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Title: Efficient and Environmentally Sustainable Grain Corn Production

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Objectives and Goals:

Develop and evaluate agronomic technology that would increase grain yield and nutritional quality of new corn hybrids and provide for a more sustainable and economically viable industry.

The objective will be realized through the following goals:

Goal 1: Improved selection of corn hybrids for the cool/short growing season of Manitoba. Selection will be based on number of days to silking, physiological maturity and yield.

Goal 2: Identify the optimum row spacing and plant population for the new generation of early maturing grain corn hybrids.

Goal 3: Evaluate new environmentally low risk herbicides with effective broad spectrum weed control designed for Zone 5 and selected from several different herbicide groups.

Goal 4: Evaluate fertilizer products (ESN) that would improve the yield and quality of grain corn in Manitoba with reduced risk to the environment and improve economical sustainability to the farming enterprise.

Progress in 2006:

The following gives details of the ARDI supported corn research established in 2006:

Trial	Locations
Hybrid Evaluation – Grain & Silage	Elm Creek & St.Pierre
Hybrid Evaluation – Grain	Carman, St.Pierre, Reinland, Bagot
ESN Fertilizer	Carman, Reinland
Plant Density	Carman, St.Pierre
Battalion Herbicide	Carman
Accent Total Herbicide	Reinland, Bagot
Distinct Herbicide	St.Pierre, Reinland

Goal 1: Corn is a high energy yielding crop. To fully meet its potential in terms of grain and/or silage yield it requires abundant sunshine, adequate moisture, adequate heat, proper balanced nutrition, and timely control of pests (especially weeds). In 2006, 41 to 54 grain hybrids from 11 companies were evaluated at four locations for yield, moisture content at harvest, silking date and density (bushel weight). As well, there were 49 silage hybrids from 11 companies evaluated at two locations for yield and quality (crude protein, TDN, NDF, ADF, NE/gain, NE/Lact, beef per acre production and milk per acre production). All data from the hybrid evaluation trials were published in Seed Manitoba 2007 and the "2006 Manitoba Corn Hybrid Performance Trials" brochure (see attached).

Goal 2: In Manitoba, a plant population of 26,000 plants per acre with 30 inch row spacing is considered a normal practice for grain corn production. For silage production, a range of plant populations and row spacings are being utilized. Grain and silage yield and quality under three different populations (26,000, 30,000 & 36,000 plants/acre) and three row spacings (30", 20" and 7.5") were measured at 2 locations.

<u>Grain Trial:</u>
Results from the row spacing treatment indicated that at both locations, there was a general increase in yield of 20" and 7.5" row spacings over the 30" row spacing. However, statistically treatments were not significantly different. There was also no effect on silking date, moisture content at harvest and density at either site.

Results from the population treatment indicated that at the Carman location, there was no significant difference in yield between the three populations. There was also no significant difference on silking date, moisture content at harvest or density. However, at the St.Pierre site, there was a significant difference in yield where the higher population of 36,000 plants/acre resulted in a lower yield. As well, moisture contents at harvest were higher under the higher population and the density decreased at the high population. When the silking data was analyzed, results showed that under the higher population of 36,000 plants/acre, silking date was delayed one day when compared to the other two populations. The results at the St.Pierre site could possibly be explained by the lack of moisture during the growing season and the resulting stress under the higher populations.

Overall, results from the 2006 field season indicate that choosing a plant population based on management and environmental factors is very important. In regards to row spacing, results suggest populations should be the same to moderately higher under narrow rows to realize higher yields.

<u>Silage Trial:</u>
Results from the row spacing treatment indicated at both locations, there was no significant effect on yield or quality. Yield results from the population treatment

varied by location. At the St.Pierre site, yield did increase under the 36,000 plants per acre treatment but it was not significantly different than the other two populations. At the Carman 2006 site, yield increased significantly under the 36,000 plants per acre treatment compared to the other two populations. However, when quality was examined, results indicate that quality was not affected by plant population.

Goal 3: In Manitoba, annual and perennial grasses and broadleaf weeds are a persistent problem. The MCGA, in cooperation with industry, annually carry out a series of herbicide evaluation tests. New herbicides from diverse groups with low environmental risk were evaluated for their crop tolerance and efficacy to meet PMRA minor use requirements. In 2006, Battalion, Accent Total and Distinct were evaluated at several locations and all gave excellent broadleaf and grassy weed control. Currently, Battalion has been submitted to PMRA and we await word about its submission. For Accent Total and Distinct, we are awaiting letters of support from the registrant to pursue a minor use registration in Manitoba.

Goal 4: Corn requires an adequate and balanced supply of plant nutrients to produce high yields of quality grain. A project to evaluate the effectiveness of ESN urea, as opposed to non-coated urea, was initiated in 2005.

ESN is manufactured by Agrium (Calgary, Alberta, Canada). ESN is a polymer coated nitrogen (N) urea granule that releases its N by diffusion through the polymer coating. Diffusion is controlled by soil temperature and moisture; primary factors in crop growth and N demand. This mechanism of release allows the N supply to be more closely programmed to crop needs.

Two sites were planted to corn in 2005 and 2006 (Carman and Reinland). The general trend was for the N status of the corn to be higher where ESN was the N source, as opposed to urea. Yields at Carman tended to be higher where ESN was applied, but not always statistically significant. The same tend was evident at Reinland in 2005, but yields overall were considered poor due to flooding and water stress. For 2005, it appeared that ESN protected the early season N availability, but that once corn plants rooted deeper, there was ample N available to offset N loss that may have occurred from regular urea.

Similar results were found in 2006 for both sites. The two year average yield data would suggest that despite N loss potential conditions, the ESN – N was not performing much differently from regular urea. Again it appears that the large amount of soil nitrate – N was precluding the need for early season protection of applied N, by using ESN – N.

Under the study conditions present, the use of ESN – N protected the early season N supply, but higher plant N status did not always translate into extra yield, as seasonal shortfall was met by nitrate – N contained at depth in the soil.

Other Activities:
In August of 2006, the MCGA held their Summer Agronomy Tour. The hybrid evaluation trial, plant density trial, ESN trial and Battalion herbicide trial at the Carman site were toured by over 50 producers and industry representatives. The tour wrapped up at the U of M Research Farm west of Carman with a tour of the herbicide plots of the Crop Diagnostic School and a BBQ lunch.

The MCGA, in cooperation with the National Sunflower Association of Canada and the Manitoba Pulse Growers Association, held the 1st Annual Special Crops Symposium in Winnipeg, MB at the MacDon Center in February 2007. Results from the 2006 trials were presented to hundreds of producers and industry representatives.