2001) have been low, and the infestation with weeds was very high. Post-harvest treatment was burning of straw, which seems to have reduced the number of weeds considerably. Second year seed yields were increased to 600 kg ha^{-1}, and the seed crops were almost completely free of weeds due to the post-harvest treatment. In 2003 a first year seed field has been harvested, however, there were many, many weeds in the research facility. Again straw was burned and besides the trial has been inspected and thistles are removed by handweeding. Second seed harvest will be performed in 2004.

In three experimental years (2000-2002) four herb species have been grown in seed production fields of white clover. The herbs do not influence the growth and seed yield of white clover; however, the growth of the herbs has been reduced by white clover. No variation in the number of clover seed weevils according to bicrops was recorded.

WP3.

Work package 3 focus on mixed cropping between grass seed crops and green manure or clover crops and additionally the potential for utilisation of by-products for forage are analysed. The objectives are to

- Evaluate green manure crops as nutrient sources in grass seed crops. Nutrient availability and timing is essential in obtaining high yields in grasses for seed production.
- Examine a cropping system where grass and clover for seed production is grown in the same field. The system will be evaluated both for seed yield and for utilisation of by-products for forage.
- Evaluate the possibilities of growing other plant species in seed fields of clover (WP4).
- Explore the possibility that grazing sheep can substitute mechanical defoliation in grasses and clover and thereby trim the seed crop and utilise by-products.

The intercropping system with seven green manure plant species was replicated in the growing season 2001-2002. The only difference was the replacement of Alsike clover by Kidney vetch. Even though the average seed yield in 2002 was lower than in 2000 the results were interesting (Figure 1). The increase in seed yield by increase of the amount of manure applied (0-100N) was similar for the two years, which indicate that the amount of available nitrogen is important for the seed production of perennial ryegrass. In addition to that, the effect of the different green manure plant species on seed yield of perennial ryegrass was similar in the two years. In both years intercropping with Bird's trefoil compared to the other green manure plant species resulted in the greatest seed yield of perennial ryegrass. The use of Kidney vetch as green manure in 2001-2002 is furthermore promising for future use.

The trial was carried out in 2003, however, the harvested plots are not cleaned yet. Due to a poor establishment of green manure crops in 2001/2002 the trial is replicated for the fourth experimental year – with a seed harvest in 2004.

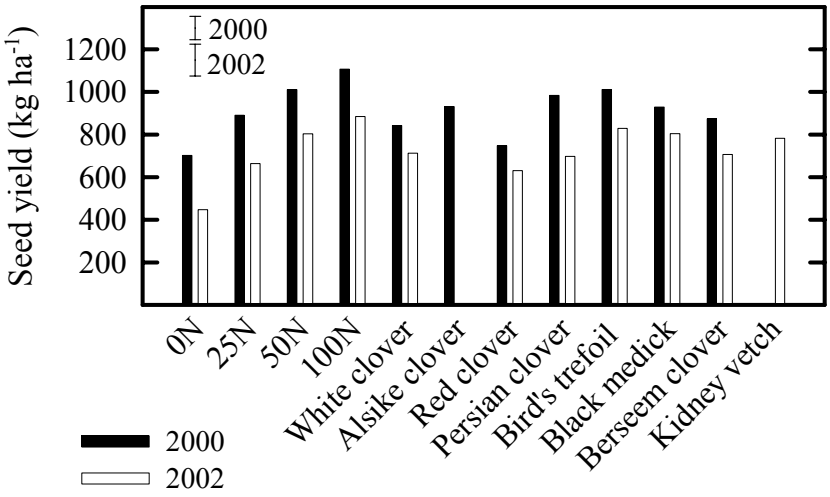

Figure 1. The effect of green manure crops in perennial ryegrass for organic seed production compared to establishment in a pure stand with different nitrogen application levels.

In a farmers field of perennial ryegrass (near Skive) sheep grazing at different time intervals has been tested in first and second year seed crops of perennial ryegrass. Seed yield data from 2001 show no effect of a late grazing (mid-December). The daily gain was 78 g/day pr sheep in autumn 2000, but only 6 g/day in 2001. Sheep grazing in 2001 did not affect seed yield, and the total forage yield was equivalent to 87 kg/ha. In 2002 yield in second seed year were between 650 – and 950 kg ha kg ha^{-1}, which means considerable lower than in first year. A sheep grazing in December (4. – 13. December) decreased seed yield compared to the defoliated control.

WP4.

White clover is a very important constituent in high-quality forage mixtures; unfortunately, it is also the forage species with the lowest supply of organic seed. This work package focuses on developing alternative cropping techniques to avoid pests or to reduce pests damage in organic white and red clover seed production. The objectives are

- To develop a management-system where the occurrence of pests in white and red clover crops is reduced to a level where organic seed production is economically profitable.
- To explore ways of prevention of clover seed weevil damage.

- To explore ways of biological control of clover seed weevil, which together with objective 2 may form a complementary strategy for organic farmers.
- To evaluate alternative cropping techniques in farmer fields.

Yellow sticky traps have been mounted in 10 white clover fields situated on Zealand and Falster with special reference to estimate the time and temperature threshold for migration of the clover seed weevil into the clover crop. The results show that the weevils do not migrate if temperatures are below 20°C. This information can be used in a defoliation and burning strategy.

A number of organic farmers have burned the white clover seed production field in spring in order to test if this treatment would reduce pest damage. Information from these fields are utilised in this project.

At Research Centre Flakkebjerg the treatment 'burning' has been evaluated in a field trial in 2002 and 2003, where burning is combined with defoliation. The preliminary results show that early defoliation in combination with burning gives the best result if the clover seed weevil is present. Number of weevils per flower head as an average is reduced from 7-8 to 2 when early defoliation is combined with burning. If defoliation is postponed 2 weeks only 0.5 weevils are left and no significant difference between defoliation and defoliation + burning is found. However, yield from 2003 trials are not yet available.

As earlier years a damage threshold experiment have been carried out. The preliminary results from earlier years show that an incidence in the area of 25 clover seed weevils per m² results in a yield reduction at 50 kg/ha.

In 2002 white clover trial were established intercropping with buckwheat and tancy-leaf phacelia, plant species that are supposed to attract parasitoids. Number of clover seed weevil, the lesser clover leaf weevil and parasitoids monitored in the trial show no significant difference between buckwheat/phacelia-plots and the control.

WP5.

From January 2004 only organically produced seed can be used in organic farming systems within the EU. It is of out-most importance that results from this project is disseminated and implemented in production guidelines during the project. The objectives of work package 5 is to

- Implement improved cultivation techniques.
- Evaluate the possibilities to utilise 'by-products' from seed crops.
- Evaluate the incorporation of seed crops in the crop rotation.

Results are disseminated to organic seed growers - papers in agricultural magazines and presentations at meetings. Some demonstration trials are al-

ready established in the organic crop rotation at Research Centre Flakkebjerg, and they are presented for organic farmers and advisers once at least once a year. In 2003 a demonstration trial in white clover was carried out in an organic farmers field (Ringsted). The treatments tested were defoliation compared to burning in either a sheep-grazed or non-grazed field.

C.2 Fulfilment of deliverables and milestones

(To be completed for each work package)

WP1: Main obstacles-grass, clover and green manure / catch crop seed	Time schedule according to application	Deviations, if any*
Deliverables		
1: A list of grass species where no or only limited amounts of organic seed are available.	03/2001	
2: An evaluation of the importance of various field characteristics for weevil occurrence and damage.	02/2002	
3: A list of the most important yield reducing factors in organic clover seed production, with an estimate of the approximate magnitude of each.	05/2001	
4: An evaluation of the possibilities of establishing seed production of new green manure / catch crops.	11/2000	
Milestones		
1: Interviews with seed companies	2000	
2: Monitoring farmers fields of organic clover seed	2000 – 2001	
3: Establishment of demonstration trials in accordance with findings in the monitoring (D2 and D3).	2002 – 2003	
4: Establishment for screening trial in green manure / catch crops	2001- 2003	
WP2: Crop establishment techniques – row cultivation		
Deliverables		
5: Information on optimal row spacing and seed rate in two different grass types and recommendations for establishment techniques in related species.	03/2002	
6: An evaluation of in row fertilisation in grass seed crops.	10/2003	
7: Guidelines for optimal row density in grass species with rhizomes.	11/2004	
8: Optimal row spacing in white clover.	12/2004	
Milestones		
5: Establishment of the third and final experimental year.	2003	
6: Screening prevalent farm equipment.	2001 – 2003	
7: Investigations on new establishment techniques in smooth stalked meadow grass.	2002 – 2004	
8: Determinations of white clover seed yield and yield components at different establishment techniques.	2002 – 2004	
WP3: Mixed cropping – grasses and nitrogen fixating crops		
Deliverables		
9. A list of green manure crops beneficially intercropped with grass seed crops and information on the range of nutrients that can be released and utilised from the green manure crop.	12/2003	

10: Results on seed yield in mixed cropping of grass and clover as well as information on the amount of forage produced when the first year is used for forage cuts.	07/2001	
11: Evaluation of the competitive ability between clover and repellent and parasitoid attractant plants.	07/2001	
12: Identification of the advantages / risks of sheep grazing grass and clover seed fields. Daily gain and body score are also determined.	12/2001	
Milestones		
9: Report including results on the production of nutrient by the green manure crops when grown together with a grass seed crop.	2003	
10: An evaluation of the possibility to produce grass and clover seed in the same field (yield and quality).	2002 – 2004	
11: Advice on intercropping in clover	2001 – 2004	
12: Report including results on daily gain and body score.	2001 and 2004	
WP4: Pests – alternative cropping techniques		
Deliverables		
13. Examination of the effect of late defoliation on clover seed weevil density and damage.	11/2004	
14: A list of potential plants species repellent to clover seed weevils	04/2002	
15: A list of potential plant species attracting parasitiods against clover seed weevils	04/2003	
16: Evaluation of the potentials of various preventive methods as elements in a management strategy for clover seed weevils on organic farms.	12/2004	
Milestones		
13: Report on the effect of defoliation in white clover.	2004	
14: List of potential plant species that are repellent to clover seed weevils.	2004	
15: List of potential plant species that attract parasitoids.	2004	
16: Establishment of demonstration trials concerning clover seed weevils in white and red clover.	2001 – 2003	
WP5: Optimisation of crop rotation - incorporating seed crops		
Deliverables		
17. Guidelines for optimising the production of high quality seed of organic grass and clover species.	12/2004	
18: Forage production and quality from seed crops.	03/2002	
19: Guidelines for optimal crop rotation with respect to seed crops.	12/2004	
Milestones		
17: Establishment of demonstration trials.	2001 – 2003	
18: Report on the amount of forage and forage quality.	2004	
19: Report on optimal crop rotation including seed crops.	2004	

** Deviations are to be further discussed in D*

D. Description of deviations and subsequent adjustments of plans

There are no deviations.

E. Project publications and other products

1. Articles in international, scientific journals with review procedures

   Langer, V., Yield reducing factors in organic white clover seed production in Denmark (to be submitted to Annals of Applied Biology)

2. Papers presented at congresses, symposiums, etc.

   Boelt, B., 2003. Organic Forage Seed Production. Submitted for presentation af the 5th International Herbage Seed Conference in Australia, November, 2003.

   **Boelt, B.*, 2002. Intercropping as solution for organic grass seed production?*. Organic Seed Production and Plant Breeding – strategies, problems and perspectives. Berlin, November, 2002 (In prep).*

   ***Boelt, B.*, 2002. Legume seed production and research in Europe*. Canadian Alfalfa and Forage Seed conference, 2002. In:Forage Seed,* winter 2002*, pp. 33-34.*

   Boelt, B. & Deleuran, L. C. 2000. Organic forage seed production. *Proceedings 13th International IFOAM Scientific Conference, Basel, Schweiz. pp. 228-229.*

   ***Deleuran, L. C. & Boelt, B*. 2000. Utilization of forage cuts in organic grass seed production*. Proceedings of the 18th General Meeting of the European Grassland Federation Aalborg, Denmark. pp. 552-555.*

   Hansen, L. M. 2002. Økologisk hvidkløverdyrkning, kløversnudebillens betydning og bekæmpelsesmuligheder. *NJF seminar nr. 341, Grass and clover seed production. Sverige, 24.-26 juni 2002.* NJF-rapport nr. 341, s. 87-93.

3. Reports, articles in agricultural journals, etc.

   Boelt, B. 2003. Produktion af økologisk hvidkløverfrø. Økologisk Jordbrug, Juni 2003.

   ***Boelt, B. & Deleuran, L. C.* 2002. Frøgræs på rækker kan høstes i flere år. *Agrologisk Tidsskrift, 3:16-17.*

   Boelt, B., Deleuran; L.C., Gislum, R., 2002. Organic forage seed production in Denmark*. IHSG Newsletter no. 34, pp. 3-4.*

   Boelt, B. 2001. Afgræsning af frøafgrøder med får*. Dansk Frøavl 8:140.*

Boelt, B., Clausen, D., Gislum, R. & Hansen, L. M. 2001. Aktuelt nyt fra Danmarks JordbrugsForskning, 2001*. Tidsskrift for Frøavl 2, 7-10.*

Boelt, B. 2000. Samdyrkning af græs og kløver*. Dansk Frøavl 9, 150-151.*

***Deleuran, L.C. & Boelt, B*., 2002. Forage cuts as a by-product in organic seed production. *IHSG Newsletter no. 34*, 2002, pp. 5-7.

***Deleuran, L.C. & Boelt, B*., 2002. Rækkedyrkning af frøgræs. *Grøn Viden, markbrug nr. 247*, januar 2002.

***Boelt, B., Deleuran; L.C., Gislum, R., 2002.* Nyt fra Danmarks Jordbrugs-Forskning*. Tidsskrift for Frøavl, 1:11-13.*

Gislum. R., Boelt, B. & Jensen, E. S. 2001. Grøngødningsafgrøder kan medvirke til et højt frøudbytte i økologisk dyrket almindelig rajgræs. *Forskningsnytt om økologisk landbrug i Norden* 5:4-5.

Hansen, L. M. 2002. Snudebillerne er kommet*. Dansk frøavl 85 (6)*

Hansen, L. M. & Boelt, B. 2003. Hvordan dyrker jeg økologisk hvidkløver - uden snudebillerne stjæler udbyttet. Økologisk Planteavlsberetning 2002, side 32-35.

Rohde, B., V. Langer & L. Monrad Hansen 2000. Økologisk hvidkløver – hvordan kan det lade sig gøre *? Dansk Frøavl 9, 148-149*

Rohde, B. 2001. Tjek bestøvningen*. Dansk frøavl 84 (5)*

4. Oral presentations, public meetings, field days, etc.

In February, 2001 a meeting for organic farmers and seed advisers were held at research centre Flakkebjerg (45 participants).
In June, July there has been 2 field days in the organic crop rotation at Flakkebjerg.

In February, 2002 a meeting for seed production advisers were held at research centre Flakkebjerg (app. 70 participants).
In June there has been 1 field day for seed production advisers in the organic crop rotation at Research Centre Flakkebjerg.

In March, 2002 Lars. M. Hansen and Birte Boelt joined a meeting on organic white clover seed production. Optimal cultivation techniques were discussed with a group of farmers, and the programme for plant sampling in farmer fields was decided.

In June, 2002 Birte Boelt participated and presented experiences from trials with organic white clover seed production - in a field day with an interest group of organic farmers.

In June, 2002 Lise C. Deleuran, René Gislum, Lars M. Hansen and Birte Boelt participated in a seminar on seed production, arranged by The Society of Nordic Agricultural Scientists. The seminar included at session on organic forage seed production where Lars M. Hansen had an oral presentation and Birte Boelt was the chairman.

In February, 2003 a meeting for seed production advisers were held at research centre Flakkebjerg (app. 60 participants).

In June 2003 there has been 1 field day for seed production advisers in the organic crop rotation at Research Centre Flakkebjerg.

In July 2003 a group of Swedish advisers visited Flakkebjerg. Their special interest was organic forage seed production.

During summer 2003 Birte Boelt has participated in four field days/evenings.

F. Scientific education

The present project is included as part of the Ph.D.-project of René Gislum, who defended his thesis in April 2003.

G. National and international cooperation

Nationally there is a very close cooperation with seed company advisers, staff in the Danish advisory service and seed growers. This cooperation has existed for many years and has resulted in at least two meetings a year – during summer, where seed production experiments are presented and during winter, where experimental results from the previous growing season are presented. Besides staff from DIAS participate in farmer field days.

Internationally we have contacts to scientific staff at Planteforsk, Norway and scientific staff at FNAMS, France specifically on the issue – organic forage seed production. An application for a EU-project has unfortunately been rejected.

H. Critical reflection on the project

Progress in the project is in accordance with the description. However, focus has been moved towards the problems in white clover, since this is the species where the problems in organic production are numerous and most severe. Registrations in farmer fields have provided useful information, and the interaction between registrations in farmer fields and replicated field trials in the organic crop rotation at Flakkebjerg is a very good combination, that provides a whole range of information. The long tradition for and experience in field experiments by the project staff is of outmost value to this project. Experiments are carried out in accordance with farm practice, which is essential for the success in dissemination or results.

The objectives in this project are very applied, and results must be applicative for the farmers – right away and before 2004! Since budgets were reduced according to the

expressed interest more fundamental scientific investigations are not possible within the budget. It would provide much more information if, for example, a number of plant species could be analysed for chemical compounds in order to repellent clover seed weevils. The utilisation of green manure crops seems to posses a potential as nitrogen source and further is might be used in a strategy where nitrogen availability is timed in order to stimulate reproductive development. Fortunately it has been possible to include some investigations in a Ph.D.-project financed by the Danish Seed Industry, but much more investigations ought to be done.

8. Budget

A. Account for any change in budgets

None

B. Budget for the whole project (1.000 DKK)

Total consumption of funds from DARCOF and expected consumption this year and coming years

Year:	Consump-tion before 2003	Expected consump-tion 2003	2004	2005	Total
Man-months	50	21	17	-	88
Scientific personnel	23	8	10	-	41
Technical personnel	27	13	7	-	47

Year:	Consump-tion before 2003	Expected consump-tion 2003	2004	2005	Total
Salaries					
Scientific personnel	848	316	386	-	1550
Technical personnel	638	325	165	-	1128
Other operational costs	248	133	71	-	452
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	336	158	131	-	625
Total	2070	932	753	-	3755

Comments:

9. Signatures and stamps

Name	Institute	Date	Signature
Head of project Birte Boelt	Danish Institute of Agri-cultural Sciences	30 September 2003	

Appendix I. Detailed budget

A. Budget for each participating institute (1.000 DKr)

Name of Institute: Danish Institute of Agricultural Sciences, Department of Plant Biology

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months	39	21	17	-	77
Scientific personnel	14	8	10	-	32
Technical personnel	25	13	7	-	45

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	455	316	386	-	1257
Technical personnel	601	325	165	-	1091
Other operational costs	238	1133	71	-	442
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	269	158	131	-	558
Total	1663	932	753	-	3348

Comments:

Name of Institute:The royal Veterinary and Agricultural University, Department of Agricultural Science

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months	11	0	0	-	11
Scientific personnel	9	0	0	-	9
Technical personnel	2	0	0	-	2

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	293	0	0	-	293
Technical personnel	37	0	0	-	37
Other operational costs	10	0	0	-	10
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	67	0	0	-	67
Total	407	0	0	-	407

Comments:

B. Budget for each participating department (1.000 DKK)

Name of Institute and department: Danish Institute of Agricultural Sciences, Department of Plant Biology

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months	30	15	14	-	59
Scientific personnel	10	5	9	-	24
Technical personnel	20	10	5	-	35

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	400	200	340	-	940
Technical personnel	500	260	128	-	888
Other operational costs	160	80	58	-	298
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	203	108	105	-	416
Total	1263	648	631	-	2542

Comments:

Name of Institute and department:The royal Veterinary and Agricultural University, Department of Agricultural Science

Year:	Consump-tion before 2003	Expected consump-tion 2003	2004	2005	Total
Man-months	11	0	0	-	11
Scientific personnel	9	0	0	-	9
Technical personnel	2	0	0	-	2

Year:	Consump-tion before 2003	Expected consump-tion 2003	2004	2005	Total
Salaries					
Scientific personnel	293	0	0	-	293
Technical personnel	37	0	0	-	37
Other operational costs	10	0	0	-	10
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	63	4	0	-	67
Total	368	39	0	-	407

Comments:

Name of Institute and department: Danish Institute of Agricultural Sciences, Department of Plant Protection

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months	7	4	3	-	14
Scientific personnel	2	1	1	-	4
Technical personnel	5	3	2	-	10

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	77	41	46	-	164
Technical personnel	101	65	37	-	203
Other operational costs	56	28	13	-	97
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	46	30	26	-	102
Total	170	164	122	-	566

Comments:

Name of Institute and department: Danish Institute of Agricultural Sciences, Department of Animal Breeding and Genetics

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Man-months	2	0	2	-	4
Scientific personnel	2	0	2	-	4
Technical personnel	0	0	0	-	0

Year:	Consumption before 2003	Expected consumption 2003	2004	2005	Total
Salaries					
Scientific personnel	78	0	75	-	153
Technical personnel	0	0	0	-	0
Other operational costs	22	0	25	-	47
Equipment					
Others (please specify)					
Direct costs					
Indirect costs (20% of direct costs)	20	0	20	-	40
Total	120	0	120	-	240

Comments:

C. Budget for co-financing from each participating institute (1.000 DKK)

There is no specific budget for co-financing in this project; however, it is relevant to mention, that the Danish Seed Industry provides funds for additional researching in organic seed production. Additionally in 2003 funding was obtained from the fund: Organic farming. Besides The Danish Seed Council has a representative in the steering committee, Jørn Lund Christensen. The representative supports the project with very important information from farm practise.