North Central Region Canola Research
FY 2012 Proposal
($30,400 + 8,574 + 10,993 = $49,967)
(Ehlke + UM + NDSU = Total)

Project Title:

The Minnesota Canola Production Centre Research

Variety and Systems Comparison Trial,
Nitrogen, Sulfur, and Boron Application and Timing Trial,
Pre-harvest Desiccants and Straight Harvesting Trial,
Date of Planting Trial

Principal Investigator:

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Amount Requested:

$38,974

Judith Klopfenstein 7/23/12

Grants Manager Date
Sponsored Projects Administration
University of Minnesota

PROJECT SUMMARY

Instructions:
The summary is limited to 250 words. The names and affiliated organizations of all Project Directors/Principal Investigators (PD/PI) should be listed in addition to the title of the project. The summary should be a self-contained, specific description of the activity to be undertaken and should focus on: overall project goal(s) andsupporting objectives; plans to accomplish project goal(s); and relevance of the project to the goals of the program. The importance of a concise, informative Project Summary cannot be overemphasized.

Title: Variety and Systems Comparison Trial, Nitrogen, Sulfur, and Boron Application and Timing Trial, Pre-harvest Desiccants and Straight Harvesting Trial, Date of Plant Trial

PD: Nancy Ehlke	**Institution:** University of Minnesota
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The variety and systems comparison trial is to establish agronomic and economical criteria (such as yield, contribution margin, crop quality, lodging resistance, harvestability, and disease resistance) for choosing among canola (*Brassica napus L.*) varieties and their respective herbicide options.

The nitrogen, sulfur, and boron application and timing trial objectives are to evaluate canola yield response to multiple rates of nitrogen (N) applied pre-plant or at the 4- to 6-leaf stage of growth, the effectiveness of top dressing urea-N (46-0-0), ESN (controlled release urea) product when compared with conventional urea, and canola response to sulfur (S) and boron (B) applied pre-plant or foliar-applied at the 4- to 6-leaf stage of growth.

The pre-harvest desiccants and straight harvesting trial is to evaluate the potential for pre-harvest desiccation and straight harvest in Minnesota canola production.

The seeding date and production system (herbicide resistance/variety) influence on canola performance trial objectives are to i) evaluate seeding date effect on performance of glyphosate (Roundup Ready) and glufosinate (Liberty Link) herbicide resistant systems, with new hybrid canola varieties; ii) compare net returns of the two herbicide resistant systems based on grain value and seed and herbicide costs; iii) investigate seeding date influence under previously not reported no-till production and also conventional tillage.

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Rationale and Significance:

The Minnesota Canola Production Centre has been a public-private partnership between the Minnesota Canola Council and the University of Minnesota since 1998. The Canola Council of Canada initiated Canola Production Centres to address the ongoing need for canola production technology transfer. The Canola Production Centre is a joint effort between producer groups, industry representatives, and government and extension personnel. Both small-plot research and field-scale strip trials utilizing commercial farm equipment are conducted at the Centre, and the information generated is utilized for extension activities throughout the year.

Outreach/Extension Activities:

Results from all studies will be compiled and published in a report that is made available to growers during winter meetings. Research will also be discussed at the Canola Production Centre summer field day, which provides a focal point for canola producers to come and look at the plots. They will hear about important current topics, such as insect and disease concerns on canola and other crops, from industry representatives as well as extension personnel from University of Minnesota and North Dakota State University.

Facilities and Equipment (Canola Production Centre):

The research will be conducted on-farm at the Canola Production Centre near Roseau, MN. Dr. Nancy Ehlke has had canola responsibilities since 2012. A technician (previously Dave LeGare, Derek Crompton, and Rob Proulx) implemented the majority of the University of Minnesota canola research and the canola variety evaluation trials. They are equipped with the appropriate field equipment to plant, maintain and harvest the small-plot trials initiated in this effort. They will rely on assistance from the farmer-cooperator for planting and herbicide spraying in the large-plot strip trial, while the weigh wagon is borrowed and the combine is rented locally at threshing time. They also have the ability to transport the all the equipment to the Roseau site with the exception of the combine. Nancy has access to the necessary laboratory infrastructure to process plant samples, as well as the statistical packages required for the analysis (SAS, 1999).

Part 1: Variety and Systems Comparison Trial

Introduction:

The Variety and Systems Comparison Trial has been conducted on the Canola Production Centres across Canada since 1997 and in Minnesota since 1999. Results have been published in each year's copy of the Canola Production Centre annual report. One exception occurred in 2006 when the trials at the Canola Production Centre failed due to lack of timely rainfall resulting in a variable and ultimately unacceptable plant stand. Other systems comparison work has been done in company strip trials which are also large plot. To our knowledge, no one else but the above mentioned has done the same kind of systems and variety comparison like we have conducted in the past and propose to conduct in 2012.

The 2011 Variety and Systems Comparison Trial at the Minnesota Canola Production Centre near Roseau was a small-plot trial that included forty varieties. Of these vareities, 30 were Roundup Ready, 4 were Liberty Link, and 7 were Clearfield.

Objectives:

To establish agronomic and economical criteria (such as yield, contribution margin, crop quality, lodging resistance, harvestability, and disease resistance) for choosing among canola (*Brassica napus L.*) varieties and their respective herbicide options.

Approach:

This study will be located at the Canola Production Centre, which in 2012 will most likely be located near Roseau, MN. Varieties for the Variety and Systems Comparison Trial are submitted for testing by the canola seed industry. An invitation is sent to all the area seed dealers in March with final confirmations made by April 1. The seed is treated with the strongest commercially available seed treatment for each variety, perhaps either Helix Xtra or Prosper 400. Varieties are seeded with a 5-foot Hegge plot seeder at seed company recommended seeding rates. Plots are approximately 20 feet long by 5 feet wide. The trial is laid out in a modified RCB design with four replicates. The Roundup Ready varieties are grouped together to help avoid drift problems between the different systems. The other herbicide systems are also grouped together. All varieties receive the same tillage, fertilizer and post-emergent fungicide treatments. All the herbicide tolerant varieties are sprayed with their respective herbicides at the recommended rates for the weed spectrum in the field. Herbicide spraying is done with a 30-foot open boom sprayer on a calm day. If conditions are conducive for sclerotinia, all varieties are sprayed with a fungicide such at 20 to 50% bloom to reduce the risk of yield loss due to this disease; in 2011, Proline was the fungicide of choice. Each plot is swathed individually when seed color change in that plot reaches 30 to 40 % on the main stem, and threshing is completed when suitable conditions exist. Swathing and harvesting are done with small-plot equipment, with entire plot samples taken for dockage and quality testing.

Data collection during the season includes percent ground cover, percent early season vigor, days to flower, days to maturity, lodging, and height. After harvest, seed quality is measured by evaluating for damaged seed, green seed count, and oil and protein content. Contribution margins are calculated using the value of the crop at harvest minus variable costs (seed, fertilizer, herbicides, fungicides, insecticides, fuel, lube and machinery repair, check-off, and interest/opportunity costs). All data, except the contribution margins, will be analyzed using SAS (SAS, 1999).

Invitation to companies for variety testing will be sent out in March, 2012 with variety confirmation by April, 2012. These projects will consist of field trials during the 2012 growing season. A summer field day will held in late June or early July to show the research and offer other extension information to growers from industry people and University personnel. Results will be available via the internet web pages, presented at scientific and grower meetings, cited in area and regional extension newsletters, and published in an extension fact sheet and scientific journals when applicable.

Part 2: Nitrogen, Sulfur, and Boron Application and Timing Trial

Introduction:

The cost and high use of nitrogen (N) by canola has been a major limit in the production of canola in North America. Research has indicated that N accumulation in canola increases from about 20 lb/ac to 100 lb/ac in a 30 day period beginning twenty days after emergence, with the most N accumulation (about 110 lb/ac) occurring 55 days after emergence (Thomas, 2000). Rainfall during this period of rapid nitrogen accumulation could leach soil N beyond the canola-rooting zone. A top dress application of N, with a little or no N applied preplant and the remainder applied at 4- to 6- leaf stage, could be more efficiently utilized by the plants, which could result in less N needing to be applied. A split application of N would provide growers an additional month to evaluate their canola crop prior to purchasing and applying the additional N. ESN has been shown to prevent nitrogen loss during the growing season, optimizing nitrogen use by growing canola. This product may be able to decrease the total nitrogen applied to grow a canola crop when compared to traditional nitrogen sources.

A trial very similar to this proposed trial was conducted on the 2005 CPC near Grygla in a tile drained field. Very wet weather from 20 to 50 days after planting provided optimum conditions to show significant differences between the PPI and top dress treatments. Top dressed treatments provided 12, 14 and 20% higher yield than the PPI treatments for the 30, 60 and 90 lb/ac N application rates respectively. Top dressing 30 lb/ac N provided a similar yield to 60 lb/ac N PPI. Top dressing 60 lb/ac N provided a better yield (131 lb/ac) than 90 lb/ac PPI.

This research was proposed for the 2006 Canola Production Centre. Preplant nitrogen applications were made and the trial was planted. Lack of rainfall at the site for over a month resulted in a very uneven stand. Because of that the trial was terminated prior to topdress application

In 2008, preliminary work was performed at the Canola Production Center comparing nitrogen timings and sources. The findings were not significantly different, but provided evidence that lower rates of nitrogen applied at the 4-leaf stage may yield as well as conventionally applied nitrogen.

In 2009, the ESN treatments showed significant promise in increasing yields, while there was no significant difference among nitrogen products and application timings in 2010. In 2011, there was some evidence to suggest that reduced rates of topdress urea or preplant ESN could be more efficient than higher rates of preplant urea, although further research is needed to confirm these results.

Objectives:

1. Evaluate canola yield response to multiple rates of nitrogen (N) applied pre-plant or at the 4- to 6-leaf stage of growth.
2. Evaluate the effectiveness of top dressing urea-N (46-0-0).
3. Evaluate the effectiveness of ESN (controlled release urea) product when compared with conventional urea.
4. Evaluate canola response to sulfur (S) and boron (B) applied pre-plant or foliar-applied at the 4- to 6-leaf stage of growth.

Approach:

This study will be located at the Canola Production Centre near Roseau, MN. The trial area will be sampled for nitrogen as well as phosphorous, potassium, and sulfur, and fertilized accordingly to its needs. All treatments will have approximately 50 lb/ac seed placed MAP (6-26-0). The canola variety Pioneer 45H28 will be seeded at a rate of 5 lb/ac. The field layout will consist of a randomized complete block (RCB) design with four replicates. Plots will be approximately 5 ft by 20 ft and managed and harvested with small-plot equipment.

Nitrogen and sulfur fertility treatments will include PPI urea applications of 45, 90, 135, 180, and 225 lbs N/acre (with and without 30 lbs/acre PPI sulfur), topdress urea applications of 45, 90, 135, 180, and 225 lbs N/acre (with and without 30 lbs/acre PPI sulfur), and PPI ESN applications of 45, 90, 135, 180, and 225 lbs N/acre (with and without 30 lbs/acre PPI sulfur). In addition, there will be three foliar boron applications in this trial, with Max-IN Boron applied at rates of 0.5, 1.0, and 1.5 pt/acre. To protect against while mold development, a fungicide will be applied at 20 to 50% bloom.

Data collection during the season includes percent ground cover, percent early season vigor, days to flower, days to maturity, lodging, plant height, and sclerotinia infection ratings. Seed yield, oil content, contribution margins, and weather data will also be collected. Abnormal growing conditions and pest occurrence will be monitored and managed if possible. The results will be statistically analyzed using SAS (SAS, 1999), and the data will be made available to the public and private sectors through a variety of oral and written presentations.

Literature Review:

Canola requires high levels of N and usually shows increased yields with an N fertilizer application. The high N requirement of canola is one reason why canola acreage in Minnesota is being replaced with soybeans, which require very little to no additional N. If canola N levels could be managed to obtain more yield with the same or lower N input, then canola would be more economically competitive with soybean. Minnesota and North Dakota both recommend 130 lb/ac of available N to obtain a 2000 lb/ac yield (Rehm et al., 2001; and Franzen, 1999). Manitoba Agriculture recommends 150 lb/ac of available N to reach a 2000 lb/ac.

Studies on top dress applications of N fertilizer are limited. An Australian study on irrigated canola indicated that top dress applications were not effective (Taylor et al., 1991). Ty Dewitz, a canola grower from Tappen, North Dakota has been seeing a 15 to 20% yield increase by using top dress applications of N on both irrigated and dry-land canola (personal communications through Eric Eriksmoen). A 2001 study conducted at two locations in North Dakota showed a yield increase of up to a 30% when top dress applications of N were used (Bob Henson, personal communications). The trial was repeated in 2002 with an average yield increase of 9% across four site-years when all or part of the N was applied at the 3 to 5-leaf stage (Eric Eriksmoen, personal communications). In 2003 an extensive nitrogen application trial including 7 nitrogen levels PPI and 4 nitrogen levels top dress was conducted at 7 locations in North Dakota. Results from this trial showed no yield difference between applying fertilizer PPI and top dressing (John Lukach, personal communications). The results also indicated a range of 5 to 10 lb/ac of canola increase per pound of nitrogen applied, depending on location. In the last

4 years, 3 out of 10 site years (Langdon, Carrington and Valley City) showed yield increases of 300 to 500 lb/ac from top dressing nitrogen compared to PPI.

In 2003 a nitrogen trial was conducted at the Canola Production Centre near Roseau which looked at adding 30 and 60 lb/ac N at PPI and the 4 to 6 leaf stage as a top dress treatment. The field was flooded in 2002 and had high levels of residual nitrogen. Top dress treatments included three nitrogen sources; urea, ammonium nitrate and 28-0-0 liquid. The only significant yield increase obtained from top dressing occurred with urea at 30 lb/ac N. In 2004 the trial was repeated near Roseau looking at applications of 60 and 90 lb/ac PPI and topdress with no difference in yield between the two application timings.

In 2004 an extensive nitrogen application trial including 7 nitrogen levels PPI and 4 nitrogen levels top dress was conducted at 7 locations in North Dakota. Results from the Valley City location showed significant yield increase of approximately 300 lb/ac from top dressing (John Lukach, personal communications). Langdon also showed yield increases from top dressing.

Studies on the timing of top dress applications are also limited. In 1999, the Canola Production Centres conducted a study at 5 sites with top dressing 10 lb N/ac and 10 lb S/ac at 7, 14, 21, and 7 plus 21 days after emergence (Canola Council of Canada, 1999). The total recommended rate of N fertilizer was applied prior to seeding. Increased yield from top dressing was observed at only one site. The 2001 North Dakota trials showed no yield difference with a split application at bolting compared to a 9% yield increase with the split application at the 3 to 5-leaf stage (Eric Eriksmoen, personal communications). A top dress application of N for winter canola seed production is recommended in Kansas with one third to one half applied in the fall and the remainder applied in late winter (Kansas State University, 1989).

References:

Canola Council of Canada. 1999. Top dressed sulphur and nitrogen trial. 1999 Canola Production Center annual report. pp. 108-112.

Franzen, D. W. 1999. Fertilizing mustard and canola. NDSU Ext. Bul. SF-1122.

Kansas State University. 1989. Canola Production Handbook. Ext. Bul. C-706. p. 7.

Rehm, G., M. Schmitt, J. Lamb, and R. Eliason. 2001. Fertilizer Recommendations for Agronomic Crops in Minnesota. Univ. of Minnesota Ext. Bul. BU-06240-S.

SAS. 1999. SAS/STAT user's guide. Version 8. SAS Inst., Cary, NC.

Taylor, A.J., C.J. Smith, and I.B. Wilson. 1991. Effect of irrigation and nitrogen fertilizer on yield, oil content, nitrogen accumulation and water use of canola (*Brassica napus L.*). Fert. Res. 29:249-260.

Thomas, P. 2000. Nutrient uptake by canola. Alberta Canadian Agric, Melfort, AAFC.

Part 3: Pre-harvest Desiccants and Straight Harvesting Trial

Introduction:

In dry years, many canola crops are short and thin. Windrowing is recommended where yield potential exceeds 1 tonne/ha and crops are tall and thick enough to sit on 25-30cm of stubble. With light crops, where windrows may be blown about by strong winds, other options are desiccation and harvest or direct heading, depending on seed moisture levels.

Reglone® is registered for use as a pre-harvest desiccant in canola. Rates are 1.5 to 3.0 L/ha. Spray when 70% of the pods are yellow and the seeds are browny/bluish and pliable. Harvest 4 to 7 days after spraying. Timing is important. Windrowing or desiccating too early can significantly reduce seed yield and oil content compared with direct harvesting at maturity. Pod Ceal® is a polymer product labeled for prevention of pod shattering in canola, and is applied when the pods are a light green color.

In 2000, the Muresk Institute of Agriculture compared the effects of windrowing, desiccation and direct harvesting on the yield and quality of canola grown at Dowerin (WA). The highest yield of 0.91 tonnes/ha was achieved by applying Reglone® (1.5 L/ha) at 56% seed colour change. Windrowing achieved a yield of 0.68 tonnes/ha, whilst the direct harvest yield was 0.79 tonnes/ha.

All canola currently grown in Minnesota is swathed and harvest approximately 14-21 days after cutting takes place.

Objectives:

The objective of this study is to evaluate the potential for pre-harvest desiccation and straight harvest in Minnesota canola production.

Approach:

A field site near Roseau, MN will be planted with a variety of canola recommended as suitable for straight harvesting. Seeding will be performed with the farmer-cooperator's seeding equipment at seed company recommended seeding rates. Plots are 400 feet long by 30 feet wide. The trial will be laid out in a strip-plot design with two or three replicates. Plots will be fertilized at recommended rates for 2,000 lbs/acre production.

Treatments consist of a conventionally swathed treatment, a conventionally swathed treatment preceded by a Pod Ceal application, a straight harvest treatment preceded by a desiccant application (Reglone), and a straight harvest treatment preceded by a Pod Ceal application. Straight harvest treatments will be sprayed with the desiccating agent applied at early pod yellowing. Plots will be harvested at the optimum time.

Spraying of Pod Ceal and Reglone will be performed on a calm day, either by using the farmer-cooperator's spraying equipment or through hiring the spraying services of a local company. If conditions are conducive for sclerotinia, all plots will be sprayed with a fungicide such as Ronilan at 20 to 50% bloom to reduce the risk of yield loss due to this disease. Each conventionally swathed plot is swathed individually when seed color change in that plot reaches

30 to 40 % on the main stem; threshing is completed when suitable conditions exist. Swathing will be done with the farmer-cooperator's swather, and the plots are threshed with a commercial combine rented from a grower or local dealership. Yields are measured with a weigh wagon, with 5 lb samples taken for dockage and quality testing.

Data collection during the season includes percent ground cover, percent early season vigor, days to flower, days to maturity, lodging, plant height, Pod Ceal and Reglone application dates, swathing date, and combining date. After harvest, seed quality is measured by evaluating for damaged seed, green seed count, and oil and protein content. Contribution margins are calculated using the value of the crop at harvest minus chemical and/or swathing costs. All other data will be analyzed using SAS (SAS, 1999). Results will be available via the internet web pages, presented at scientific and grower meetings, cited in area and regional extension newsletters, and published in an extension fact sheet and scientific journals when applicable.

References:

Auld, D.L. and K.A. Mahler. 1991. Production of canola and rapeseed in the U.S. *In* McGregor, D.I. (ed.) *Proc. of the Eight Int. Rapeseed Congress*, Saskatoon, Canada. pp. 978-983.

MN Ag. Statistics. 2000. Minnesota Ag. Statistics Service. 90 West Plato Boulevard, St. Paul MN 55107. Electronic version at: http://www.nass.usda.gov/mn/

Oelke, E.A., D.G. LeGare, K.B. Andol, P.M. Ehlke. 2000. Planting date influences canola yield and growth in northwestern Minnesota. Agron. Abst. p.38.

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Specht, M. 2004. High Yields of Winter Oilseed Rape in Germany 2004. www.ufop.de/downloads/**High**_Yield.pdf

Topinka, A.R.C., R.K. Downey, and G.F.W. Rakow. 1991. Effect of agronomic practices on the overwintering of winter canola in southern Alberta. *In* McGregor, D.I. (ed.) *Proc. of the Eight Int. Rapeseed Congress*, Saskatoon, Canada. pp. 665-670.

Part 4: Seeding Date and Production System (Herbicide Resistance/Variety) Influence on Canola Performance Trial

Objectives:

The study objective is to i.) evaluate seeding date effect on performance of glyphosate (Roundup Ready) and glufosinate (Liberty Link) herbicide resistant systems, with new hybrid canola varieties; ii.) compare net returns of the two herbicide resistant systems based on grain value and seed and herbicide costs; iii.) investigate seeding date influence under previously not reported no-till production and also conventional tillage. This research will be in conjunction with Dr. Burton Johnson at NDSU.

Approach:

The field experiment will be a randomized complete-block design in a split plot arrangement with four replicates (Steele and Torrie, 1980). The study will be conducted near Roseau in 2012, in conjunction with proposed plots at Carrington, Hettinger, Langdon, and Minot Research Extension Centers in North Dakota. The experiment is a RCBD with a split-plot arrangement. Seeding date and hybrid are the main and subplots, respectively. The five seeding dates are spaced at approximately 8 to 10 day intervals with the first date when canola is normally planted. This corresponds to approximately 3, 13, and 24 May, and 2 and 11 June. Glyphosate and glufosinate herbicide resistant types will be evaluated with one variety of each type. Standard agronomic practices will be applied for seeding rate, fertility, pest, and harvest management (Berglund et al., 2007). Plots will be approximately five feet wide with row spacing of 6 to 7 inches and a length of 20 to 25 feet. Herbicide systems will be bordered on either side by a plot of their respective herbicide resistance to prevent herbicide drift from the adjacent dissimilar treatment. This will increase the size and many management aspects of the study by 300%. This planting date study will spread out over a broad range most management aspects of the study from planting of the first date to harvest of the last planting date. Traits determined are stand rating, weed pressure, weed control, first flower and end flower, plant height and lodging, maturity, seed yield, test weight, seed weight, and oil content. Observations will also include pest incidence, seed shatter, and harvest concerns. Statistical analysis will be performed by SAS (1999) and consider seeding date and variety as fixed effects and location-year as a random effect. Treatment means comparisons will be based on *F*-protected LSD comparisons at $P \leq 0.05$.

References:

Berglund, D.R., K. McKay, and J. Knodel. 2007. Canola production. North Dakota Ext. Serv. Bull. A-686 (revised). North Dakota State Univ., Fargo.

Eriksmoen, E., M. Zarnstorff, R. Henson, and N. Riveland. 1999. Planting date effects on yield and agronomic traits of canola (*Brassica napus* L.) Expt. Stn. Rept. Hettinger Res. Ext. Ctr., Hettinger, ND.

Johnson, B.L., K.R. McKay, B.K. Hanson, and B.G. Schatz. 1995. Influence of planting date on canola and crambe production. J. Prod. Agric. 8:594-595.

SAS Institute Inc. 1999. SAS/STAT User's guide, Version 8, SAS Inst. Inc., Cary, NC.

Rationale and Significance:
Published manuscripts and local research reports pertaining to canola response to seeding date in the region are limited and dated and consequently the topic was identified as a research priority in the RFP for the North Central Region Canola Research proposals for FY 2012. The study results will identify location, seeding date, herbicide resistant type, and variety interactions useful for selecting varieties and herbicide resistance types for maximum production in different production regions. The study treatments will identify the variety and herbicide resistance type for optimum grain yield and economic yield (grain yield value minus seed and herbicide costs) at each location. This information is extremely helpful to producers, agricultural consultants, and university extension agronomists when making decisions/recommendations on which varieties perform best when seeded at different locations. The study results would also be helpful regarding discussion in adjustment of final canola planting dates for crop insurance.

Budget:

	All Trials
Salaried Technician (2 months' salary paid over 6 pay periods)	$16,100
Student (400 hours x $10.50/hr)	4,200
Fringe (40.1% T & 7.7% S)	6,780
Materials & Supplies (chemicals, fertilizer, stakes)	320
NDAWN Weather stations maintenance and service at Mavie, Roosevelt, and Greenbush	3,000
Costs	**$30,400**
Facilities and Administrative/Indirect Costs (28.205%)	**$ 8,574**
Total Costs	**$38,974**

Budget breakdown by trial:

		Treatments	Dollars
1.	Systems Comparison Trial	(~8 x $1000)	8,000
2.	Nitrogen Top Dress Trial	(~8 x $1000)	8,000
3.	Pre-harvest Desiccants and Straight Harvesting Trial		7,000
4.	Date of Planting Trial	(40 x $110)	4,400
5.	NDAWN Stations		3,000
	Costs		**$30,400**
	Facilities and Administrative/Indirect Costs (28.205%)		**$ 8,574**
	Total Costs		**$38,974**

Budget justification:

Items listed as wages will be used for summer support staff to assist in conducting the field research, collecting samples, and data summarization. Labor will be paid at a rate of $10.50/hr for a summer student at 400 hours, and $23.00/hr for a technician at 700 hours. Fringe benefits are calculated at 7.7% and 41.1% for students and technicians, respectively. Materials and supplies include the herbicides, insecticides and fertilizer needed to conduct the trials.

The data from the NDAWN Weather stations at Mavie, Wannaska, and Greenbush are used to help generate the Sclerotinia Forecasting Maps that provide growers timely information for then to decide how to manage sclerotinia. Costs included here are for telephone line service ($500 x 3 stations = $1500) and maintenance provided by NDSU ($500 x 3 stations = $1500).

Facilities and Administrative / Indirect Costs are added to the costs at 28.205%.

See attached page for CSREES-2010 budget page.

Budget Justification

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