Cost Benefit Analysis for Using Climate-based Models as a Risk Management Strategy in Saskatchewan



Submitted to the Prairie Farm Rehabilitation Administration

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Executive Summary

The feasibility of developing a system that allows the agricultural sector to develop and use climate-driven risk management products to help Saskatchewan farmers was examined. Through the examination of a system that is presently working in Manitoba, it was found that, with certain adjustments, such a system could also work in Saskatchewan.

In examining financial issues, it was determined that the system should be developed in a progressive, five-year phase-in. In examining grower and independent crop input retailer interviews conducted for this study, it is apparent that a user-pay system would be feasible. In interviews conducted with life sciences companies, with crop insurance people and other agencies, it is apparent that other stakeholders would be interested in supporting or using the products that would be developed from such an enterprise.

Overview

All agricultural economies around the world must deal with weather risk. In the case of Saskatchewan, weather risks come in the form of drought, heat, wind and frost. Weather-related losses to Saskatchewan's economy and to specific growers come in the form of reduced yield, lost crop quality, and in livestock feed deficits. Losses due to weather also manifest themselves in the form of climate-driven pest or disease events that damage crops and lead to subsequent income losses.

Given the importance of the agricultural sector to the economy of Saskatchewan, it has always been important to monitor and manage weather risks. Policy makers, farm support personnel and farmers need three broad tool sets to deal with weather impacts on the economy or on specific farms. These include (1) public policy instruments and programming, (2) financial risk management tools and (3) agronomic management tools. All of these are important at one level or another, either in terms of agricultural policy or in terms of individual field or pasture management. Each depends on having an adequate system in place for measuring the vagaries of weather as they pertain to agricultural production.

Farmers in other areas of North America (Oklahoma, North Dakota, Manitoba, Nebraska, Colorado, Kansas, South Dakota, Texas, Arizona) are using information models that help them manage weather risks associated with growing their crops and pastures. These information models are delivered to farmers on a regular basis through maps or charts that show them how 'invisible' threats (drought, disease) are impacting their crops in near real time. These knowledge products are powered by climate data that is collected in highly localized stations that collect data on multiple weather variables that are impacting the immediate area surrounding the farm. By using them, the growers can make better, timelier decisions on weather related decisions on input expenditures, livestock feeding plans, crop marketing and yield potentials. This capability also has the potential to assist those who help farmers (extension personnel, suppliers of crop inputs, crop insurance agencies) to more effectively respond to drought, manage existing farm water supplies, create new risk management tools, detect and react to large scale production threats, and deliver accurate and crisply executed agricultural policy.

Weather monitoring in Saskatchewan requires a review. The current technology relies heavily on a synoptic network of 32 Environment Canada stations along with a volunteer network. The number of these synoptic stations has trended towards lower numbers over the past few years. The most advanced capabilities within this science are not available to Saskatchewan growers. The purpose of this investigation is to assess and evaluate the benefits and costs associated with bringing such capabilities to Saskatchewan.

Of the jurisdictions currently using this technology, (powered by mesonet technology[1]), the closest in proximity to Saskatchewan is Manitoba. As well, Manitoba has had the most success of any jurisdiction mentioned above in engaging multiple stakeholders in an economically sustainable, credible and carefully built climate data collection system. As such, this study will explore the Manitoba case in Phase I. Then the lessons, challenges and successes from the Manitoba experience will be overlaid onto Saskatchewan's circumstance and will be discussed in Phase II of the report.

[1] Meso=intermediate, net=network.

Phase I
Case Study – Manitoba's Agrometeorological Centre of Excellence

Historical development of ACE

In 2000, the Carman Development Corporation formed a non-profit corporation called the Agrometeorological Centre for Excellence (more commonly referred to as "ACE"). Incubated as a pilot study with potato growers in the area, the corporation received funding from both private sector and provincial government agencies and was charged with the responsibility of developing useful weather-driven decision tools for potato farmers on a not-for-profit basis.

Initially, ACE was funded by key partnerships with the following entities;

- Manitoba Agriculture and Food
- ADCON Telemetry (Austria), the company that manufactures climate-monitoring equipment.
- Industry partners who would provide advertising revenue, sponsorships and other revenues.

Manitoba Agriculture provided operating funds and staff who assisted with ground-truthing the agronomics of the models for use in the field. ADCON provided the technical expertise with respect to the equipment and the telemetry. Industry partners such as Bayer, Aventis and the Keystone Vegetable Growers Association, provided funding, sponsorships and other support.

Start-up cost needed to initiate the system was estimated to have been $2 million. The provincial government contributed $1 million of this but then was credited with $276,000 per annum worth of discounts on equipment and cost-free access to data. Approximately $400,000 in costs was contributed in the form of expertise from the province (salaries of specialists etc).

The ADCON system used by ACE was composed of a series of climate data-collection stations that were located in or adjacent to fields. These stations consisted of sensors that recorded temperature, precipitation, relative humidity and leaf wetness. These sensors recorded these variables every 15 minutes in field and these readings were transmitted via FM to a computer at ACE head office in Carman, Manitoba.

As the program evolved, windspeed recorders, global radiation sensors and a soil moisture sensor were added. This enabled ACE to develop a wider range of products for use in crops beyond the initial potato and late blight products.

For maximum efficiency, the stations were configured so that 15 of the stations were equipped with data storage device/relay devices. These 15 central station collected and relayed data from up to four other ADCON stations that surrounded the central station in fields in a radius of anywhere from 8 to 20 kms. A description of selected ADCON sensors used in Manitoba is found in Appendix I of this report. Specifics dealing with the configuration costs and competing technologies will be discussed in Phase II of this report.

The life history of ACE's commercial activities to date can be divided into three phases, given in Table 1.

These phases describe organizational development benchmarks of the company and show the pathway that climate driven weather products for farmers have taken in that province. Generally speaking, the pathway has involved public sector involvement at the outset, then a gradual phase-over to a stand alone organization that sustains itself financially by (1) producing products that are climate data driven then (2) selling these to customers who are willing to pay for them.

Table 1. Phases of development of ACE

Phase	**Activities**	**Funding sources**
Pilot project - incubation (1997)	ACE provided crop growth and disease models to potato growers. A key activity was the ground truthing of potato disease model recommendations to local conditions	Primarily 'term funding' in nature, with funds from the equipment manufacturer in the form of reduced cost for equipment. Direct cash contributions for start up were $50K from processors and $100K from the Keystone Vegetable Producers
Market entry preparation (1998 - 2001)	ACE prepared and tested products for use in larger field crops. Refined potato products.	In this period, ACE obtained funding from sponsorships, subscriptions from potato growers and from government assistance.
Wide market entry (2002)	Launch of climate-driven products into larger scale field crop market.	ACE to exist as stand alone, with fees from subscriptions to data and from sponsorships.

Pilot study – incubation in the potato industry

Initial efforts at product development centred on potato production. The crop has a high requirement for inputs - not least of which is fungicide application for disease control. Potato growers in Manitoba spend $184/acre on several applications of fungicides. For ACE, that meant that there was a large opportunity to advise growers on the climatic data implications on the farmers' spraying schedules-specifically for late blight control.

In 1997, ACE installed 25 climate data collection sites throughout the potato-growing region of Manitoba. These were spaced at 11 to 14 km intervals throughout the potato areas in southern Manitoba. This was deemed to be of sufficient density to allow for accurate collection of data on key climate factors including leaf wetness, relative humidity, temperature and total solar radiation. All of these factors are recognized as being critical to decision making in potato crop management.

Market entry preparation – refining the potato products and development of canola and wheat products

From 1998 through to 2001, the potato mesonet continued to evolve and grew to a 49-station mesonet by 2001. By that year, the system had allowed for payment by farmer subscription. In 2001, approximately 20 potato growers were purchasing subscriptions for the potato products. Purchase price ranged from $400 up to $625 per station. Most growers chose two stations worth of data.

The key products developed included a crop growth model and a late blight forecasting system. Farmers utilized this information in one of two ways. They could (a) receive updated forecasts on blight risks within their crops (sent by fax or email) or (b) they could download their own software from an ACE Internet site and analyze or examine real time climate data from their site.

The data was widely used by the potato growers, who received bi-weekly faxes updating them on the progress of their crop and the real time risk of late blight in the area.

Of the growers who indicated that they used the ACE mesonet, most stated that they did not religiously adhere to the spray application recommendation through the whole season. Rather they used the recommendations in order to allow them to 'hold off' their weekly spraying until later in the season. Many growers employ custom or aerial application companies to spray their crops with fungicides at regular intervals and are reluctant to change the regular scheduling of this business arrangement. The unpredictability of weather-dictated spraying is a feature that the farmers felt that their custom applicators would not accept. Thus the chief savings were in that the ACE system permitted the growers to hold off the scheduled sprayings for days or weeks and save money by shortening the duration of regular sprays over the season.

No quantitative customer satisfaction surveys have been carried out by ACE on these growers. One case study grower showed that his savings were approximately $30,000 (gross) per season in reduced spray cost through the use of ACE data. These savings came from deferral of unnecessary spray applications.

Wide market entry

Even as the use of ACE technology in potatoes was becoming more widespread, the company was developing climate driven products for wheat (crop growth and fusarium modelling) and canola (crop growth and sclerotinia modelling)

The canola and wheat products were introduced to the market in the period from 1999 through 2001, in the form of weekly maps predicting the severity of these diseases and the timeliness or need to spray for them. Funding for the program arose from sponsorship sources including the provincial government, Bayer and Dupont.

The mesonet required for these crops is different than that required for potatoes because the sensors for potato crops must be deep within the crop microclimate created by the potato canopy. Thus a new network was required. In order to cover the wheat and canola growing regions of Manitoba, ACE knew that they needed to have stations close enough together to mitigate against erroneous interpolations. This meant a density of no more than 20 km (8 miles) between stations and a target of 200 stations in order to cover off the bulk of the growing area of Manitoba. The issue of erroneous interpolation is a major consideration for weather monitoring plans in Saskatchewan and is discussed in the next section - *'Key learnings from the ACE experience in Manitoba'* and in Phase II.

These stations were emplaced over a four-year period, growing from 40 in 1999, to 80 in 2000, and to 200 in 2001. The funding for the capital costs for installing these came from a provincial government grant of $132K, a grant of $32K for flood forecasting from the Ministry of Natural Resources. The remainder came from two sources;

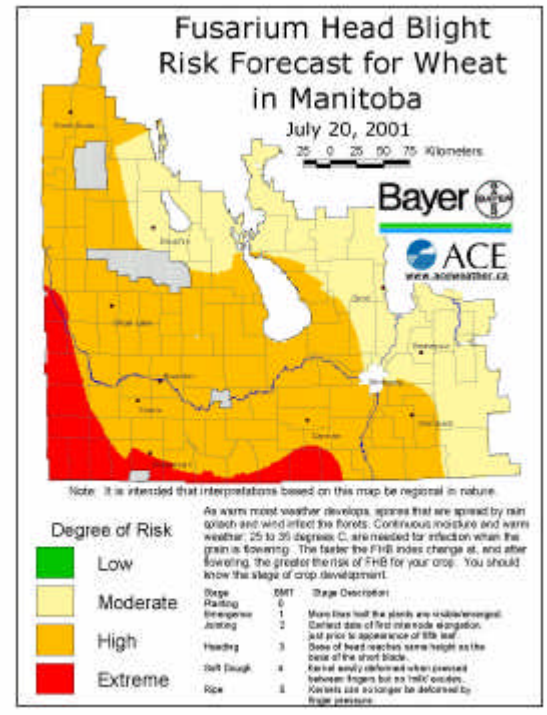
- Subscriptions. Fees that farmers paid to have faxed daily analysis of data from stations adjacent to, in proximity to, or actually on their farms.
- Sponsorships. Fees paid by agricultural organizations such as crop input suppliers or farm organizations in exchange for recognition as supporters of the product of interest.

Targeted number of subscriptions for the year 2002 is about 250, with the fee per grower averaging $1250. This will, if attained, generate revenue of $319K. As well, past contributions through advertisers and corporate sponsors has been $150K per year for the large-scale field crops. Budgeted number for 2002 is $250K.

It should be noted that while some may view potatoes as highly valued and thus more likely to financially carry a high-cost high-tech system like a mesonet, ACE did not find this to be a paradigm that withstood logic. The organization found that the corporate community was willing to place a very high value on the crops that cover millions of acres. In the case of ACE, corporate sponsorship was heavier in the field crops in total than in the smaller acreage crops like potatoes. An example of a

product that was underwritten by a life sciences company, namely Bayer, is given in Figure 1. The product involves a fusarium head blight forecast. Fusarium head blight represents a significant threat to wheat and barley producers in Manitoba and has spread west to the Saskatchewan border and beyond. Timing of spraying is tricky and must be predicated on weather.

Figure 1. Sponsorship opportunities were a key revenue stream for ACE.



An examination of the potential value for field crops in Manitoba versus potatoes shows why ACE and its sponsors were so interested in the market potential of ACE products in cereals and oilseed crops.

Last year, the farm gate value of potatoes in Manitoba was $140 million versus canola at $525.4 million. Cost of controlling late blight in Manitoba potatoes was $16.8 million versus the cost of spraying of sclerotinia in Manitoba canola at $64 to $108 million. The potential value to the province's farmers was (and is) far greater in field crops than in potatoes.

Examining that case for an individual farm, a comparison of the potential value of ACE disease products is given in Table 2. As well, the opportunity to forego a single spray operation in the field crops represents a far greater proportion of the farmers' margin per acre in canola than in potatoes for example. From the data in Table 2 it is apparent that the size of the opportunity for saving money through reduced spraying

in canola represents 20 percent of the farmers total operating costs in canola, versus only 15 percent in potatoes.

Table 2. Cropping budgets and the cost of disease control in potatoes vs. canola.

Parameter	Potatoes	Canola
Average yield[1]	260	28
Average price[2]	$ 7.00	$ 6.00
Gross (yield*price)	$1,820.00	$ 168.00
Cost of fungicide[2]	$ 184.00	$ 21.15[3]
Operating costs[2]	$1,220.00	$ 105.00

[1] Canola in bu/acre, potatoes in cwt

[2] Avg .from Manitoba Agriculture and Food cropping budgets

[3] Cost is for a single application.

The main difference in terms of the likelihood for a grower to utilize information services like ACE lies in the differences in business approaches that have been used by farmers in the past in the two industries. Farmer custom and business habits will be discussed in more detail in Phase II of this report. For now, however, an analysis conducted by Ipsos Reid is submitted which speaks to the predicted market penetration for ACE products on non-potato farms in Manitoba. The full report is given in Appendix II. As a summary however, the findings are filtered through a "Probability of Product Trial" equation by Funk et al. at the University of Guelph. The summary is found below in Table 3.

Essentially the survey shows that the population of 3000 plus acre farmers who grow cereals and oilseeds and who possess email addresses or faxes, will pay for the product on a trial basis. If the product is priced at $800 per season, only 33 percent will try it. If the product is priced at $500, 50 percent will purchase and try it.

Table 3. Predicted market penetration of ACE product into large farms in Manitoba at various price points.

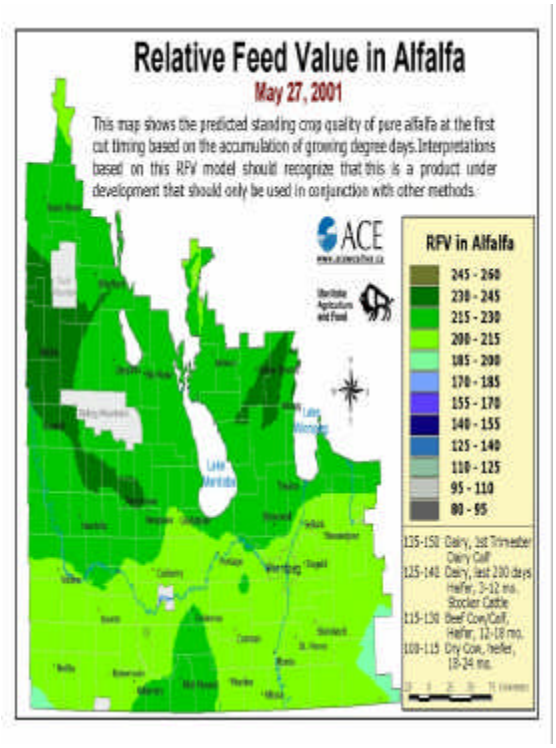
Response category	Pricing				
	Factor[1]	**$ 800.00**	**$ 700.00**	**$ 600.00**	**$ 500.00**
Very likely to purchase	0.85	0%	0%	8%	32%
Somewhat likely to purchase	0.67	24%	28%	28%	12%
Somewhat unlikely to purchase	0.33	16%	12%	16%	24%
Very unlikely to purchase	0.2	60%	60%	48%	32%
Predicted market share at the price		**33%**	**35%**	**40%**	**50%**

[1] These are multipliers that are applied against the actual populations that fit into each category and then summed to predict trial use. They were developed at the University of Guelph to predict trial use of new products at various price points.

Non- field crop roles of ACE

As the organization has grown, it has developed early phase products in non-field crop areas. The mesonet has potential usage in terms of generating products that are of use to livestock producers. Although ACE has not marketed feed information on a large scale, there are strides that have been made in the livestock front. The data in Figure 2 gives relative feed values for areas across Manitoba. The only step that would need to be made in terms of product development lies in the packaging of the data into individual farm tables as opposed to provincial maps. This effort appears not to have been the highest priority of focus for ACE as they developed other key products.

Figure 2. Use of climate data in a livestock support function.



To date, ACE has not entered the area of product development for risk management-specifically crop insurance. The Manitoba Crop Insurance Corporation has not been involved with developing products on a direct basis with ACE to date. Crop insurance management indicate that they feel that the use of ACE products by growers has led to timelier spraying of potatoes and field crops and thus reduced losses.

MCIC is currently studying the market potential for Single Peril Insurance products that would be powered by data from ACE. These weather derivative products would gather data from ACE stations and pay farmers out on measurements taken at the stations. For example, a Portage la Prairie area grower would purchase either 'Drought Insurance' or 'Excess Moisture Insurance', with his payout determined by

the rainfall readings at ACE stations in his area. MCIC would purchase this data from ACE.

The advantage of this to MCIC would be in reduced administration, less time measuring bins, and quicker payouts. The disadvantage is that it is only a single peril insurance form and does not assist either MCIC nor the farmers in the non-rainfall related insurable losses routinely encountered in Manitoba. (Rainfall related losses are historically only about one-quarter to one-third of losses.) It should be noted that this initiative is only in the discussion phase.

Key 'learnings from ACE in Manitoba

1/ Too sparse of a weather data collection system leads to misdiagnosis of on-farm problems.

ACE quickly discovered that a sparsely spread climatic data collection network has the potential to misdiagnose crop problems and crop health and to give faulty readings to (1) crop and livestock producers, (2) to those setting policy in times of drought, and (3) to any crop insurance initiative that would use the data derived from the network.

This finding has profound impact on the current state of weather data collection in Saskatchewan and the appropriateness of its use. This will be discussed in Phase II of this report.

To illustrate this, see Figures 3 and 4. These depict climatic conditions during the same week in the Carman, Manitoba region. Crops in the area include corn, canola, cereals, sunflowers, potatoes, beans and flax. Figure 3 is a rainfall map constructed through the use of Environment Canada stations at Carman, Winnipeg (60 kms away north east of Carman) and at Morden (about 30 kms from Carman). Figure 4 is the same precipitation measurement performed using ACE stations in the region. The ACE stations are located at distances varying form 8 to 20 kms apart.

The sparseness of the Environment Canada stations has led to an under measurement of precipitation in the area. About 15 percent of the geography actually received 60 to 110 mm of rainfall at a time when the Environment Canada stations were interpolating a 40 mm rainfall event. This is of an error of a size and dimension that is greater than a mere local squall or thunderstorm. The error would have had a major impact on any disease models if those would be derived from the data. It also would have misled policy makers had there been issues relating to livestock feed supplies due to drought, excess moisture etc.

The error associated with faulty interpolation of weather data is called 'bogussing error' and R. Raddatz and J.L. Kern of Atmospheric Environment Service raised this source of error as a concern back in 1984 in a paper published in Atmosphere-Ocean Volume 22.

This finding calls into question the current use of disease forecasts and crop growth models in Saskatchewan and Alberta, where Environment Canada stations have been relied upon to fuel mapping data for disease prediction.

Figure 3. Environment Canada measurement of rainfall in the Carman growing area

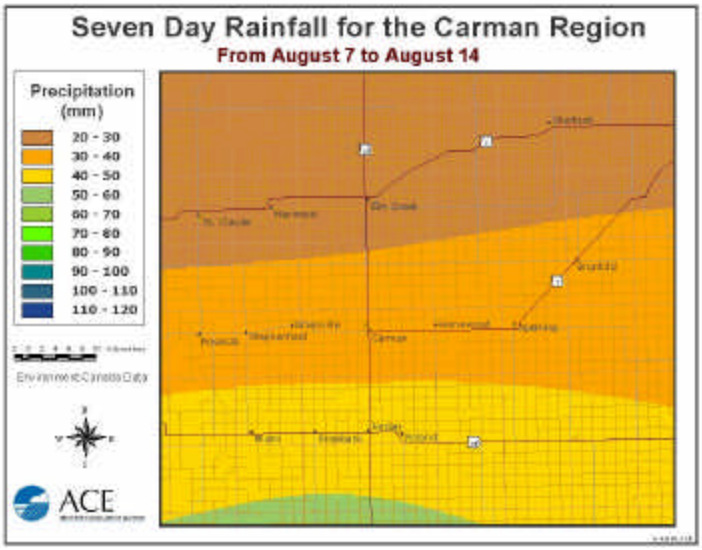
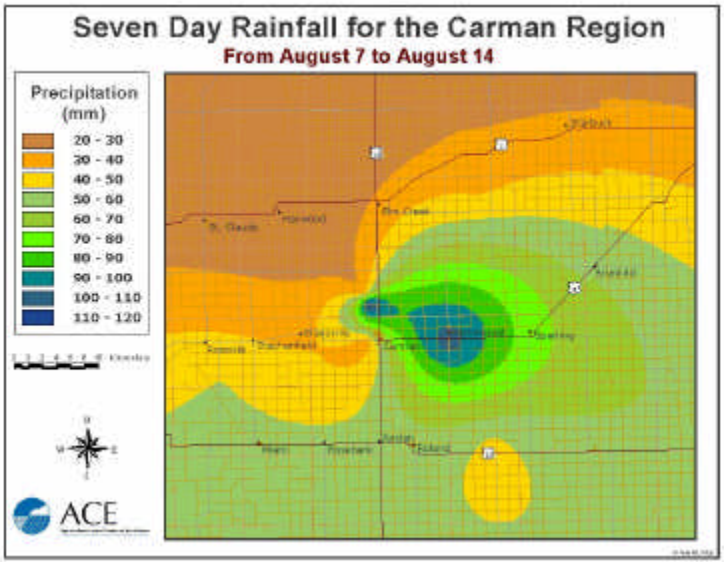


Figure 4. ACE measurement of rainfall in the Carman growing area



2/ It is possible to 'incubate' a mesonet with public sector involvement and have it graduate towards a self-funding status.

A breakdown of the funding sources that ACE has used over the past few years (Figure 5) shows that the group managing the organization is successfully shifting the project over to a user-pay system. The actual dollar amounts are given in Table 4.

Subscriptions to farmers have grown from representing only 2 percent of overall revenues in 2000, to 48 percent in 2002. Sponsorships through advertising have gone from covering 22 percent of revenues to 37 percent in the same two years. Grants that totalled 61 percent in 2000 will represent only about 1 percent of revenues in 2002.

Figure 5. General funding sources for ACE

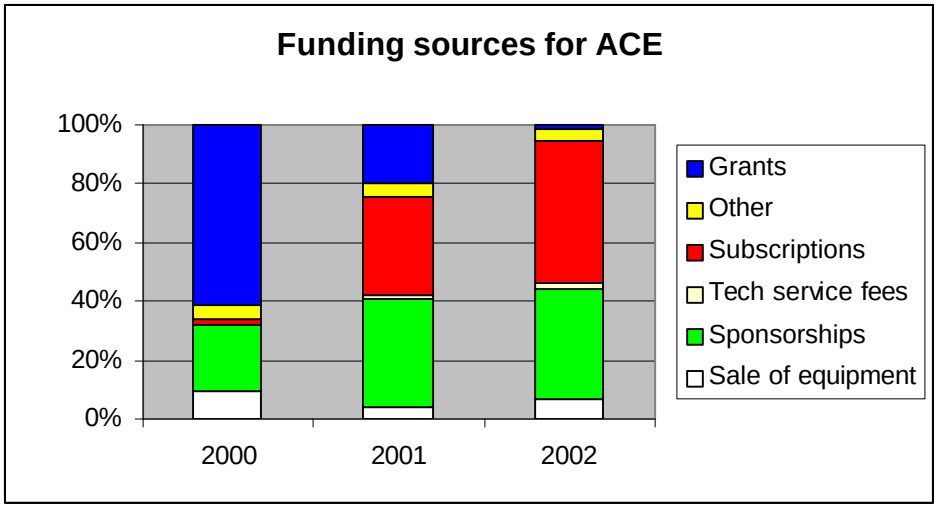


Table 4. Revenue sources for ACE. 2000 through 2002(E)

Revenues	2000	2001	2002
Sale of equipment	$ 30,000.00	$ 25,000.00	$ 45,000.00
Sponsorships	$ 70,000.00	$ 245,000.00	$ 250,000.00
Tech service fees	$ -	$ 7,000.00	$ 15,000.00
Subscriptions	$ 7,000.00	$ 225,000.00	$ 319,000.00
Other	$ 15,000.00	$ 30,000.00	$ 30,000.00
Grants	$ 190,000.00	$ 130,000.00	$ 8,000.00
Total	**$ 312,000.00**	**$ 662,000.00**	**$ 667,000.00**

3/ ACE required a cooperative approach between the public sector and private sector during startup phase and would probably not have been able to successfully launch without that approach.

Capital costs for startup, and the time required building and customizing models meant that patient capital in the form of a public and private sector shared effort was key to this entity gaining a solid financial footing. A financial analysis performed on performance metrics of ACE is presented in Appendix III.

The analysis from (1) asset turnover (2) net margin ratio (3) return on investment and (4) cash flow shows that the financial performance of ACE's model easily allows it to be self sustaining, but that this self-sustaining point would not have been reached had the involvement of both the public and private sector not been enrolled for the first four years.

4/ To graduate to a 'user pay' system, it is necessary to have a product focussed, market-driven approach – not an engineering/technological approach.

There would have been two approaches possible in setting up the Manitoba mesonet. One would have been a technology-based approach, wherein the parties involved in setting up the project could have taken a "build it and they will come" approach.

In this approach, focus is placed on the mesonet itself, with an assumption that there are sufficient opportunities downstream to justify a complete build.

The second approach would have been a marketing-focussed approach. In this second approach, a mesonet would be built and grow only where a proven business model supported by marketing data supports the program. Attention would be given to the essential elements of marketing and market penetration. The emphasis on this approach is not on the mesonet itself but on the actual deliverables.

An example of the first approach, a technology-based approach, is that of the mesonet built in Oklahoma. This case is outlined in Appendix IV and is included in this report only to serve as an example of how a technology-based approach will generate an excellent system, but one that has not been able to pay for itself through a user-pay system. In that system, two universities started the mesonet, using the cooperative efforts of a number of public sector agencies. But the system managers in Oklahoma have struggled to understand why farmers have not become paying customers in significant numbers once it was built.

It is clear that ACE has chosen the latter approach, namely the marketing-focussed approach. They have built their system on a small acreage crop basis first, learned from it, and used resources to begin work on larger acreage opportunities.

There are shortcomings in ACE's use of the classical marketing approach. But there is no doubt that the personnel involved in the project have attempted to 'grow' the system in a way that justifies itself through generation of products that add value to the farm sector.

5/ Current data suggests a mixed revenue model is necessary once the stand-alone phase is reached.

The agricultural sector is no different than the rest of society when it comes to 'user pay' approaches to selling information-based products. Historically speaking, ACE in Manitoba must address the fact that there has been a century of farmers perceiving that they were receiving 'free' information provided by government extension services and from chemical companies and livestock and crop supply companies. The concept of paying hundreds of dollars for information products is not widely embraced.

Nonetheless, things are changing. Extension services now routinely charge for publications and information meetings. Thinner margins that come with genericization in the crop supplies business are leading to innovation in the dealer sector with respect to user pay services for field scouting etc.

Given that these trends are unfolding slowly against a backdrop of decades of conditioning farmers to not pay for this type of service, it is wise for ACE to continue to attract revenue from two streams and not too rely on farmer subscriptions for 100 percent of revenue.

Data collected for this report gives the actual predicted market penetration for ACE products at several price points in Saskatchewan. These data were attained through an Ipsos-Reid survey conducted in March 2002. It is clear that additional sourcing of funds needs to be found beyond subscription in the short term. To date, larger corporations who serve farmers have found satisfaction in supporting ACE. Interviews with them indicate that they see will continue to actively support ACE product promotion through sponsorship. That being the case, it would appear that present funding levels would be maintained. Saskatchewan opportunities in this regard are discussed in Phase II of this report.

6/ The support of the extension service is essential in fulfilling the role of agronomic support and verification.

The provincial extension service in Manitoba serves a role as an important centre of influence. It is clear that the organization played and continues to play a central role in providing support for model development in the form of ground truthing and customization. Interviews with provincial potato specialists and with ACE show that their role was key in developing the prediction products that ACE is now in the

process of selling to farmers. Manitoba Agriculture staff also can provide frontline technical support in interpreting the results of ACE data collection.

7/ Any mesonet launched with a product focus must have a carefully planned distribution strategy to match.

If a product-focussed footing is necessary to the success of ACE, then the issue of distribution channel strategy must be addressed.

Typically in western Canada, new farm innovations are brought to the farmer through partnerships with distribution channels who have a closer relationship with the end user than does a manufacturer. Life sciences companies will carefully select vets, crop input dealers or agents, and determine whether their product launch will be broad-based or regional, exclusive or market wide.

ACE has had experiences on a small scale with a number of distribution channels. A summary of their experiences is listed in Table 5.

Table 5. ACE experience through various distribution channels

Channel	Experience
Large crop input chains (e.g. grain companies)	Positive reception to the technology but decision making lies in part or in whole at levels outside of the immediate community retailer. No adoption or embracing of the technology on any meaningful scale to date.
Public sector extension services (ag reps)	Positive influencers but this channel is not trained in the elements of the sales process. Have been proponents of the system but are not comfortable with selling. No meaningful sales to date.
Independent retailers	The most promising of the channel used to date. Independent retailers are traditionally among the first to get access to new herbicides because the founding entrepreneur is closer to the sales process than in larger organizations. Sales are currently being pursued in this channel. An example of an effort being conducted by a Souris area dealer on his website is given in Figure 6.
Grower organization	Involvement of the grower organization in the sales process has worked with the potato model, with the organization serving to provide both direct funding and an increase in sales due to assumed endorsement by the organization.
Direct to farmer	ACE has a website but the site has not led to meaningful sales as a result of ‘clicks’.

Figure 6. An independent crop input retailer in Manitoba promoting ACE on his website.

Conclusions from this chart indicate that ACE should continue to pursue the following channels;

- Distribution by independent retailers.
- Potential role of grower organizations in promoting the products

Of less immediate benefit in the actual selling process is;

- Sales by public sector staff.
- Direct sales to farmers.

For the purposes of this study, Phase II of the investigation includes data on the expectations of independent dealers in Saskatchewan. That portion of the study is contained in the Phase II portion of this document.

Phase II. The potential value, cost and potential configurations of a climate driven risk management system in Saskatchewan

Overview of an ACE-like system in Saskatchewan

The feasibility of empowering Saskatchewan's agricultural sector with the resources needed to develop climate-driven risk management products will be discussed by answering the following questions;

- What are the key issues of difference in how climate driven risk management would work in Saskatchewan versus Manitoba?
- Where are some sources of potential demand for this type of service in Saskatchewan?
- If this demand exists, what would the agronomic and scientific needs for such a system be in Saskatchewan?
- What are the financial needs for installing such a system in Saskatchewan and how those could be met in a self-sustaining way?
- Which potential partners or strategic customers have strategic interests in such a system?
- What are the key steps to take in installing and running such a system in Saskatchewan?

Climate driven risk management products in Saskatchewan versus Manitoba

There are four key comparisons that require discussion regarding how climate-driven risk management products would work in Saskatchewan versus how they are working in Manitoba. Each discussion impacts either the form or delivery of potential climate driven weather products in Saskatchewan. These need to be addressed at the outset of this portion of the report because they were comparisons that were voiced by almost every person consulted in the process of carrying out this study.

These four comparisons relate to;

- Size of geographic and scale of network required. Simply put, "Saskatchewan is bigger than Manitoba and so climate driven risk management over such a large area requires an immense amount of capital".

- Climatic differences and the impact of these on disease and risk management. Or in other words, "Saskatchewan is drier than Manitoba and so has less disease issues, thus the need for weather monitoring for disease is less."

- Yield potentials and their impact on user-pay economics. Stated as "Yield potential is lower in Saskatchewan than in Manitoba and therefore the need for high tech agriculture is less".

- Grower acceptance and attitudinal issues in Manitoba versus Saskatchewan. "Growers in Saskatchewan will not pay for information like they would in Manitoba".

Each of these issues is addressed below in turn.

Issue #1. The greater geographic size of the agricultural area in Saskatchewan

Saskatchewan's size relative to Manitoba means that any system, if put in place, would require a much larger scale of operation. Saskatchewan is about 3.5 times the size of Manitoba in terms of the size of its agricultural area. This has implications in terms of the placement of hardware across the province and the scale of support required to maintain it. But it does not make the project unfeasible because the market for the products is also larger than that seen in Manitoba.

If we take the learnings from the ACE experience in Manitoba, we can assume that a relatively dense network is required in order to capture localized conditions to the extent that is necessary to drive many risk management tools. The ACE-recommended density of one station every 20 kms means that anywhere from 700 to 1100 sites would be needed to cover the entire province depending on coverage intensity in the most northerly

areas. The figure given by the Saskatchewan Research Council in the report *'An investigation into the nature and applicability of an atmospheric science surface mesonet to Saskatchewan'* calls for 300 stations to cover the 57th parallel south with a density of only 20 to 40 kms.

In either case, the number of stations required is sufficiently larger than the Manitoba requirement so as to require more hardware and more staffing to repair or maintain the network. With that comes greater need to manage financial risks.

This could easily be achieved by growing such a program in a way that phases in the project on a regional basis that attends to specific cropping or livestock needs. This would ensure that as areas are covered, they become self-sustaining. Then the next area region could be addressed.

The larger size of Saskatchewan's geography has implications on the centralized administrative structure. These issues can be addressed by pricing and revenue strategies so that extra costs incurred in administering the area are covered.

Two things are clear when considering this:

(a) The personnel needs for system support, installation and maintenance require permanent staffing *within* the borders of the province (as opposed to the system being run from outside the province). Saskatchewan is sufficiently large as to make managing the project from outside the province unsustainable. This is the opinion of ACE managers who strongly recommended that the attention to day-to-day running of the system be staffed with people in Saskatchewan.

(b) Personnel needs must be scaled up in synchrony with the size of the service as it grows. Table 6 gives estimates for centralized personnel needs and are based on examining the infrastructure needs in Manitoba. The growth in personnel arises chiefly out of examining the resources required by ACE in Manitoba in terms of seasonal repairing, servicing or adjusting equipment. As the network grows, the number of field personnel required to maintain it grows. These needs must be factored into pricing structures for products that arise from the system.

Table 6. Staffing levels required for maintaining a climate driven risk management system in Saskatchewan

Number of stations	Staffing level (full time) required for maintaining and monitoring the system.
1 to 500	4
501 to 600	5
601 to 700	6

Issue #2. Saskatchewan's drier climate

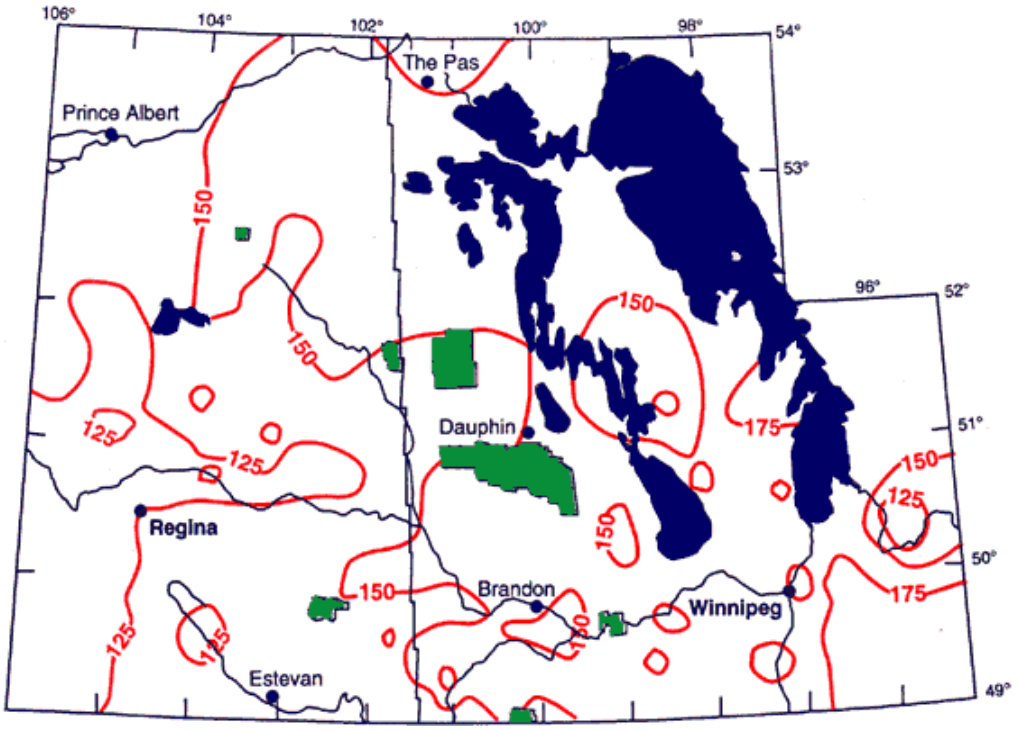
Saskatchewan has a more arid climate than a large part of the agricultural areas of Manitoba. This means different disease issues – but not necessarily less. It also means that there is a potential market for drought management products.

- There is a different profile to disease risk in Saskatchewan than in many areas of Manitoba. Any disease monitoring products driven by weather data would have to account for this. To date, sclerotinia and cereal leaf diseases require more management in Manitoba than in Saskatchewan, while Saskatchewan farmers have required more use of fungicides for ascochyta and anthracnose. This difference is due in part to weather and the impact it has on crops grown and disease conditions.

  That does not mean that Saskatchewan's drier climate means less need for disease monitoring. Provincial pathologists in Saskatchewan estimate that approximately 70 percent of lentils are sprayed with fungicides and a large portion of the chickpea crop was treated in 2002. With 1.7 million acres of lentils and 1.2 million acres of chickpeas, this means that almost as much fungicide is sprayed on lentils and chickpeas in Saskatchewan as on all crops combined in Manitoba. The size of Saskatchewan's agricultural area still allows for a large value placement on disease monitoring. It is only the prioritization of targeted diseases for this effort that is different in Saskatchewan than in Manitoba.

- There is more drought risk in Saskatchewan than the bulk of the growing area of Manitoba. The map (Figure 7) gives the 25 percent risk levels for low precipitation. As can be seen, in one year in four, precipitation levels in Saskatchewan fall between 125 mm and 150 mm. These values are 25 to 50 mm lower than those in Manitoba. Given this, there is probably greater need to develop drought risk management tools in Saskatchewan than there is in Manitoba.

Figure 7. One year in four rainfall patterns for Saskatchewan vs. Manitoba



Issue #3. General yield potentials in major crops in Saskatchewan vs. Manitoba

Yield potentials in Saskatchewan are often viewed as being lower than those achieved in Manitoba and thus it is viewed that farmers in Saskatchewan would not be receptive to high technology, high input agriculture.

This is a dated overgeneralization. It is true of some of the major crop comparisons but not all. As growers adapt to new crops like chickpeas, and continue to master lentil production, it is apparent that farmers in Saskatchewan can and do produce crops as effectively as those in neighbouring jurisdictions, and thus probably have the same need for high tech tools.

For wheat and canola, the 20-year average yields in Saskatchewan are indeed lower than those seen in Manitoba (Table 7). In the case of wheat, Saskatchewan yields are 4.8 bu/acre lower on average. With canola, Saskatchewan yields are 2.5 bu/acre lower on average. But for lentils, the yields attained in the two provinces have been approximately equal and it could be argued that Saskatchewan farmers grow lentils far more effectively than Manitoba farmers. Agronomists also indicate that chickpeas will likely thrive as a crop over the long-term to a greater degree in Saskatchewan than in Manitoba.

Table 7. Long-term average crop yields – Manitoba versus Saskatchewan

Crop[1]	Manitoba	Saskatchewan
Spring wheat (bu/acre)	31.8	27.1
Canola (bu/acre)	23.8	21.4
Lentils (lbs/acre)	1109	1170

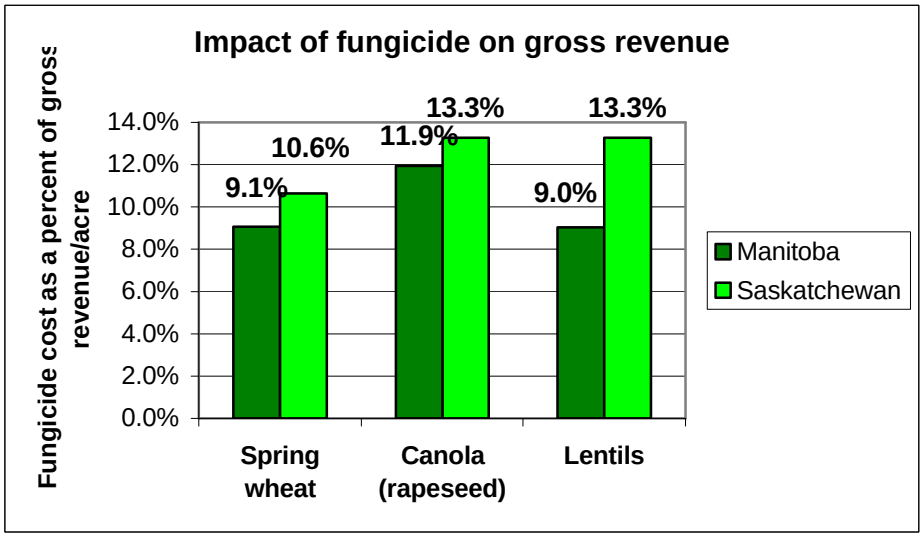
[1]Wheat and canola are 20-year averages. Lentils are 10-year averages, with very low acreage for lentils in Manitoba since 1998.

There is a compelling business case to be made for grower use of climate driven disease management models in Saskatchewan's dry climate. This case is particularly strong in the case of disease monitoring in chickpeas and lentils, and equally strong in the case of disease monitoring in canola and wheat in areas where disease is an issue on these crops (eastern portions of the province).

In the areas of Saskatchewan that are seeing a rise in new diseases, it is more important to these growers that they make sure that their dollar expenditures on fungicides are well-placed. Fungicide costs as a percentage of total revenues are higher in crops which are affected but which have lower yield potential (Figure 8). Having good information on the wisdom of spraying and the application factors that maximize control measures is more important to growers who are managing a tighter margin than those who are not. If, as is commonly held, disease risk goes down in crops with less potential and less vigorous canopy, then the growers need to monitor this fact as well.

There is also a good business case to be made for developing climate driven insurance derivatives. For those crops that do have a lower potential yield due to lower rainfall, Saskatchewan growers would benefit from enhanced drought insurance products driven by climate data. This is especially so in rangeland situations, where loss measurement issues have prevented cost effective coverage for growers afflicted by drought.

Figure 8. When needed in a crop, fungicide expenditures impact more heavily in Saskatchewan than in Manitoba



Issue #4. Farmer attitude towards user-pay models for information.

One of the recurring and underlying perceptions encountered during the course of the study was the repeated assumption that Saskatchewan growers would accept or adopt this technology at a more gradual pace than that of Manitoba's growers.

Focus testing with Saskatchewan farmers was conducted in the first half of March 2002 to gather data that would test whether the targeted market of Saskatchewan farmers would pay for this service. The findings of this suggest that the predicted trial use in Saskatchewan will be very similar to that seen in Manitoba. In other words, large, progressive farmers in Saskatchewan will adopt the technology at the same rate that large progressive farmers will in Manitoba.

These results are discussed under *Potential demand sources for climate-driven risk management tools in Saskatchewan* and a full text of results is given in Appendix V.

Potential demand sources for climate-driven risk management tools in Saskatchewan

Interviews conducted with a broad range of agricultural interests in Saskatchewan suggest that there are potential demand sources for climate driven risk management products in Saskatchewan. Some of these benefits are similar to those in Manitoba. Others are additional opportunities that Manitoba does not have.

Demand source #1. Crop insurance alternatives - enhanced ability to deliver responsive, flexible risk management tools

Throughout its 40-year history, Saskatchewan Crop Insurance Corporation (a crown corporation under the auspices of the provincial Ministry of Agriculture) has been responsible for delivery of risk management products to farmers. The group plays an important role in helping growers to minimize the impacts of severe losses due to weather related perils.

Climate driven risk modelling would provide the group with a whole new level of capabilities in terms of meeting farmers' needs for weather insurance.

When it comes to insuring farmer's crops, one of the limitations in providing new and innovative products has been the measurability of the risks and benefits of potential products. As an example, in the past it has been difficult to insure native pastureland. To measure loss, it was necessary to perform highly intensive sampling on the pasture species themselves, which are present in complex ecological communities. This meant that livestock producers on approximately 16 million acres of native range could not avail themselves of key risk management tools.

Using intensively collected climate data allows these measurements on certain single peril products. Growers could purchase insurance for their rangeland based on quantitative measurable parameters such as inches of rain. These measurements would be taken from the farmer's choice of nearby climate collection stations. The advantage of such a product is that it is easily measurable and is not cost prohibitive in terms of the labour required to measure loss.

This approach was taken in a pilot study in the area surrounding Assiniboia Saskatchewan in 2001. Growers could purchase insurance based on weather station data and insure themselves against the risk of the area receiving less than 80 percent of normal rainfall (based on long-term averages). If the area did receive less than 80 percent of normal rainfall, a payment of $10/acre was triggered.

The program was extremely successful with grower participation being very high. The allowable numbers of applicants (there was a limit imposed) was reached two full weeks before the program deadline of March 31st.

In 2002, the program was expanded to cover the areas serviced by 81 stations (see Table 8) and was also expanded to cover off annual crops as well as forages. At the time of writing, grower demand for these products had not been judged because the program had just started. The table shows the premium rates that growers pay to receive the coverage for the amount listed at the top of the respective columns.

The potential for other single peril risks could also include risk management product that would help canola growers mitigate the risk of excessive heat during mid-summer. Canola yield is severely impacted by hot weather in mid-summer when flowering and early pod set is occurring. The parameters under which this occurs are well established from a science and agronomy standpoint. The actuarial aspects of temperature risk are also known. All that is needed is a localized, accurate measurement of temperature parameters.

Saskatchewan Crop Insurance currently is using a combination of volunteers who take measurements at some stations, Environment Canada stations and ACE-installed stations. It is not a hard case to make that this program probably requires a professional network as opposed to a volunteer network.

Table 8. Saskatchewan Crop Insurance usage of weather-driven derivatives for risk management for Saskatchewan forage producers

Station	Native	Tame	Station	Native	Tame
	$7/acre cvg	$9/acre cvg		$7/acre cvg	$9/acre cvg
ANEROID	0.64	0.82	MELFORT	0.8	1.03
ASSINIBOIA	0.6	0.77	MELITA	0.41	0.53
ATWATER	0.55	0.71	MOOSE JAW	0.84	1.08
BALCARRES	0.64	0.82	N BATTLEFORD	0.42	0.54
BENSON	0.47	0.6	NIPAWIN	0.54	0.68
BICKLEIGH	0.51	0.65	OUTLOOK	0.64	0.83
BIGGAR	0.48	0.62	OXBOW	0.52	0.67
BINSCARTH	0.38	0.48	OYEN CAPPON	0.67	0.86
BROADVIEW	0.51	0.65	PELLY	0.49	0.62
BUTTE S P	0.5	0.64	PIERSON	0.49	0.62
CARLTON	0.51	0.66	PRINCE ALBERT	0.56	0.72
CODERRE	0.72	0.93	REGINA	0.63	0.81
COLD LAKE	0.47	0.6	ROBLIN	0.39	0.49
CORONACH	0.58	0.74	ROCK POINT	0.53	0.68
COTE	0.38	0.49	ROSETOWN	0.57	0.73
CYPR HILLS	0.76	0.97	SASKATOON	0.65	0.84
DAHINDA	0.72	0.92	SCOTT	0.31	0.4
DUVAL	0.69	0.9	SHAUNAVON	0.51	0.66
ELBOW	0.59	0.75	SWAN RIVER	0.37	0.47
ELKHORN	0.37	0.47	SW CURRENT	0.56	0.72
ELROSE	0.57	0.74	THE PAS	0.44	0.56
EMPRESS	0.62	0.79	TUGASKE	0.63	0.81
ESTEVAN	0.69	0.89	UNITY	0.45	0.58
FENWOOD	0.62	0.78	VAL MARIE SE	0.55	0.71
FLIN FLON	0.49	0.64	VIRDEN	0.45	0.57
HARRIS	0.57	0.74	WASKESIU	0.55	0.7
HUDSON BAY	0.53	0.69	WATROUS	0.54	0.68
HUMBOLDT	0.55	0.69	W POPLAR RIV	0.28	0.36
INDIAN HEAD	0.82	1.06	WEYBURN	0.58	0.76
KELLIHER	0.66	0.85	WILLMAR	0.3	0.39
KINDERSLEY	0.52	0.67	WYNYARD	0.68	0.87
LAST MTN	0.65	0.84	YELLOW GRASS	0.58	0.73
LEADER	0.4	0.51	YORKTON	0.52	0.68
LEROY	0.59	0.76	RM 496	0.55	0.71
LLOYDMSTR	0.4	0.51	RM 335	0.48	0.63
MAFEKING	0.14	0.18	RM 8	0.44	0.56
MANOR	0.4	0.51	RM 19	0.53	0.67
MAPLE CR NO	0.34	0.43	RM 169	0.41	0.53
MCKAGUE	0.34	0.44	RM 561	0.37	0.48
MEADOW LAKE	0.34	0.44	RM 442	0.34	0.44
MEDICINE HAT	0.59	0.76			

Demand source #2 - Better disease risk assessment by farmers

The scope of the effects of diseases on farmer's crops in Saskatchewan is large. Furthermore, according to plant pathologists, there are new disease problems in the province (Fusarium Graminearum). Last year (2001) saw large-scale requirements for ascochyta control in some pulse crops. The ingress of Fusarium Graminearum means that the growers on the east side of the province will require tools to manage this cereal disease which has devastated the malt industry in central Manitoba and continues to affect wheat quality.

In most of the cases above, control decisions are much more involved than they are with weed or insect control. Most disease organisms are invisible to the unaided eye thus the grower can only tell if they are in the field through manifestation of damage or through complex diagnostic techniques. With many diseases, crops may require treatment prior to symptoms manifesting themselves. It is difficult for the grower to know if the causal agent is even present in the field so he/she must rely on weather monitoring to adjudge whether the conditions prevail wherein the risk of disease is high. Without that ability on a highly localized basis, the grower has few tools.

Discussions with pathologists in Saskatchewan gave assessments as to the value of risk management tools in each crop/disease relationship. These are summarized in Table 9.

Table 9. Summary of disease relationships in Saskatchewan and estimates of the need for climate driven risk management tools

Crop	Disease impacts	Fungicide issues
Chickpeas and lentils.	Chickpea diseases are estimated to have cost Saskatchewan farmers over $40 million last year. Pathologists indicate that approximately 70 percent of the 1.7 million acre lentil crop required treatment for diseases.	Fungicides are a significant input cost ($16 to $21/acre for chickpeas, $11 to $21/acre for lentils. One dealers interviewed indicated that their growers did not notice problems until it was too late and thus mistimed their applications.
Canola	Only about 5 percent of canola requires treatment for sclerotinia. The treatment rate in the easternmost areas of the province is higher.	Sclerotinia fungicides cost $18 to $28/acre. Use decisions are difficult for growers in years and regions where the disease is prevalent because it must be treated prior to visible symptoms.
Cereals	Very low usage of products for cereal leaf diseases. The ingress of Fusarium Graminearum is going to quickly require rapid learning on the part of the growers in areas affected with regards to disease control and fungicide timing. Additionally, canary seed producers indicate that they have a high need to monitor for leaf diseases.	Fusarium control in the eastern areas of Saskatchewan will require precise timing of fungicide applications coupled with a change in cultural cropping techniques.
Peas	Opinions vary o this crop. There are pea diseases such as powdery mildew and mycosphaerella in the province. Some sources indicate that the impact of the diseases is low, others that it is severe in cases.	Some issues surrounding control of pea leaf diseases..

Will farmers pay for disease risk management models? To answer this question for this study, large acreage growers were sorted for technological adoption insofar as all had to have fax or email working on their farm. These growers were then asked the same questions with regards to the issue of climate driven risk management products as their counterparts in Manitoba. They had been faxed or emailed a sample product ahead of time.

A full text of growers' answers is in Appendix V.

This prediction of trial use is based on pricing sensitivity models developed and tested at the University of Guelph and it assigns a weighting to various levels of responses to staged pricing questions.

Table 9. Saskatchewan farmers' likelihood of purchase of disease monitoring products

Response category	Pricing				
	Factor	$ 800.00	$ 700.00	$ 600.00	$ 500.00
Very likely to purchase	0.85	0%	0%	3%	25%
Somewhat likely to purchase	0.67	18%	20%	40%	33%
Somewhat unlikely to purchase	0.33	40%	43%	28%	15%
Very unlikely to purchase	0.2	60%	60%	48%	32%
Predicted market share at the price		37%	39%	48%	54%

At the $500 per season pricing level, penetration to paying customers within the demographic chosen (i.e. large, progressive farmers)is shown to be 54 percent in Saskatchewan). The rate of acceptance goes down to 37 percent market share within the segment for the $800 per season pricing level. Note that the chosen demography (large farmers, with fax/email) is 22 percent of Saskatchewan farmers.

If we assume a pricing level approximating $600 per season (the price in Manitoba was $625) then roughly 11 percent of Saskatchewan farmers are predisposed to adopting this technology for disease monitoring purposes.

These patterns are very similar to those observed in the Manitoba study.

From this information, we can conclude that a solid, steady approach to developing these products in a way that preserves credibility of the models and is staged to manage financial risk, will find a paying audience for crop monitoring. Note as well, that this study did not attempt to cover crop insurance uses and only examines one stream of income, that being subscriptions.

Conversations with agronomists in Saskatchewan show a strongly held belief that in their experience, farmers would be highly resistant to paying for this type of service. This opinion must be taken quite seriously because senior and experienced people hold it. An issue for discussion though relates to the manner in which the technology is presented to the grower. If it is presented to the grower through public sector/growers association alliances, then the grower will expect it for free because that is what has happened for decades. If the grower receives this service from commercial channels that successfully transact hundreds of millions of dollars a year, then he/she is likely less conditioned to receiving it for free.

A focus group consisting of 10 independent retailers was held in early March to address this issue for this study. The opinions of the retailers are given in Appendix VI. The opinions range from extremely negative on whether their farmer-customers will pay for disease and crop modelling, to extremely positive. That was reflected in sales projections, with a low of zero sales to growers projected by one dealer to a high of 70 sales to growers projected by another dealer. Average of the projections was 20 to 22 farmers per dealer for the 10-dealer focus group.

Demand Source # 3 – increased ability to make and execute water management decisions

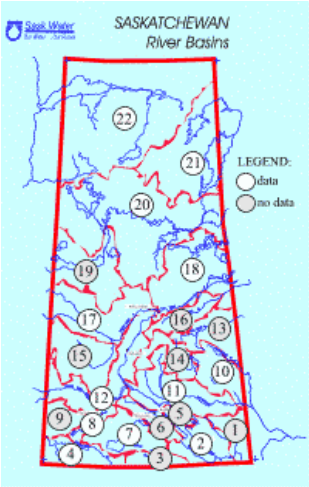
Sask Water is charged with the mandate of monitoring and managing the water resources of Saskatchewan. As such, the corporation monitors, develops, manages and protects water sources generally, and more specifically in support of the agricultural industry in the province. The corporation provides technical assistance to farmers in the development of on-farm water supplies, irrigation and drainage works and in forecasting of droughts, floods and water supply.

A significant component to being able to manage water resources is to be able to forecast streamflows and water supply. The availability of real-time climatic data is paramount to the corporation's River Forecast Center (RFC) operations and forecasting efforts. In recent years, the reduction in climate networks by Environment Canada has significantly impacted on the RFC's ability to monitor weather events and to provide accurate and timely forecasts of streamflows and water supply.

One of the most effective means of mitigating the impacts of the extreme events of droughts and floods is to be able to forecast the event well enough in advance in order to allow corrective/protective action to be taken in advance. The introduction of a dense climate station network, such as operated by ACE in Manitoba, would be of significant benefit to forecasting and managing water resources in Saskatchewan. Water managers in Manitoba subscribe to the ACE data for the purpose of water management in that province.

Figure 9 illustrates the 22 major river basins in Saskatchewan wherein Sask Water needs real-time climate data. In some of these basins the availability of real-time climate data is virtually non-existent, thereby requiring significant extrapolation of data from

neighbouring basins; in many instances summer rainstorm events are completely missed by existing networks. A dense climate network would provide improved determination of soil moisture levels for stream flow and water supply forecasting.



Basins that require monitoring by Saskatchewan Water Corporation
Souris River (2)
Frenchman/Battle/Lodge River (4)
Wood River (7)
Swift Current River (8)
Assiniboine River (10)
Quappelle River (11)
South Saskatchewan River (12)
North Saskatchewan River (17)
Saskatchewan River (18)
Churchill River (20)
Reindeer Lake (21)
Lake Athabasca (22)
Lower Souris/Pipestone Basin (1)
Missouri River Basin (3)
Wascana Creek Basin (5)
Moose Jaw River Basin (6)
Cypress Hills North Slope Basin (9)
Lake Winnipegosis Basin (13)
Eagle Creek Basin (15)
Carrot River Basin (16)
Quill Lakes Basin (14)

Demand source #5 - enhanced capabilities to assist farmers with integrated pest management (IPM)

The use of an integrated approach to pest management (including weed, insect and disease control) requires that growers use pesticides only as part of an overall management strategy that includes cultural, mechanical and biological methods.

Both levels of government have worked in promoting this approach to farmers. Saskatchewan Agriculture and Food advises farmers that monitoring environmental conditions is an important component of IPM systems. The federal government, in its report to the Standing Committee on Agriculture title *'Pesticides: Making the Right Choice for the Protection of Health and the Environment'* affirms its commitment to IPM, defining intervention decisions as a 'key idea' in implementing IPM strategies. Intervention decisions are powered in part by the presence of the pest, in part by the presence of the crop, and in part by the right environmental conditions for the pest to flourish. Experience in Manitoba shows that accurate collection of climate data is needed to give accurate information on IPM decisions.

Integrated pest management is an approach that needs to be fuelled by cutting edge research. If the philosophy is to continue to be advanced, it is critical that the tools be in place to allow growers to execute it on-farm. Given the stated goal of the federal

government with respect to its support of IPM, it is only logical to seek resourcing parties to advance this goal.

Scientific and agronomic needs for climate –driven risk management tools for Saskatchewan

If climate driven risk management tools are to be used in Saskatchewan, it is important that it be done right. It is important to minimize the risk of developing products that give false readings, nearly correct readings or partial information. An instance of this is given in Phase I on page 15 of this report. Paying close attention to the scientific validity of the models that underlie these products is ultimately the only way to achieve long-term faith in the system on the part of agricultural producers and the support organizations that provide products to those farmers.

Some key scientific and agronomic needs follow.

Appropriate density of stations

With respect to the density needs (how close the stations are to one another), the grid must possess enough granularity so as to minimize the risk that the system misses a key macroclimatic event.

In the case of disease monitoring in Manitoba, that meant that there needed to be no more than 20 kms between collection stations. It was only when this density was reached that ACE felt that they could accurately generate farm-specific disease monitoring products.

The same necessity would hold true for any system that would be needed to provide farm-specific products in Saskatchewan (e.g. single peril crop insurance based on weather derivatives). Saskatchewan Crop Insurance Corporation personnel feel that they require a minimum of 40 kms between stations but acknowledge that they may miss local events such as convective thunderstorms.

Given this experience, it is logical to submit that the density of stations required in Saskatchewan would need to average 20 kms from point to point as well in order to perform similar modelling on the same disease set that is being monitored in Manitoba. This would more than meet the needs for other groups such as water managers and crop insurance personnel.

Recommendation: Station density must be such that all stations are no more than 20 km apart. Stations should be installed on a phased-in basis over several seasons in groups or clusters that maintain the 20 km separation.

Appropriate emplacement of individual stations

Station placement was found to be important in Manitoba. Some climate driven risk management products required that the station be located directly in the crop canopy (i.e. potatoes). Some required that the station be merely adjacent to a farmed area or pasture (e.g. canola disease products, Fusarium risk monitoring).

In Saskatchewan, this must be addressed if the system is to be dual purposed for non-agricultural uses. Great care must be taken to not include station data that is not appropriate to whatever agricultural information is being synthesized. This is not to say that the hardware positioning developed for agriculture will not have uses that other groups may find of value – only that station placement must not be compromised in contemplation of such dual purposing. In most cases, that will mean adjacency to crops or in pastureland.

Recommendation: Stations must be placed in crop/pasture relevant microclimates, with this requirement not compromised in the interest of dual-purposing the station for non-agricultural uses.

Appropriate source of technology

It is not the purpose of this report to select specific sensors or to weigh the advantages and disadvantages of data storage devices or relays. There are a multitude of companies in Europe and in the U. S. that build climate measuring devices.

It is paramount to recognize that the quality of hardware is not the key issue since there are several suppliers of very high quality climate sensing equipment. It is the assembly of a product development team to derive products from the hardware that really matters. There are two routes that could be followed in assembling such a team; (1) leverage and use ACE as the central core of the team or (2) start a new team. The latter strategy would pose a risk of the inefficiencies associated with making all the errors in start-up phase that usually come with developing a new enterprise from scratch.

Some basic specifications for hardware follow:

- Sensor selection needs to be made with the input of plant pathologists. Variables that drive disease monitoring could include relative humidity, leaf wetness, precipitation, global radiation, and windspeed.
- Sensor selection needs to be made with the input of crop insurance personnel. There are specific issues with respect to integrating new measurements in with 30- or 40-year averages so that they are valid from an actuarial standpoint. A new system would have to be configured in such a way that past measurements on the Environment Canada grid could be interpreted in with new measurements for longterm averages.
- Sensor selection and configuration needs to be made with the input of water managers. As with crop insurance, the vital aspect of data collected for water

managers is that it needs to be interpreted against the backdrop of past events so that risk of drought and flood can be assesses in water system management.

- Data transmission must flow smoothly and automatically within a multi-hundred-station network that is professionally run. There is no room for a volunteer network or one that relies on manual transmission of data in a modern system that assesses crop production risk on a minute-by-minute basis.

One standards body that oversees the collection of weather data is the World Meteorological Organization. The body allows for standard operational procedures and measurement techniques so that climate data is collected in the same way on a worldwide basis.

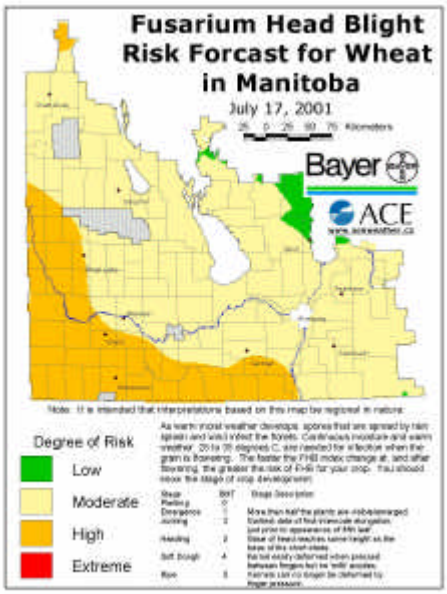
There is no need to subscribe to WMO methodology for the sake of doing so, so long as all data is collected in the same way from point to point, and so long as the data collected can be seamlessly integrated with past data collected in Saskatchewan to produce accurate longterm averages.

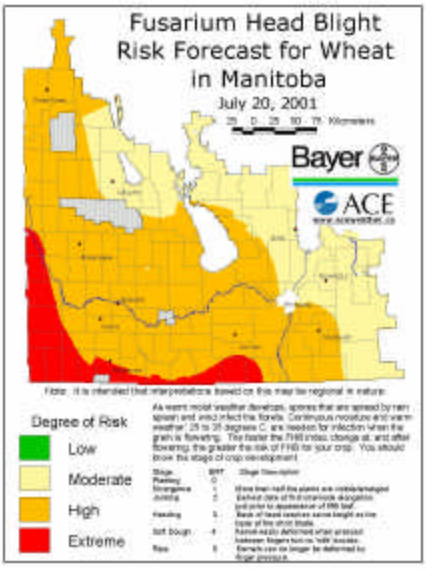
Recommendation: The scientific aspects involved in the choice and configuration of equipment and sensors must be made in consultation with key user groups that include (1) crop insurance, (2) pathologists, and (3) crop agronomists. It is recommended that ACE serve as core of this group due to its experience in developing locally tested risk management products.

Frequent reporting necessary

Current technology allows for relatively frequent reporting (every 15 minutes with some systems). This high frequency of reporting is necessary because cropping and feed conditions change as quickly as the weather does. To illustrate the speed at which this change can occur, Figure 10 is included. These maps show the speed at which canola diseases conditions changed in Manitoba over a 72-hour period. Note that some areas rapidly went from being low risk to high risk with respect to sclerotinia. Growers relying on a weekly map would not be well served but growers relying on daily updates would have enough time to address rapid changes such as this.

Figure 10. Fusarium head blight risk map on July 17 and July 20





Professional support required - involvement of agronomists, ag-climatologists and pathologists in model development and ground truthing.

In Manitoba, the ACE system requires a four-person team to develop agronomically useful products and to provide ongoing support to users of these products. These are ACE employees. The team consists of an agronomist, an operations manager, an installation technician and a computer systems expert. The group also receives technical support at no cost from crop and pest/disease control specialists at Manitoba Agriculture's Soils and Crops Branch.

In Saskatchewan, these talents will also be required. A professional services structure is central to interpreting mesonet data, adjusting models and helping clients to use weather driven risk products appropriately. Given that there are more stations that could potentially be operated in Saskatchewan than were used in Manitoba, there will be more people required to install, maintain and interpret results from these stations in Saskatchewan as well. It would be assumed that these people would need to be located centrally on a permanent basis within Saskatchewan.

The involvement of provincial government specialists is critical. These people represent an obvious talent pool in terms of bringing technical agronomy issues to the fore, but they also are key to ensuring that the system is accurate, unbiased and just as importantly, seen to be so. They can also martial and interpret supporting data or research from the university and federal research systems.

One example of this occurred in the case of the potato-forecasting network that was installed in Saskatchewan in 1998. The 13-station network operated mainly around Lake Diefenbaker with a small number of stations scattered in single locations across the province. In 2001, provincial extension specialists who were ground truthing the blight-forecasting model that the system was using, found that the model was not performing optimally for the growers. The specialist searched for and found a better prediction model and the group is now in the process of testing out a new, far more accurate model than the one used in the past. This illustrates the fact that the network itself is not the main asset in this type of program; it is the continued input of experts working with growers.

Recommendation: Science of the system needs to be overseen by extension/agronomy personnel.

Appropriate selection of crop growth models and disease development models

The selection of variables and construction of equations for any crop modelling requires great care. It is not sufficient to merely import models from dissimilar climates or areas where farming practices differ. Provincial pathologists must be involved in making sure that the initial round of field crop products are powered by models that are tested and continuously improved under Saskatchewan conditions. Pathologists point out that models that are developed in far-off farming areas usually incorporate foreign cropping practices into the model. This may make their use irrelevant or erroneous when used with Saskatchewan-specific cropping practices.

Recommendation: Locally tested models need to be used for local cropping conditions.

Actionable products must be developed

It only makes sense to develop and distribute models that have a practical and actionable end point. For instance, it makes sense to develop a drought monitoring product for pastures if the product leads to a grower being able to make an actionable decision on whether to purchase drought insurance based on his foreknowledge that he can do so. It makes no sense to develop a blackleg-monitoring product for canola growers if there are no actionable remedies available for blackleg control in the crop in the first place.

Given this, Table 11 lists cases where climate driven risk products may be applicable for Saskatchewan, and characterizes the value of initiatives that could be launched.

Table 11. Characterization of climate-driven risk product potentials

Crop	Climate driven risk management project	State of the science	Potential for being a available as a product in Saskatchewan	Geographic dimension	Opportunity for actionability
Wheat barley oats	Fusarium head blight risk for cereals	FHB modelling available and tested in western Canada on Graminearum strain but not Avenerium. The Av strain is the most common one in Saskatchewan but the more virulent Graminearum strain is now in the eastern portion of the province.	Immediate. Graminearum model for Saskatchewan on cereals requires fine-tuning.	There is Graminearum in Saskatchewan in the eastern portions of the province.	High. Assists in spray/no spray and spray timing decisions for fungicides This is a new disease in Saskatchewan and the disease has devastated Manitoba malt barley production..
Canola	Sclerotinia stem rot in canola	Sclerotinia models are available for western Canada conditions.	Immediate. Sclerotinia model requires regional fine-tuning.	There is sclerotinia in Saskatchewan in the eastern portions of the province.	Medium. Assists in spray/no spray and spray timing decisions for fungicides. However, only about 5 percent of canola requires sclerotinia fungicide so the disease is not a key one in Saskatchewan.
Canola	Heat risk insurance	Requires only long term temperature records and agronomic information on the effects of heat on canola development. Both are available	Immediate.	Province wide.	Weather derivative on this single peril risk is being considered. Allows growers to diversify crop rotation but manage weather risk.
Chickpeas	Ascochyta blight in chickpeas	No testing of any models has been done to any large extent on the crop in western Canada.	Longer-term. Requires 3 to 5 years of model development.	There is ascochyta in Saskatchewan in the all areas of the chickpea-growing region.	Low. If models aren't ready, there can be no recommendations.
Lentils	Ascochyta/ anthracnose on lentils	Modeling available for use in western Canada but requires customization in Saskatchewan	Immediate. Sclerotinia model requires regional fine-tuning.	There is ascochyta and anthracnose in Saskatchewan in the all areas of the lentil-growing region but it is more prevalent in the eastern areas.	High. Assists in spray/no spray and spray timing decisions for fungicides. About 70 percent of lentils are sprayed every year with fungicide.
Pastures	Drought risk insurance	Testing of the technology has already been done in pilot projects.	Immediate.	Drought prone pasture areas of Saskatchewan (western half of the province).	Weather derivative on this single peril risk has been tested. Allows a grower to manage weather risk in his livestock operation..

Aggressive ground truthing for continuous improvement

In the case of ACE in Manitoba, the organization aggressively ground truths data from previous years to see if they can reach higher levels of accuracy and continuously improve the system. There is an ongoing requirement for professional input from plant pathologists, agronomists, ag-meteorologists and computer programming experts in this regard.

The same will be true for any system installed in Saskatchewan. Ground truthing adds value because it allows the model to be back tested against historical data. This would progressively customize the models to Saskatchewan conditions as time went on and more data was analyzed. It also increases farmer's faith that the system is appropriate for local conditions.

Financial pathway for climate–driven risk management tools for Saskatchewan

From the foregoing, the following is evident;

Funding for about 700 stations are required.

These would cover the bulk of the agricultural area for the variables need to collect information on cropping and livestock feed at the farm level. These stations and their configuration need to conform to the agronomic and scientific recommendations made previously in this report. The cost of installing the framework for this endeavour requires a staged approach due to the fact that the system must cover a tremendous geography. This means starting with a few stations and adding more every year.

It is important to reiterate at this point, that the current system whereby forecasting is dependent on generating maps and other tools based on interpolating data from sparse data sources, is highly dangerous. Saskatchewan growers and those who support them are not well served by having a system that has a high risk of missing key climatic events and conditions over vast areas.

There would be sales demand for the products generated from this network.

About 11 percent of larger growers would trial disease monitoring products initially if made aware of the products. Most dealers indicated that they could sell this to some of their farmers. Fungicide manufacturers have shown a willingness to sponsor the products. Saskatchewan Crop Insurance Corporation has shown interest in the concept and has already begun to launch products. The Saskatchewan Water Corporation has also shown interest in using climate monitoring in areas for which they have a lack of information.

A staged approach to installing the infrastructure is needed.

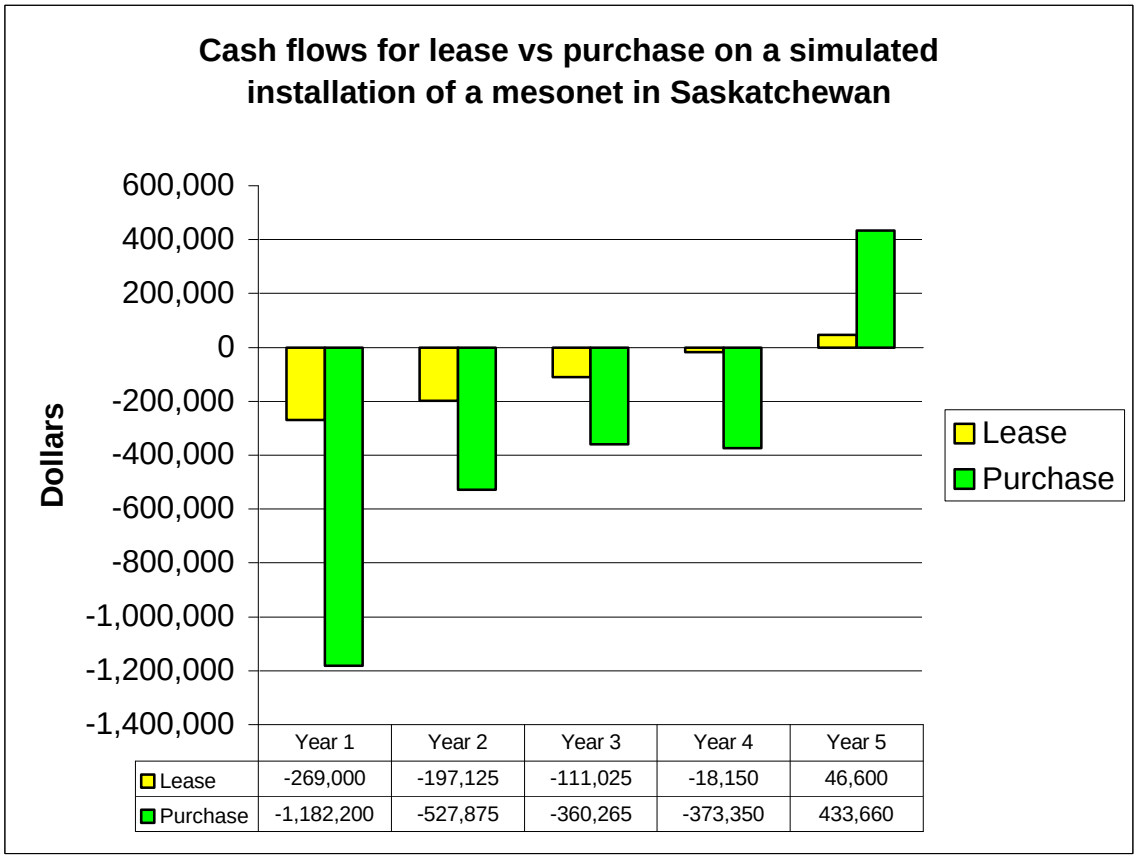
Staging the installation in a way that is attached to individual projects would be a logical way to approach this (e.g. canola and wheat disease monitoring stations staged into the north-eastern and eastern parts of the province, forage crop insurance into the cattle and rangeland areas of the western part of the province, ascochyta and anthracnose monitoring on the Regina Plains, for example)

The system should be leased and not purchased

A study of projected expenditures and cash flows was undertaken. ACE's costs for setting up in Manitoba were examined, and then adjusted for the larger number of stations that would be required in Saskatchewan. A simulation wherein the growth in the number of stations was taken to be 200 stations in Year 1, 300 in Year 2, 500 in Year 3 and 700 in Years 4 and 5. Anticipated revenue was modelled, based on the IPSOS Reid data on market penetration and on discussions with corporations who indicated that they would have interest in such a proposal. (These revenues are presented in detail in the next section of this report). Then a comparison was made between cash flows based on leasing stations from a manufacturer, or purchasing them outright. The leasing and purchasing costs of Adcon's system was used for the purposes of the comparison.

Note the high cash needs and high risk levels with the purchase model compared to the relatively lower risk level with the leasing model. Note as well that the positive cash seen in Year 5 with the purchased system needs to be viewed through the critical lens of net present value analysis. This positive cash flow of $433,660 needs to be discounted, reasonably at a rate of 15 percent per year. As well, the number comes only after exposing large amounts of capital over multiple years.

Figure 11. Cash flows for a leased vs. purchased hardware system for Saskatchewan over a five year installation period



	Year 1	Year 2	Year 3	Year 4	Year 5
Lease	-269,000	-197,125	-111,025	-18,150	46,600
Purchase	-1,182,200	-527,875	-360,265	-373,350	433,660

Patient capital is required for the first five years.

In the case of the Manitoba mesonet, the process whereby ACE has been successful in achieving a glide path towards a user pay started with public funding. There was a period of about five years in which ACE was incubated and supported by public sector funds. This allowed the group some time to develop and test crop specific risk management products and to grow carefully, phasing in more and more stations every year as their revenues grew. This would not have been possible without the benefit of an initial incubation period funded by patient capital such as that provided by public funding for startup.

This incubation period would also be needed in Saskatchewan. An examination of cash flow issues for the larger system that Saskatchewan would need shows a similar result. About five years are required to get the system to the point where it is cash flow positive. If a similarly careful, phased in approach to installing the system itself is taken in Saskatchewan as was taken in Manitoba, the same proportion of funding would be required, assuming that the system is started from scratch and does not leverage other organizations current capabilities. The figures in Figure 11 show that about $269K is required in Year 1 and this number drops down every year until it is only $18K in Year 4 and zero in Year 5.

Compatible partners should be sought

There are some logical partners and interests who conduct business directly or indirectly with farmers and who stand to benefit from the installation of a climate driven product capability. They benefit from either the ability to make decisions based on better data, or more effective use of products purchased by growers. Some logical partnerships are as follows;

- Strategic life sciences companies. Bayer, BASF and Syngenta are the most important players in disease control technology and have demonstrated the will and commitment to support the development of these types of tools in Manitoba. These companies have shown interest in developing key disease monitoring products in chickpeas, lentils, cereals and canola in interviews conducted for this study and would be open to extending the program into Saskatchewan.

- Saskatchewan Crop Insurance Corporation. The corporation has been innovative in the past with risk management products that are driven by climate data. This is an asset that even the Manitoba group did not have. There is potential to help many growers with risk management products province-wide.

- Saskatchewan Water Corporation. This group is entrusted with managing water as a resource and as such recognizes the need to monitor climate parameters relating to water use and supply. There is potential to work with this group in any or all of the 22 basins for which they require data.

- Strategic grain companies. Confidential conversations with one company indicates that they would consider being involved with any project that allows them to hedge weather risk, either on the world market or internally within the company.

- Independent dealers. Independent crop input dealers who were surveyed indicated that they could and would be able to sell products in the area of disease risk management to their top growers.

- Saskatchewan Agriculture and Food. The extension function within the department is a critical component of presenting credible, usable products to growers, and the specialists within SAF have the expertise to assist with product development.

- Agriculture and Agri-food Canada. This agency has initiatives and interests in integrated pest management and soil conservation that would be well served by the success of climate-driven risk management techniques.

Need for user fees must be established right from the outset.

Prevailing opinion among some shows a well-founded scepticism with respect to farmers' willingness to pay for climate driven risk management tools, especially those developed for crop management. This scepticism is rooted in the century old tradition of giving information away to farmers for free.

Crop input dealers do not share the same view. This group, which is trained in the expertise areas needed to achieve sales, is more likely to believe that there is a paying market for weather products among farmers.

Both of these divergent views could be accounted for if one assumes that farmers are more likely to pay if the product is delivered through traditional commercial channels and less likely to pay if they feel that the program delivery through government channels.

If this is in fact the case, it makes sense to drive sales of these products through the private sector. And since crop input dealers are already interacting with farmers on a selling footing with respect to fungicides and other pest control products, it is this channel that should be used as the sales platform for crop production products.

The wrong way would be to follow the classic pathway for free information as followed for decades; that being a project funded solely by government, heavily identified with a

growers association and excluding local dealers. Under those circumstances, farmers would expect that the products generated would follow the same pathway that printed information and decision tools have followed – that being a free service or one with at most a nominal fee.

The right way would be to clearly define the nature of the project from the beginning as a not-for-profit, full cost recovery program that would be delivered through business channels that farmers recognize as being traditional sales routes.

User pay in Saskatchewan will mean a mixed revenue model.

While farmer subscriptions are key to the success of a mesonet, the Manitoba case illustrates the wisdom of involving corporate assistance in the launch of a mesonet. This provides a second engine of growth for the mesonet and this is especially of value in the early years of setting up the system, when subscribership will be small.

The expertise and patience of the corporate structures that provide farm inputs and merchandising was of value in Manitoba. Interviews with corporate personnel show that crop protection companies have been particularly open to assisting the enterprise. This has taken the form of financial assistance but more importantly there has been valuable inputs and feedback from industry workers on 'kinks' that needed to be ironed out in the modelling products.

Interviews with the key large supporters of the mesonet in Manitoba indicate that there is ongoing commitment to continue to contribute to mesonet technology. But in no case did interviewees commit to or indicate that that would entertain raising the level of corporate dollars they spend on the technology.

This should be possible in Saskatchewan as well. The potato industry in the Lake Diefenbaker area has taken steps in installing a mesonet in that area. This resembles the incubation and learning opportunity that ACE and provincial government specialists had in Manitoba with the potato industry there.

In product development, priorities must be placed on what products user groups will pay for. This is different than saying that products will be developed that groups *may* pay for. A proper marketing plan will need to be done which includes an examination of the size of the opportunities at hand, both in market penetration and cost recovery potential.

Competent, experienced distribution is necessary.

Once a given set of products is selected for development and subsequently for sale, it is necessary to give thought to distribution, sales and after-service of the products.

This enterprise requires its own set of talents and trained individuals. The process of adoption of agricultural advances is always accompanied by a committed group of functionaries who ‘close the sale’ or champion the advance. Ignoring this step will leave even the best ideas unused and on the shelf. Using people who have not been trained in the sales process is likely to have less than satisfactory results. A survey of extension personnel regarding ACE in Manitoba revealed that the group was not familiar with the key basics that are taught to sales people. This is understandable, given that direct commercial selling is not a mandate that this group of experts has traditionally carried out.

It follows then, that the sales process should involve commercial channels as opposed to ag reps.

A model for developing climate driven risk management tools into Saskatchewan

A model is proposed wherein a five year phase-in of stations tasked for specific user groups is proposed. This is based on broad discussions with these user groups. The specific numbers need to be further discussed with the groups and are not proposed as a commitment. But they are reflective of the types of tasks that each user group suggested as being of interest to them.

The general assumptions for the model are as follows. All are based on an approach that involves staging growth in geographic clusters, locating these clusters so that they are tasked against specific purposes (eg pulse diseases in southern Saskatchewan)

Year One.

Assumptions:

- Phase-in of approximately 200 stations.
- Set up of sclerotinia models and Fusarium head blight modeling on the eastern side of the province.
- Establishment of stations in locations where crop insurance weather derivatives may have 'holes'.
- Initiation of ascochyta monitoring and basic work on models.

Year Two.

Assumptions:

- Add 125 more stations to bring total up to 325 stations.
- Add to sclerotinia monitoring and Fusarium monitoring and begin to attract subscribership (200 initial)
- Add more monitoring stations for crop insurance capabilities across the province.
- Initiation of ascochyta monitoring and basic work on models.
- Continue ascochyta work and ground truthing.

Year Three.

Assumptions:

- Add 140 more stations to bring total up to 465 stations. Add an additional technician to maintain and install network.
- Set subscribership goal at 400 farmers.
- Add more monitoring stations for crop insurance capabilities across the province.
- Begin selling ascochyta modelling in pulse crop market.

Year Four.

Assumptions:

- Add 200 more stations to bring total up to 700 stations. Add a second additional technician to maintain and install network.
- Set subscribership goal at 800 farmers.
- Add more monitoring stations for crop insurance capabilities across the province.

The costing assumptions that would need to underpin this model would be as follows

Assumptions List	Amount
Ag area in Saskatchewan (km2)	220,000
One station w/ telemetry	$13,500
One station w/out telemetry	$5,766
Need 1 w telemetry surrounded by 4 w/out	4
Area covered by a 'node' of five stns (one w/ telemetry) in km2	1200
Cost to lease one stn from ACE	$2,000
Farmer subscription cost (season)	$625

If these assumptions hold, then the revenue generated would resemble that seen in Table 12. Note that all participants are allocated a number of stations in congruency with the goals of the organization involved estimated based on interviews and these numbers should be considered estimates only for the purposes of generating the financial data. Each station is assigned a lease cost of $2000 for corporate users. Subscribership from farmers is set at the ACE price of $625 per station.

Table 12a. Assumptions for demand for 12b

Client	Assumptions
Life sciences companies, grain company	Assumes that three life sciences companies will each purchase $35K sponsorships. Grain company will purchase $15K initially per year. Amounts rise when chickpea model comes on stream.
Crop insurance models	Popularity of single peril risk products will increase and SCIC will not wish to rely on volunteer network and grow station subscriptions from 60 in Year 1, to 200 in Year 5.
Research	Assumes that federal/provincial funding for e.g. IPM initiatives will be forthcoming
Saskatchewan Water Corporation	Will want to grow station numbers in basins where there is little monitoring from 50 stations in Year 1, to 100 stations in Year 5.
Farmer subscriptions	Will grow to meet a minority portion of the 11 percent predicted share from Ipsos Reid study. Zero subscriptions in Year 1 to about 1200 in Year 5.

Table 12b. Profit and loss statement for a five year simulation of a mesonet installation in Saskatchewan

Source of funds	Year 1	Year 2	Year 3	Year 4	Year 5
Life sciences sponsorships	$120,000	$120,000	$120,000	$120,000	$120,000
Crop insurance models	$120,000	$160,000	$200,000	$300,000	$400,000
Research-based resources	$60,000	$60,000	$60,000	$60,000	$0
Saskatchewan Water Corp models	$100,000	$120,000	$140,000	$160,000	$200,000
Farmer subscriptions	$0	$190,000	$390,000	$670,000	$770,000
Total stations	$400,000	$650,000	$930,000	$1,330,000	$1,510,000
Operating expenses					
Vehicles	$18,000	$21,750	$25,950	$31,950	$32,000
Professional fees	$30,000	$30,000	$30,000	$30,000	$30,000
Telephone	$20,000	$25,000	$25,000	$25,000	$25,000
Travel	$30,000	$39,375	$49,875	$50,000	$50,000
Building	$20,000	$20,000	$20,000	$20,000	$20,000
Salaries benefits.	$255,000	$255,000	$255,000	$300,000	$300,000
Sales and Marketing	$16,000	$26,000	$37,200	$53,200	$60,400
Other/Miss	$40,000	$40,000	$40,000	$40,000	$40,000
Lease Payment	$240,000	$390,000	$558,000	$798,000	$906,000
	$669,000	$847,125	$1,041,025	$1,348,150	$1,463,400
Net Income	**($269,000)**	**($197,125)**	**($111,025)**	**($18,150)**	**$46,600**

For a list of threats and risks inherent in the assumptions made in the table above, see Appendix VII.

Startup Action Plan for the Development of a Climate Driven Risk Management system for Saskatchewan

Strategy	Tactic	Timeline
Establish a beachhead of core agencies and confirm financial support for purchase of data or sponsorship of stations.	Approach • Saskatchewan Crop Insurance • Syngenta/BASF/Bayer • Cargill Ltd • Saskatchewan Water Corp • Government of Canada (sustainable pest control in chickpeas)	Fall 2002
Seek incubation funding as outlined in the financial discussion.	Approach federal and provincial funding agencies for • $269K in Year 1, • $197K in Year 2, • $111K in Year 3 • and $18K in Year 4.	
Establish agronomy expertise network	Approach Saskatchewan Agriculture and Food and request the assistance of specialists in model truthing. Require • A pathologist, • A pulse specialist • And a canola agronomy specialist.	
Put out RFP requesting proposals with regards to hardware, after-service and model development.	Approach ACE. There are no other groups that provide multi hundred-station telemetry synthesized into models that are built and tested on the Canadian prairies in an automated way.	
Establish initial modelling goals and first wave of products.	Convene a technical working group to prioritize goals, with the highest priority being those models that are likely to sell well. Participants include stakeholders listed above.	Early winter 2002
Set intermediate goals station set-up	Set three-year goals for the group contracted to install the system.	Late winter 2002/3
Marketing and Communications	Establish a marketing work group to ensure that marketing efforts are in tune with financial goals and benchmarks	Late winter 2002/3

Appendix I. Selected sensors used by ACE

Weather monitoring at ACE is done with Adcon Telemetry equipment. ACE is the Canadian Distributor for all Adcon equipment. The equipment can be used for weather monitoring from one station to large networks of hundreds of stations. Stations can be placed at any location, as they are solar powered with a battery back up. Data delivery goes over FM frequency. Sensors are detailed below. Costs are about $13,500 for a fully equipped station with data relay capablilites. Costs for station surrounding the fully equipped station are about $5700 per station.

Temperature/Relative Humidity:

Specifications	Range
Temperature Measuring Range:	-40°C to +60°C
Temperature Accuracy:	±0.6°C
Relative Humidity Accuracy:	±3%
Temperature Range:	-40°C to +60°C

Rain Gauge:

Resolution:	0.2 mm
Capacity/Minute:	2.4mm
Orifice:	200 cm2
Accuracy of Calibration:	±1%

WindSpeed/Wind Direction:

Wind Speed	
Range:	2.5 to 100 km/hr
Starting Speed:	2.5 km/hr
Wind Direction	
Range	0° to 360°
Accuracy:	±2%
Dead Angle:	3° ±1°
Switch Over Point:	North
Starting Speed:	0.5 m/s

Leafwetness:

Measuring Principal:	Elect. Conductivity
Measuring Range:	0 - 9 Units (10 Steps)

Pyronometer (Solar Radiation):

Range:	0 to 1400 W/m2
Wave Length:	400 to 700 nm

Appendix II. Ipsos Reid Study on the Marketability of ACE Products to Non-potato growers in Manitoba

CLIMATE DRIVEN CROP MODELS

Preliminary Report for Manitoba Producers

Prepared for: March Agricultural Ltd.

Prepared: February 28, 2002

Introduction:

Ipsos-Reid, on behalf of March Agricultural, conducted 25 telephone interviews with growers in Manitoba between February 21 and February 27, 2002. The purpose of the interviews was to obtain insight into farmers' attitudes towards the Agrometeorological Centre of Excellence (ACE) crop model outputs.

Methodology:

Participants in these interviews were growers that had 'large' operations (greater than 1000 seeded acres). The participant had to be the main or at least joint decision-maker for the farm. In addition, growers either had to have access to the Internet or own a fax machine, as these are the possible delivery methods of the final product.

Participant Profiles:

The average number of acres that were seeded in 2001 for the participants was nearly 3000 (with a maximum of 6500).

Age of Respondents:

	Less that 35	35 to 44	45 to 54	55 and over
Number of respondents	2	10	11	2

Research Findings:

First Impressions:

Overall the first impression for most of the growers was positive. Receiving comments like "Good information and lots of it", "I'm impressed", and "This could be a valuable tool". It should be noted that some growers felt intimidated by the amount of information, however when they sat and looked at it, then it started to make more sense. A few of the growers had concerns that this would not be accurate enough for them because of the widely varying conditions across their farm.

Information in Report:

All the growers felt that the information that is currently in the report should remain in the report. A few growers felt there was information in the reports that they would not use very often, however they would not like to see it removed because they may need it at some point.

The growers had a number of suggestions when it came to information that would like added. The most commonly requested addition was a manual or instructions on how to properly read/use each of the sections. Many growers were hoping it already had, or would like to see some sort of forecast system (1 to 3 days). Other suggestions included

- Cumulative reports for some sections (e.g. Rainfall)
- Historical information (i.e. what was it like last year)
- Drying index (alfalfa, hay, other crops)
- Caution/danger zones marked on the graph or stated in the text.
- Frost information (frost-free days, frost risks)
- Overall regional overviews (things that they should watched out for)

Additional Diseases to Include:
When asked about additional diseases, most of the growers indicated their main disease problems were covered with this report. A few thought that cereal leaf disease should be broken out into the specific diseases, or at least state which ones the current index covers. Some of the growers said that it would be nice to have a couple of insect indexes as well. Suggestions included grasshoppers, flea beetles, wheat midge, aphids, bertha armyworm and diamondback moth.

Spray Recommendations:
Most producers said that they would use a recommendation from this service as an additional tool in their decision-making. Some other growers said it would depend on how confident they were in the accuracy of the data (if very accurate they would follow the recommendation).

Report Pricing:
Respondents were asked about their likelihood to purchase the report (in its current version) at four price levels. As the table shows, despite interest in the reports, most are unwilling to pay the price points tested.

Base: all growers interviewed	Price Level			
(n=25)	$800.00	$700.00	$600.00	$500.00
Very Likely	0	0	2	8
	-	-	8%	32%
Somewhat Likely	6	7	7	3
	24%	28%	28%	12%
Somewhat Unlikely	4	3	4	6
	16%	12%	16%	24%
Very Unlikely	15	15	12	8
	60%	60%	48%	32%

Those who were unlikely to purchase at these prices were asked how much they were willing to pay. Responses varied from being uncertain, or willing to pay a dollar a day, up to $400.00 for the season. Of the respondents that provided a dollar figure, the average price they would be willing to pay was $180 per season.

Appendix III. Selected Financial Performance Measurements of ACE

1.Risk Assessment

Financial Risk- the following unanticipated changes could cause adverse economic outcomes to organizations using this model.

- Changes to the commodity prices the farmers receive could change the demand elasticity for the mesonet products.
- Reduction in acreages of key crops will reduce demand and adversely affect forecasts thus reducing NPV (Net Present Value), reducing the value of the investment.
- Higher interest rates due to revenue targets not being met could result in lower net income and poorer credit rating.
- An inability to secure necessary operating credit lines could threaten the stability of the organization.

Strategic Risk-the following outcome could invalidate plans of organizations using the Mesonet business strategy.

- The target customers in the standalone year may not see the same value as the first customers (early adopters). The target customers are growers of Canola and Wheat and the early adopters were potato growers.
- Target customers could, in the future, get the same value from another source i.e.: Internet, local retailer.
- The reuse rate could be lower than the adoption rate, resulting in growth that is slower than planned. This will invalidate the plans for the standalone year and beyond.
- Segment size at the time of market could be smaller than market research had indicated.
- Changes in technology could shift users in a different direction
- Delays in installation of stations could cause a missed season

Operating Risk – the following outcomes could lead to negative net income.

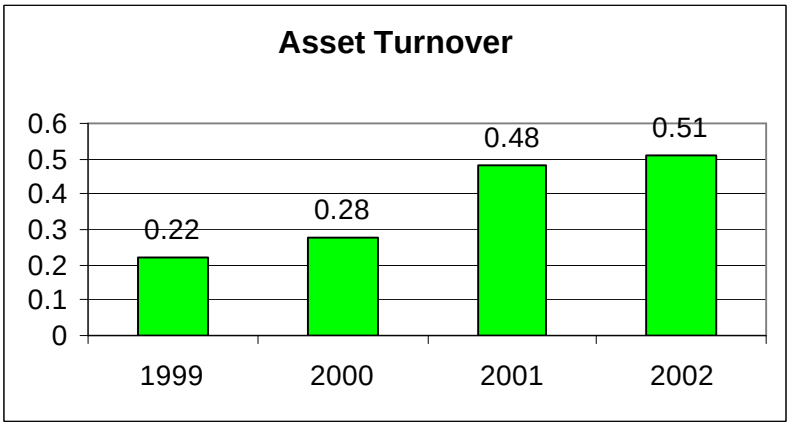
- Price could be too high for the market
- Overhead costs could be higher than expected
- There may not be enough profitable customers
- There could be higher maintenance and operating costs than expected
- The stations may not be as reliable as expected

Accidental Risk – the following outcomes could lead to negative net income.

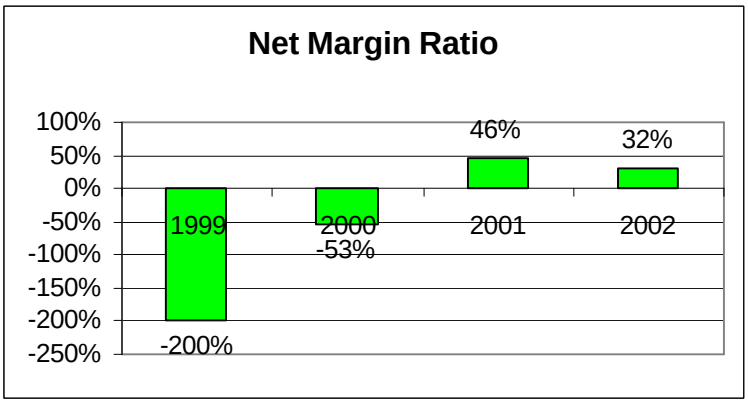
- Natural problems like fire, lightning, flood or wind could occur
- Property losses such as theft, equipment breakdown or failure could occur
- There could be equipment defects or service problems

2. Trend analysis

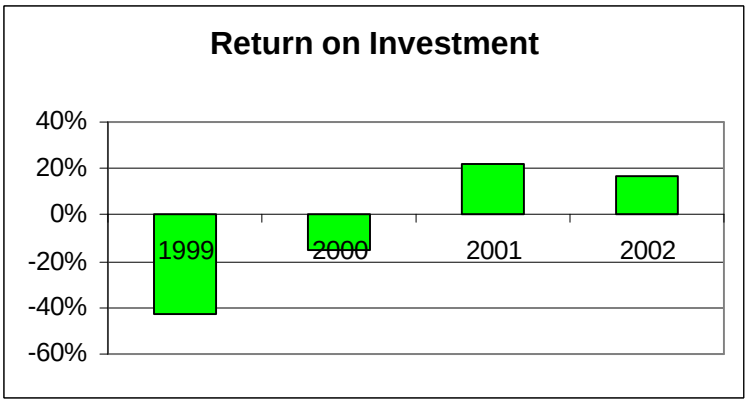
The Mesonet model in Manitoba show the following trends



Asset turnover (total revenues minus grants over total capital expenditures) shows that over time, assets are being managed for better results.



The net margin ratio trends show that ACE can show positive returns with the revenues it has to work with. (Net Margin Ratio= Net Income/Net Revenue – Grants)



Return on investment is positive at year 2001 and NPV (Net Present Value) is positive at 5% discount rate in 2008 with current net income growth rates.

3. Cash Flow

Cash flow measurement	1999($)	2000($)	2001($)	2002($E)
Cash In	150000.00	312000.00	662000.00	667000.00
Operating Expenses	150000.00	187000.00	288000.00	445000.00
Capital Expenses	231000.00	437000.00	437000.00	188000.00
Net Cash	(231000.00)	(312000.00)	(63000.00)	34000.00
Cash Flow per Subsriction	(15400.00)	(15600.00)	(350.00)	133.33
Cash Flow per Station	(5775.00)	(3900.00)	(315.00)	154.55

Cash flow is positive in the budget for year 2002. Once cash flow is positive there is less reliance on grants to maintain operations. As more subscribers are added more cash is generated and more net income ensuring fixed and variable costs are covered.

The trends show that the Mesonet model can work and is standalone from a cash management point of view at Year 5. The margin trends show that the model can provide a return on the assets and investment. Further analysis would be required to incorporate specific market research results pertaining to demand. The capital structure could be set up to reduce the negative cash flow whether through leases or a larger initial investment.

Appendix IV. Oklahoma mesonet case study

Mesonet case study – Oklahoma

In the early 80's, two different groups in Oklahoma were collecting weather information for their own use. Oklahoma State University agricultural scientists wanted to expand the use of weather data in agricultural applications. The second group, the University of Oklahoma, were helping to plan and implement a flood-warning system for Tulsa. Both groups needed to upgrade their weather instruments, and recognized the need for a statewide monitoring network.

Historical development of the Oklahoma mesonet

In 1987 Oklahoma State University (OSU - Stillwater) and University of Oklahoma (OU - Norman) joined forces to attempt to build one weather network (the Oklahoma Mesonet Project). Funding was provided in 1990 with $2 million from the governor's office, $350K from OSU and $350K from OU to set up the infrastructure. In addition, the Oklahoma Law Enforcement Telecommunications System donated time for the mesonet on their communications infrastructure.

The mesonet began collecting data in 1991, and by 1993 108 sites were completely operational. The current number of Mesonet sites is 114 (this number has remained constant since 1996). There is at least one Mesonet site in each county. With a land area of approximztely 68,000 square miles, this places a mesonet station every 600 square miles. Half of the sites are on property owned by federal, state or local government, academic institutions or foundations. The other half are on loaned private land (at no charge) for use by Mesonet.

The agricultural products offered by the site included an alfalfa weevil monitoring system, and modelling programs for the pecan nut casebearer, watermelon anthracnose, pecan scab, pecan leafspot.

Ongoing costs are $2.2 Million US a year to maintain and upgrade the system as required (this is with no communication costs incurred). In 1993, the Oklahoma state government provided aprox 20% of current funding, with the remainder coming from federal grants and public & private contracts. In 2002, the state government will fund 80% of the costs, with this amount raising to 100% by 2003. The reason the state government has chosen to fund the whole project is because the key users of the program (Public Safety (police, fire, EMT's, emergency management, etc); Teachers K-12; Electrical Utility Co-ops) have petitioned the government on the importance of the system.

The Mesonet has approximately. 1,500 subscribers, but only a few hundred are paying subscribers (see types of subscriptions and associated costs in Table 1). Virtually all government agencies subscribe, as well as 150 Public Safety organizations and 250 Primary Schools. All of these subscriptions are offered free of charge. Since the

Mesonet is funded with government funds, they have never actively promoted their project to paying subscribers. There are some private companies offering weather data to different subscribers, so it is assumed by local managers to be appropriate for the government funded mesonet to actively compete with this private enterprise. This may have limited the amount of paid subscribers the system has.

Table 1. Subscription to the Oklahoma mesonet

Level	**Cost (per year)**	**Service**
Limited pages	$44.95	This would give you access to all the AgWeather pages, as well as additional text based information.
Basic pages	$99.95	All the access of the Limited Pages subscription, plus higher end visualization information. Includes ag weather products.
Premium pages	$4800.00	All the access of the Limited and Basic Pages subscription, plus detailed and customized products for weather forecasters, the media, university scientists and other "high-end" customers.

Approximately 75 farmers subscribe to the Agweather system. These growers pay $44.95 per year for the weather and pest programs. This represents a small proportion of the grower base in the state and managers at the mesonet are trying to determine what the obstacles are to a larger set of customer subscriptions for ag products. No formal marketing studies were done either at the outset of developing the products, nor on the realization that the products were not selling.

Benefits of the Oklahoma mesonet

- Allowed extension and scientific staff at OSU to develop and ground truth pest management models.

- Promotes an active interface between urban sector and the agricultural sector, with public school teachers actively using the system to expose children to agricultural aspects of weather.
- Allows agricultural applications ‘piggy-backed’ onto other public utilities (eg law enforcement communications, flood forecasting etc)

Challenges

- Continued public sector involvement creates difficulty in terms of the mesonet’s ability to charge for certain services.
- Marketing the agricultural forecasting products has not resulted in high numbers of farmers signing on to the system on a pay basis.

Appendix V. Saskatchewan grower interviews

Interview#: 01			
Postal: S0L 0C0	**Age: 44-55**	**Acres: 3000**	**Rcrt ID#: SK18**

Notes: Although this was around the 12th interview I completed I feel it should be seen first as this respondent went into great detail on points that a great many of the Saskatchewan respondents mentioned. This respondent took 40 minutes to answer where most completed in less than 10.

Questions
1. First Impression? Intensive (p) In a good way. Overall I would give it a 50% though because while it gets good grades for what it is – I don't think I need it myself.
2. Benefits? It would grow on me. I would have to watch and see how well the data worked for me (C) In terms of comparing their reported facts to observed circumstances. The Canola Council is putting a weather monitor right next door so I will get a chance to see what this sort of localized weather can do for us this summer. It will be very interesting to compare notes. I can see this sort of thing benefiting the chemical companies in getting to know local farming – to see the problems we face and help us make decisions. There are a lot of variables in play when it comes to farming and the more information we all have the more it helps us (farmers and chem. companies) make decisions.
3. Anything to add? Not really. (P) I suppose they could add more in the way of forecast information. That is more what I need. I guess if I got really picky I would advise these guys to add something in the way of daylight hours – total hours of sunlight would be really helpful and not take up much space. Also an actual cumulative sunlight (C) – a reading on how many hours the sun actually hit the field – makes a big difference in the health of the field over a longer term. (P) Frost too. Both risk and total frost free days. This would be good to have as a risk index and as a total cumulative for history purposes from year to year. They could even go the extra step and give average yield based on sunlight and rainfall for the area. If I saw that a guy should have X amount coming off the field with my sunlight and rainfall it would help me spot problems.
4. Anything to remove? The historical stuff doesn't have to be hourly. Once the news is a day or two old – daily figures are good enough for me. I don't see what knowing hourly would help me do.
5. Easy/hard to understand? A lot to take in all at once – but I got it. It would get easy to read over time. When you first look down at it you see a lot of little acronyms you've never seen before. I figured most of it out in around 20 minutes though.

6. Other diseases? (probe: Any other weather factor issues like insects?) I think you got them all. Sclerotinia and Leaf Disease on the barley are the worst I deal with. See… I know that is what they are looking at this as being a tool to help out with. It is interesting data to have – especially on Sclerotinia. And Leaf Disease – it would help to spot risk - but the trouble you are going to have selling me on this comes out of my not seeing much in the way of disease risk lately. A good five years now and we have been dry enough not to have to worry about this stuff. I take a look at what you have here and I can see that it would be a big help to a guy who is dealing with Sclerotinia as a constant threat. I can see how some who are a bit jumpy and stand to loose a lot if they misinterpret the risks would see this tool as very beneficial because they could probably save a lot of money on spraying if they are spraying to real risks and not to being overly cautious. Just-to-be-safe spraying is a lot of money – but it can save you a lot if it saves a crop.

I don't have to spray just to be safe. Lately even the barley and canola have been safe enough that I haven't needed to spray for weather related reasons. I just spray by staging the plant – a couple of times a season as my chemist and I decide by the literature out there.

7. Aided cost:

$800	VU
$700	SU
$600	SU
$500	SU

8. Unaided cost? Or, if answered Q7, comments? If I were looking at this just as something interesting to read over I wouldn't pay more than $100 or so. If I was facing a higher disease risk the information might become more valuable to me so I would be willing to pay more.

I used to get a lot of information on DTN – same idea. But it was so much so often it ended up just being wasted fax paper. I doubt your guys need to send this sort of thing out 5 times a week. 1 or two weeks out of the year I might actually look at them every day – but for the rest of the season I would see the fax and think "waste of paper" like I did with the DTN faxes or the 400 pieces of mail I get a week from every public and private service in the country telling me what I should do to get a better crop.

If this company delivers on what it says it will do. *If* the monitoring truly is local enough to be my most relevant source of data. *If* I saw real accuracy beyond what the weather reports for the nearest town give. *If* I saw that the data could help me make real money saving decisions or give me piece of mind…I can see how $800 could be worth it. They would have some proving to do first.

9. Follow spray/no spray recommendation? Sure. I would go right from seeing the data to spraying the field if I believed in the data. If I call an agronomist he is going to look at the same data and tell me to do it anyway so why bother. If I have good information I am not afraid to follow it. The only catch is that while I may decide to spray of the data I may not be able to because while past and present are the most important in deciding whether one *needs* to spray, whether one *can* spray is a question you need future for as well. Wind, heat, humidity will all affect if a spray sticks to the field. If you don't look at what is coming you can be in big trouble and waste a whole lot of money.

10. Anything like this out there you have looked into/purchased? Nope. Not like this. Lots of information out there for us but I think this is pretty unique in what it is trying to do.

Further comments (he went off into a lengthy monologue when I thanked him for his time. The nice advantage of a in-depth is I can keep recording…)

I wonder if this isn't better suited to Agronomists or retailers. As a producer I want this information when I want it and although it may seem odd – we want it from someone. A person. This will seem strange from someone that just shot you down for $800 - but I don't mind paying $5 an acre to help me make a decision – that is what those guys charge me to help make up my mind (5X3000acres=$15000) and I do it because it gives me something your $800 sheets wouldn't do… even if it is the same information. Talking to an agronomist or retailer gives me a little piece of mind that I don't mind paying for. Your data forms would be valuable – potentially as valuable as these guys are – but they still leave all the decisions up to me. I would read data and make decisions whereas if I talk to an agronomist or crop specialist I get to share decisions. Get council. Advice. I like to share decisions on the big stuff. I don't mind paying for that… so maybe your guys have to work on making me think that way with their product.

I have thought about getting a weather station. I already have a flag out and a rain catcher. I see the value in all this stuff. It does help me make decisions… but the more I think about it all… I guess my best advice would be for your friends at ACE to have a real person attached to all this. Someone I can call for up to the minute readings when I need them (what is wind speed and direction right now at my station?)… and maybe a little help in interpreting the information – then you would be crossing over into something I would see as a lot more valuable. There you shift over into the present tense, which is a lot more valuable for me. Instead of being past history you have a current aspect to it as well. That brings us closer to the future and allows me to make better decisions.

I can think of three times that would have saved me a lot of grief and money last year. Once when a change in wind direction had spray drift from my corn onto my canola, which cost me a lot of money. Another time we had what is called atmospheric reversal, which I could have predicted if I had access to a couple of very basic facts. Particular temperature and humidity saw the spray hover over the crop rather than settle. A slight wind blows it miles away by the time it hits the ground. Atmospheric reversal is a rare occurrence – but a good example of a headache that good up-to-the-minute data would have spared me.

So fax me your history every morning or every other morning – but be there for me to call when I need up to the minute facts and help with decisions.

Interview#: 02

Postal: S0G 5E0	Age: 35-44	Acres: 5000	Rcrt ID#: SK10

Notes:

Questions
1. First Impression? Good. Very good (excited)
2. Benefits? If I could get some of this information up-to-the-minute like wind direction and speed… A really good spray aid. Also very interesting in terms of just general interest. I love weather and can't get enough of this stuff. Nice to see that someone is thinking of those of us that feel we know best and can do something with the data ourselves rather than relying on someone else's interpretation. (Added towards end of survey) It would also give recourse with chemical companies. You would have something to show them if a spray didn't work and they ask about conditions.
3. Anything to add? No. (Says "forecast" and then takes it back and explains…) Forecasts are already out there and they are going to be as good as anything this can give us. I am never going to have enough faith in a forecast even if it is calculated for 12 miles away. I would rather have the history and draw my own conclusions. My big suggestion would be that they offer this – what I see here – just as it is. But I would like to see them add a service where we can have access to at least some of the information up-to-the-minute. Basically I would like to have access to wind speed/direction, temperature, and humidity. Those are the factors that are going to determine what I do with my next few hours. Maybe a call-in line or access through their website.
4. Anything to remove? No way
5. Easy/hard to understand? Easy
6. Other diseases? (probe: Any other weather factor issues like insects?) Fusarium and Ascochyta are the problems around here. Anthracnose is a problem with specialty crops. (Unaided) They could add an insect risk to… not an index perhaps because you can't predict quite as scientifically as you can with disease, I believe. A simple alert when conditions look bad for a couple of them would be enough.

7. Aided cost:	**$800**	SL
	$700	SL
	$600	SL
	$500	VL

8. Unaided cost? Or, if answered Q7, comments?

9. Follow spray/no spray recommendation? Yes. Sure. A degree or two makes a big difference in this stuff and you have to believe in those margins. If this can help give an edge you would be foolish not to put faith in it.

10. Anything like this out there you have looked into/purchased? I have been looking closely at those monitoring stations… I think I was looking at one called a WeatherWizard (?) which was around $1000 for the basic unit and a couple of hundred for the software to run it. That is really the only real competition and this looks better at first glance. I am interested in knowing more and I'll be watching the website.

Interview#: 03

Postal: SOL 2Y0	Age: 44-55	Acres: 2500	Rcrt ID#: SK5

Notes: Odd guy. Seemed to warm up towards the end but at first hard to get more than a few words out of him.

Questions
1. First Impression? It needs a lot more explanation. I don't really understand what the point of something like this is.
2. Benefits? None for me. Would give me some weather history and that's about it.
3. Anything to add? Explanation on how to use this. It needs a forecast to be any help to me. I don't have any use for history – it doesn't help me farm knowing what happened yesterday.
4. Anything to remove? No.
5. Easy/hard to understand? Difficult. It needs more information and less of those three letter things all over the place. A manual at least. Could make the whole thing look simpler too.
6. Other diseases? (probe: Any other weather factor issues like insects?) Black leg. Main ones are Fusarium and some Sclerotinia. That's about it. (sp) Flea beetle, Diamond back moth and cabbage moth are also problems around here.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? Maybe with a good manual and full product support I would pay something. I would have to sit down and figure out what it would be worth to me. Not 500 though. Not even half that.
9. Follow spray/no spray recommendation? If I saw that it came within 95% accuracy I would. Otherwise I would take it into consideration with forecasts, agronomist advice, and walking the fields.
10. Anything like this out there you have looked into/purchased? Just the weather stations and some internet sites I look at. None of them are very accurate. That is why I don't have much faith in this stuff. I like the internet for radar and I didn't have much faith in the internet at first either. You just have to win me over by proving yourself.

Interview#: 04

Postal: S0K 3E0	Age: 35-44	Acres: 2500	Rcrt ID#: SK15

Notes:

Questions
1. First Impression? I can see this being a big help to many people. I don't know how helpful it would be to me but I can see some potential here.
2. Benefits? Checking disease risk. Provided this thing is truly set up to be within 12 miles I could keep an eye on disease conditions.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Pretty easy. Fax was a bit hard to make out in places – too small to read. The charts look good and I like the overall layout.
6. Other diseases? (probe: Any other weather factor issues like insects?) You got the main ones. (sp) I would add a couple of insects in there too. If you get a south wind and the temperature and humidity are at a certain level you can see diamond back moth and wheat midge move in. Those are the only ones I can think of that are as tied to the weather as those diseases are.
7. Aided cost: **$800** **VU** **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? $100 per month is about as much as I can see spending on anything like this. Would depend on the year. Last few years I just haven't had the need for this level of monitoring. It would be nice but I don't feel I need it.
9. Follow spray/no spray recommendation? Yes provided I could then find some evidence in my field. I'd walk the field looking for some visible signs. Too dry to see the sort of risk that the growers in MB are facing.
10. Anything like this out there you have looked into/purchased? No I think this is pretty unique… nothing like this that I have looked into.

Interview#: 05

Postal: SOH 2J0	Age: 44-55	Acres: 1600	Rcrt ID#: SK7

Notes: Seemed against it but is willing to pay $500 for it. Another strange one.

Questions
1. First Impression? Hard to say without seeing a lot more about this product. Lot's of information there. I am not sure how relevant it would be.
2. Benefits? The day after? I don't know about how much weight I put on yesterday's news.
3. Anything to add? Forecast. Storm warnings. That is the kind of thing I would like to get alerts on.
4. Anything to remove? No. Depends on what I seed. I wouldn't want anything taken out until I decided what I was seeding because then I would know what I needed - or didn't need.
5. Easy/hard to understand? Fairly easy.
6. Other diseases? (probe: Any other weather factor issues like insects?) (unaided) Not diseases. Grasshopper and wheat midge are what I am more worried about now. Depends on what I decide to grow but I doubt it will be pulse crops or canola.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments?
9. Follow spray/no spray recommendation? If it was accurate I would. Depends on how it performed. I am a data guy… I will spray if the numbers tell me to but I don't need this much data to decide whether I need to spray or not. Just the basics – current wind and temp and an idea of where the humidity has been at for the last little while. This might be overkill. But I would follow it.
10. Anything like this out there you have looked into/purchased? No

Interview#: 06

Postal: S0G 0H0	Age: 35-44	Acres: 3300	Rcrt ID#: SK1

Notes:

Questions
1. First Impression? Looks very interesting. I think this would be nice to have.
2. Benefits? Long-term benefits would be a good account of average temperatures and seeding times, first frost. Amount of rainfall at your fingertips. (P)
3. Anything to add? No
4. Anything to remove? No – may as well have all you can get.
5. Easy/hard to understand? Easy. Some trouble reading the fax… the bottom came out a little blurry. Layout is very good and I like the charts.
6. Other diseases? (probe: Any other weather factor issues like insects?) We do some chickpeas so Ascochyta. Is our main one of the ones you have there. Not much of a risk around here. Wheat midge is the only other thing I can think of that would make some sense to add.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? $100 or so is about as much as I would part with.
9. Follow spray/no spray recommendation? I would use it cautiously for a while until I saw it gave good results. I would do both – watch the risks and do some traditional checking for a while. If it proved and its information coincided with mine I would.
10. Anything like this out there you have looked into/purchased? No. I don't think there is anything out there that compares with this. Interesting idea.

Interview#: 07

Postal: S0N 2E0	Age: 35-44	Acres: 4000	Rcrt ID#: SK08

Notes: This guy was quite nasty. Very difficult to get much out of. Just sort of barked out two word answers.

Questions
1. First Impression? Fine for what it is. Doesn't excite me.
2. Benefits? Could help keep track of things around the farm. More likely pile up under the fax machine.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Easy
6. Other diseases? (probe: Any other weather factor issues like insects?) None
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? I really couldn't tell you.
9. Follow spray/no spray recommendation? No. It is not going to tell me anything I don't already know.
10. Anything like this out there you have looked into/purchased? No.

Interview#: 08

Postal: S0K 3L0	Age: 35-44	Acres: 3000	Rcrt ID#: SK14

Notes:

Questions
1. First Impression? I am exited about it as far as its ability to provide disease projections. Beyond that it is just interesting stuff I wouldn't use too much.
2. Benefits? Disease indexes are the main benefit. Good tool to know whether to spray or not. If I saw a high risk it would get me looking at my fields harder. I would need more current information for wind and temperature to determine if I actually sprayed or not however.
3. Anything to add? Not really. Perhaps a short-term forecast for basic information into whether I can spray or not. I wouldn't need actual numbers – just a low/medium/high type of index.
4. Anything to remove? No
5. Easy/hard to understand? Not easy – but not too difficult either. I'd get used to it. A little hard to read (c) hard to read the fax. Small and a little blurry in places.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. (sp) Maybe some insect trap information. Could show us Diamond Back Moth risk.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? 250-300 and you've got me
9. Follow spray/no spray recommendation? No. I would use it to make a decision on Sclerotinia maybe. The others I would walk the fields before I run out to get chemicals on the field. I would check forecasts too.
10. Anything like this out there you have looked into/purchased? No – just the infield monitoring stations, which I have been hearing more and more about – targeted for those that are running a risk of Sclerotinia. Nothing else like this on the market.

Interview#: 09

Postal: S4H 2K7	Age: 45-54	Acres: 2200	Rcrt ID#: SK16

Notes:

Questions
1. First Impression? I like this idea but I would need more information on how to best use it. It is a new idea to me… Using risk indexes for disease and how to extrapolate decisions from this sort of data. In general I would say that I see a good tool that I would like to learn how to use.
2. Benefits? Assessing the risk of disease. I am sure that there is some really good information to be found in the numbers. I can also see something like the heat units coming in handy to provide some useful tracking information over time. I don't feel I need to be told when my crop is ready to be harvested – but it would be interesting to track the year and then be able to look back on it all easily.
3. Anything to add? A manual or guideline. Disease index guides especially need explanation. I would also like some definitions. What is "risk"? What do they consider risk and does everyone agree that risk is the same everywhere?
4. Anything to remove? There is a lot here that I wouldn't pay much attention to because it is history… wind for example – doesn't do much to know what the wind was like yesterday. It is all interesting though.
5. Easy/hard to understand? Difficult to get what I want to get out of it. I need more training. I get the gist – but I would like to be able to read this all with more confidence. The fax took a couple of tries to come through but once it came through it was fine to read.
6. Other diseases? (probe: Any other weather factor issues like insects?) Fusarium and Sclerotinia are the big ones. Ascochyta to a lesser degree but it is a problem too. No other diseases. (sp) Yeah… Diamond Back Moth is another thing you can predict off short term weather history. Southerly winds and the right temp/humidity will create a risk.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SU
8. Unaided cost? Or, if answered Q7, comments? $200-300 would get my interest.

9. Follow spray/no spray recommendation? Not sure. Not with any blind faith. I would take it into consideration – and it would carry a lot of weight but it is history. In order to make decisions on spraying you need the right balance of good history and good forecast.
10. Anything like this out there you have looked into/purchased? I have heard of this kind of thing before. Not sure where I saw it but I do recall coming across an article or something. Haven't seen anything locally though.

Interview#: 10

Postal: S0N 2E0	Age: 45-54	Acres: 1600	Rcrt ID#: SK2

Notes:

Questions
1. First Impression? OK. The basics (temp humidity etc.) don't interest me but this has some interesting stuff.
2. Benefits? Moisture levels would be good to know. It would be good as a reference over time. Would help in the spring to make planting decisions.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Looks good. Charts easy to read. It all makes sense
6. Other diseases? (probe: Any other weather factor issues like insects?) None. Disease not a problem around here. We just get sawflies and grasshoppers. They're enough.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? $300. Keep in mind you are selling this to farmers. We are a tight bunch. I wouldn't gain much by using this – as far as money saved or anything because I don't have to spray. The guys down the road that are growing pulse crops would be very interested I'd bet. We are simple here. No pulse and not nearly the sort of heavy rotation you see with some of the other guys around here.
9. Follow spray/no spray recommendation? Not me but I so rarely have to spray and when I do it is because there is obvious risk.
10. Anything like this out there you have looked into/purchased? There is an Agricultural newsletter that gives daily information. Lots of different stuff. Not like this but it is an information subscription service and for that I pay $80 for the season.

Interview#: 11

Postal: S0L 1Z0	Age: 45-54	Acres: 4200	Rcrt ID#: SK17

Notes:

Questions
1. First Impression? Very detailed. A good-looking program. I'd like to know more.
2. Benefits? This would have to be a lot more accurate than any other source available to me now. Rain levels, wind, tem, you would have everything you need here to make a good decision on spraying.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Easy The charts and the overall layout are easy to pick up on and figure out.
6. Other diseases? (probe: Any other weather factor issues like insects?) Sclerotinia and Ascochyta are the worst for us. (sp) No insects that I would add.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments?
9. Follow spray/no spray recommendation? Yes. I would fully trust the numbers to show me better than any other thing I would base a decision on so why not?
10. Anything like this out there you have looked into/purchased? Nothing this local. Weather stuff all comes from miles away.

Interview#: 12

Postal: SOL 2V0	Age: <35	Acres: 1950	Rcrt ID#: SK21

Notes:

Questions
1. First Impression? Very similar to what I already get through AgInfonet (?). The data I would use off of this is the same that they give me and theirs is free. AgInfonet even gives us a one day forecast so they have a little more of what I need than your guys do.
2. Benefits? It does extrapolate disease indexes, which is unique. We do some pulse crops and have had problems with Ascochyta in the past. I also like the heat units – another thing that AgInfonet doesn't provide and I would be curious to follow.
3. Anything to add? Forecast. That is big benefit to me because I want to be able to know what to do in the next few hours.
4. Anything to remove? Wind as far as history. I wouldn't look at that.
5. Easy/hard to understand? Nothing wrong with that. Very clear. Easy to read. Fax came through well.
6. Other diseases? (probe: Any other weather factor issues like insects?) Anthracnose in lentils. White leaf mould in peas once in a while. Leaf Rot/Rust in barley. (sp) no I wouldn't add any insects.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** SU
8. Unaided cost? Or, if answered Q7, comments? $200s about as much as I would spend not knowing more about this.
9. Follow spray/no spray recommendation? It would be one more tool to use. I would continue with crop surveys and walking the rows. This would act as an alert – but I wouldn't run out and spray simply because it told me to.
10. Anything like this out there you have looked into/purchased? No, apart from the internet and what it can give me. AgInfonet and others similar.

Interview#: 13

Postal: S4V 2G4	Age: 55+	Acres: 2000	Rcrt ID#: SK22

Notes:

Questions
1. First Impression? Gets me curious. I have a lot of questions. Got my interest. Also – you would have to train me – I am a bit of an old mutt. Certainly looks like something the young fellas would enjoy.
2. Benefits? The disease indexes are the main benefit. Fusarium and Ascochyta have been hitting hard in places around here… Sclerotinia as well. It would also give you timing for spraying and the ability to monitor crops for risks. Looks like it would be pretty precise. If you have something that is watching your field for disease risk – that is a really good tool.
3. Anything to add? You have all I can think of.
4. Anything to remove? There are a couple of things that I may not look at but even those things I'd watch out of curiosity. Also I'd hate to tell you to remove something that someone else would really like to have in there.
5. Easy/hard to understand? Well… I didn't study it as close as it deserves because I know this is only a model. It would take me a while to pick a lot of this stuff up but I would figure out what I need. There is a lot there that I have never seen before. GDD BMT and all those other three-letter things. You would have to teach this old dog a new trick or two, Also… Metric gives me a big headache.
6. Other diseases? (probe: Any other weather factor issues like insects?) You got all the ones I would like to see. There are a couple of others that I don't recall the names of that can hit the barley and oat guys around here but I don't grow those crops so I don't worry about them. (sp) Insects? No…
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? I do think that $500-800 sounds quite reasonable. I think you could get those prices for this. I am just past all this stuff and starting to wind down so I doubt I would sign up except out of curiosity – and that is more than my curiosity is worth.

9. Follow spray/no spray recommendation? Yes. I think good information should be trusted. You have a very small window of opportunity with Sclerotinia and CLD in particular so you really have to be on the ball. If I saw that I had a god source of information on risk levels and it told me I was at risk I wouldn't waste any more time… I'd be out in the field within the hour if conditions allowed for it.
10. Anything like this out there you have looked into/purchased? Not a thing. This is completely unique as far as I know.

Interview#: 14

Postal: S0L 2N0	Age: <35	Acres: 1700	Rcrt ID#: SK19

Notes:

Questions
1. First Impression? Very detailed. Impressive in how much it covers.
2. Benefits? If I sprayed more or was doing a lot of custom spraying this would be a real benefit. If I had problems with a chemical company this would be a good tool to have as well. Aprt from that it would just be a good record to look back on as far as good grow days and that sort of thing. Like a journal.
3. Anything to add? I have DTN so I wouldn't want anything that they already offer me. They have a good forecast system and a lot of the information you cover. I can't think of anything I would like to see added to yours.
4. Anything to remove? No. Everything there is useful.
5. Easy/hard to understand? Basic. Pretty easy to understand and straightforward. Everything I looked for I found right away.
6. Other diseases? (probe: Any other weather factor issues like insects?) No others. I wouldn't add any others but then disease isn't a big problem here.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? A lot of the basic information I have already – not as local but I am happy enough with it anyway. The disease thing makes it valuable that way but not for me because of how little I have to spray. I see the value and your prices don't surprise me – but I wouldn't pay them because I wouldn't use this in the way that it is meant.
9. Follow spray/no spray recommendation? I would still check the field first. I see a lot of difference even between my fields so I would want to walk them before making that sort of decision.
10. Anything like this out there you have looked into/purchased? DTN is comparable – especially when you also look at some of the internet resources available. I am lucky in that there is a pretty god weather station pretty close to us so we get some fairly local data when we need it.

Interview#: 15

Postal: S0G 5B0	Age: 45-54	Acres: 2200	Rcrt ID#: SK12

Notes:

Questions
1. First Impression? Difficult to get through. A lot of information there and not stuff I am willing to give the sort of time it requires.
2. Benefits? Not much for me. The basics like wind rain and wind are interesting in that they are proposing to be very local. But it is just interesting. I don't grow enough of the crops that see disease risks to want to fill my head with this kind of data.
3. Anything to add? No.
4. Anything to remove? The corn stuff. Heat units and that sort of thing – no use to me at all. All of the disease stuff is interesting and I can see it's use – but no use to me because I don't plant the kind of crops that would see me worry about them.
5. Easy/hard to understand? Pretty basic except for all the stuff under rainfall. GDD CHU BMT – I have no clue what they are giving me there. I get the reports out of the airport near here and this is a whole lot easier to understand than those reports are.
6. Other diseases? (probe: Any other weather factor issues like insects?) Nope (sp) army worm and flea beetle I suppose.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? No clue. I subscribe to a few magazines and I don't even get to reading those – so not much value to me at all.
9. Follow spray/no spray recommendation? No. I would still scout. It may trigger my going out and having a better look.
10. Anything like this out there you have looked into/purchased? No – and it it is interesting in that way. I wish these guys all the best – I hope they find a market because it is interesting stuff.

Interview#: 16

Postal: S0N 0K0	Age: 35-44	Acres: 2400	Rcrt ID#: SK13

Notes:

Questions
1. First Impression? Looks good. Good information and in all the right places. Very interesting idea.
2. Benefits? Mainly as a spraying aid. Also would help me make decisions regarding threshing. I could also use this as a backup if I had a problem with a chemical company and needed to show them records of weather for a given day.
3. Anything to add? Maybe a short term forecast. Just 1-3 days at most. Basic stuff like temperature, wind and POP
4. Anything to remove? No
5. Easy/hard to understand? Easy. They use terms I am familiar with. The charts are easy to follow. The fax is easy to read. I had no trouble with it at all.
6. Other diseases? (probe: Any other weather factor issues like insects?) Ash. Is the big one for me. Chickpeas are big money and I feel the most on the line with them. The others you mention here are also good. I can't think of any I'd add.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? $200-300 would be ideal. Especially in the first year where I would be curious to try to see how it works.
9. Follow spray/no spray recommendation? Yes. This would become my main guide along with my chemical reps.
10. Anything like this out there you have looked into/purchased? DTN works pretty well for my needs. Doesn't cover all the same ground but it does give me a lot of the basics I need.

Interview#: 17

Postal: S0H 2J0	Age: 45-54	Acres: 5000	Rcrt ID#: SK6

Notes:

Questions
1. First Impression? Sounds like a lot of work. (p) On their part and on mine.
2. Benefits? Locality of the information is an advantage. As far as the information goes I have DTN and that already gives me what I need as far as where the weather has been.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Easy
6. Other diseases? (probe: Any other weather factor issues like insects?) I don't grow Canola. Just some yellow mustard. I am mainly worried about grasshopper this year and that is about it.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? Can't say. I pay 1300 a year for DTN already so I doubt I would want to pay more for information. That is already my budget.
9. Follow spray/no spray recommendation? I avoid buying chemicals – they are the biggest way to becoming broke. I don't grow lentils or chickpeas anymore so I can largely avoid spraying. When I do have to I know it… so no – I doubt I'd use this to make a decision.
10. Anything like this out there you have looked into/purchased? DTN and Internet

Interview#: 18

Postal: S0K 3L0	Age: 35-44	Acres: 4000	Rcrt ID#: SK20

Notes:

Questions
1. First Impression? Good. I would be excited to learn more about this. I believe you get what you pay for… so I am going to bet that this isn't going to go cheap.
2. Benefits? Spraying mainly. Good historical data too – it would cut down on my log taking. I believe in logs and try to keep a good one so I would value this for improving that side of the work I have to do every day.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Easy. Fax came through OK although it did take a few tries. My fax # and my home # are the same so sometimes it is a little annoying getting it to work right. As far as the information it contains, that was clear and easy to follow. The charts were easy to understand overall… I would have to get used to it all – they would be more clear with time. Once I saw these things with my own local data in them it would be a lot easier to follow too because I could compare the figures with what I know already.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. (sp) No… I get insect data already and wouldn't need to see that data worked out in the way they have done with the diseases.
7. Aided cost: **$800** VU **$700** VU **$600** SL **$500** SL-VL
8. Unaided cost? Or, if answered Q7, comments? My willingness to pay would depend on the year. Some years I really haven't had to worry about disease so this would really only be a benefit to me as a log tool and for interests sake and I wouldn't be willing to pay big bucks for that. Other years I would want to see this data a lot more and I would be reading these sheets in a different way – a different frame of mind – then I would be paying more. $500 splits the difference so I would be quite likely to pay that.

9. Follow spray/no spray recommendation? Probably. Maybe not at first – I would do what I have already found works for me – but I would follow them with interest and once they won my trust I would give them more and more weight until perhaps they would take over as my main source. Also – these things tell me I am at risk and should spray – they don't tell me I can spray – I would need to look at forecast data to determine that.
10. Anything like this out there you have looked into/purchased? I have seen those weather stations and a number of us around here have considered them. Nothing in the way of a subscription service like this so I am pulling for you guys in that respect. I wish them all the luck.

Interview#: 19

Postal: S0K 4L0	Age: 44-55	Acres: 1500	Rcrt ID#: SK3

Notes:

Questions
1. First Impression? Not useful. I think this is overkill. Too much information. Maximums, minimums, daily, weekly, hourly… I know just by walking outside whether it is hot enough or wet enough.
2. Benefits? If as accurate as they say it could help me with planning. Could help me make decisions like whether I can dry hay. 12 miles is good – but I am close enough to Lloydminster to get weather reports that are nearly that close anyway.
3. Anything to add? No
4. Anything to remove? Daily and 7 day… I don't need that sort of history.
5. Easy/hard to understand? The fax is a bit blurry. I would suggest going with e-mail or the web. Fax is a crap way to send information like this out.
6. Other diseases? (probe: Any other weather factor issues like insects?) No (sp) No insects either. We are in a low disease risk area.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? $500 is still way too high for the reasons I already gave you. Couldn't suggest a price.
9. Follow spray/no spray recommendation? No. I would take into consideration a high risk warning and go to a second opinion until it proves to be as accurate as my current sources.
10. Anything like this out there you have looked into/purchased? No. Haven't looked.

Interview#: 20

Postal: S0K 4P0	Age: <35	Acres: 2200	Rcrt ID#: SK4

Notes:

Questions
1. First Impression? Detailed. You went through a lot of trouble! A lot of info. I'm not sure how useful it is to me but I like the look of it.
2. Benefits? Well… Depends on the year and how close you have to watch your crop. We haven't had much of a problem around here lately. In a disease year – and we have had them – this would be a big help. It would be good for keeping records regardless of the year. I could, for example, use it to watch rain levels to help calculate the advancement of the crop. You could even predict crop stages using the heat units – mostly in corn but I know there is a trend looking at heat units for other crops too. You could even use this to predict seeding dates.
3. Anything to add? Wind speed and direction maybe – in the way of up-to-minute or short term forecast. Could even throw in a POP and temp in that way.
4. Anything to remove? Some years I wouldn't look at some of the things you have here but other years I would. Don't remove.
5. Easy/hard to understand? Easy. Good layout and easy to read. I liked the charts.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. We mainly seed canola and wheat. If I was seeding peas or pulse crops I could think of a few… mildew, for example. (sp) Maybe flea beetle.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? We are going into a year where we need every dollar. $200 might sell me.
9. Follow spray/no spray recommendation? Not likely. (p) I would look at the risks and take them into consideration but I wouldn't spray every time. You have to take the economics into consideration every time. The markets. Just not getting enough for these crops to warrant dumping money on them. I spray when I have to – not when I am at risk. And when I have to – it is obvious because the disease can be seen to be showing up.
10. Anything like this out there you have looked into/purchased? Nothing

Interview#: 21

Postal: S0N 0N0	Age: 35-44	Acres: 2500	Rcrt ID#: SK26

Notes: Odd… Quite pessimistic about the use it would have to him… and yet he seemed to like the prices (so often it was the other way around!)

Questions
1. First Impression? Alright. I can see where they are going with this idea and it is a good one – not for us though. Maybe back when I grew chickpeas.
2. Benefits? When I grew chickpeas I had to watch disease close. This would have helped. I know half a dozen guys around here that would be very excited about this idea. Unfortunately you called the wrong guy.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Once I sat down with it and gave it some attention I would say it was easy.
6. Other diseases? (probe: Any other weather factor issues like insects?) We have a little bit of Ascochyta around here and not much else. We are a low risk area.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? The prices are about what I expected. They sound fair. Still not sure I would go for it but I might.
9. Follow spray/no spray recommendation? I would need to look closer. It would have to prove itself to me first but I would watch it with interest.
10. Anything like this out there you have looked into/purchased? I use AccuWeather (?) out of the US and Environment Canada reports which give me some of this. Not all of it – but most of the stuff I feel I need these days. Those sources are both free.

Interview#: 22

Postal: S0M 0E0	Age: 45-54	Acres: 2100	Rcrt ID#: SK38

Notes:

Questions
1. First Impression? Elaborate (C) in a good way and a bad way. It is a lot to take in. How are they going to do this? I have a lot of questions. (asked a lot of questions!)
2. Benefits? Disease prediction, mainly. It looks as though this would be really good for that. I have peas and canola so I am wrestling with some risky crops. Currently I call the Environment Canada hotline a lot – that 7000 number for disease risk. I would imagine this would be a lot more accurate if it is really as close as they say.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? I'd get used to it. I do feel I need a lot of clarification on some of these points. I see these risk levels for example – this scale that climbs to 100. I understand that 90 is worse than 80 – but I wonder what 90 means. When should I start to sweat? Where do they come up with the number? As I say… more questions than answers.
6. Other diseases? (probe: Any other weather factor issues like insects?) Ascochyta, Sclerotinia and Blackleg are the big ones around here. The others we haven't had to worry about yet.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? Those are what I say now knowing what little I know about this… I would want to know a lot more before I commit to any more than that. In this program's first year I would want to try it for $250 to $300. If worth more I'll pay more.
9. Follow spray/no spray recommendation? I would but it would depend on the markets. No matter how risky these crops are only worth so much and I can't afford to spend more than a certain amount on them.

10. Anything like this out there you have looked into/purchased? No. (He kept asking about the monitoring system ACE would use throughout the study – I didn't get the sense he had ever heard of field monitoring stations).

Interview#: 23

Postal: S0L0V0	Age: 35-45	Acres: 1600	Rcrt ID#: SK31

Notes:

Questions
1. First Impression? A lot of information. I am not sure how useful this would be to me personally.
2. Benefits? The idea of average temperatures, humidity and rainfall – but I have a good running knowledge of that anyway. We do grow lentils so Asc. Is a risk that can be pretty high some years. This would be good to have for that. And it would be good to have a running record of all this data from year to year.
3. Anything to add? Yeah… fix the numbers so that we get more rain (laughs) No. Nothing to add to these sheets.
4. Anything to remove? No
5. Easy/hard to understand? A little overwhelming but not too bad once you sit down with them.
6. Other diseases? (probe: Any other weather factor issues like insects?) No… even the ones you have are all low risk. I know that Sclerotinia has been creeping this way – showing up within 20 miles of here… the others are all low risk except Ascochyta.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? That is about where I figured you would have priced this. I would try it for $500
9. Follow spray/no spray recommendation? Yes… I would still scout but I would spray off good data.
10. Anything like this out there you have looked into/purchased? Nothing like this.

Interview#: 24

Postal: S0N 0N0	Age: 35-44	Acres: 4600	Rcrt ID#: SK25

Notes:

Questions
1. First Impression? Good. We grow chickpeas, which is high risk for disease. Ascochyta can be a big problem.
2. Benefits? The idea of the disease indexes appeals to me the most. I can also see a use for this in showing moisture collection over a longer period of time. Also.. Just as a local weather tool in the most basic sense. We really don't have any good data available to us now. I rely on Environment Canada and their data is all based on stations so far away it is nearly useless to me. For wheat and durum there is the problem of value of the crops – I just can't get enough money out of those crops to make spending anything much worth it.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Easy
6. Other diseases? (probe: Any other weather factor issues like insects?) Powdery Mildew… our other problems are all accounted for here.
7. Aided cost: **$800** SU **$700** SL **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? I am basing my expectations of price on what a Mitos (?) Weather Station would run me. I priced those out and know roughly what they would run on a seasonal basis.
9. Follow spray/no spray recommendation? Definitely. I would have great faith in this sort of data. I have seen models for the weather stations and these things are showing a 90% accuracy. That is more than good enough for me – better than any other source of information that I - or any Agronomist - is going to base an opinion on.

10. Anything like this out there you have looked into/purchased? I looked into a weather station. This would be a good solution to the problems I had with purchasing a unit. I am largely sold on the idea of having a station and the benefits one would give me. My problem with them is largely the cost and the means of collecting the data and interpreting it… This solves all those problems. I have to say that I am glad you called because now I will wait a bit before buying a station. I think this subscription idea is much better for me because of the pricing and the lack of commitment. If I spend thousands on a system and find out in a year that it doesn't pay for itself I am committed. With this I would be able to opt out in a year or two and be way ahead.

Interview#: 25

Postal:S0N 0W0	Age: 55+	Acres: 1600	Rcrt ID#: SK27

Notes:

Questions
1. First Impression? Looks like a pile of work for me and for them. Do they expect me to collect all this data for them? (I read the description to him to insure that we were on the same page). I am getting too old to worry about all this stuff. I do what I have always done. I can see a market for this sort of thing in the new breed of farmers. They have a mind for all this technical stuff.
2. Benefits? Not much. You can't do much about the weather. Ascochyta is a problem around here so it might help me a bit to know what is happening on that front.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Understandable. No problems. (yeah right… he thought he would be going out and monitoring himself when I called!)
6. Other diseases? (probe: Any other weather factor issues like insects?) We are pretty low risk around here other than Ascochyta in our chickpeas.
7. Aided cost: **$800** VU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? Hard to put a figure on it without knowing more.
9. Follow spray/no spray recommendation? Doubt it. I know when to spray. I walk the fields with my sons. Together we make a decision.
10. Anything like this out there you have looked into/purchased? No

Interview#: 26

Postal:S0N 2M0	Age: 55+	Acres: 2500	Rcrt ID#: SK28

Notes:

Questions
1. First Impression? I am pretty pessimistic overall.
2. Benefits? We are in a risky area for chickpeas and this disease risk idea would help. It would be good to have for history too. We measure rainfall and temps and keep track over time so this would be handy in that way. Would be interesting to watch.
3. Anything to add? Maybe some forecast information. Short term. Mainly because all of the stuff we get sucks.
4. Anything to remove? No
5. Easy/hard to understand? Hard to figure out. A lot of information. I would need a manual to help me figure out what a lot of this stuff means.
6. Other diseases? (probe: Any other weather factor issues like insects?) You have all the ones I can think of and they are all pretty low risk around here.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? I would have to crunch the numbers. It is a question of what it stands to save me on my chickpeas. Your figures don't scare me – but I wouldn't want you to think I would commit to any of these until I sat down and did some accounting.
9. Follow spray/no spray recommendation? Yes. At least as a good part of my decision. I wouldn't immediately spray if I saw I was at risk… but it would get me out there looking.
10. Anything like this out there you have looked into/purchased? Nothing like this.

Interview#: 27

Postal: S0L 2A0	Age: 55+	Acres: 2000	Rcrt ID#: SK32

Notes:

Questions
1. First Impression? I can see this being great to have. I liked the idea and while it is not completely something I'd need I know a few people in town that would love this. I took it with me to lunch today and showed it to a few other farmers and we all agreed this is something we would like to know more about. The guys there that grew canola were especially excited.
2. Benefits? I think it is just nice to see every day mapped out like that. It would be interesting to look back on in a number of different ways. We are largely wheat and barley here so it is the Fusarium index that stands out above everything else.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? A little hard at first, to be honest. I gave it some time though and I think almost everything is clear to me now. Wouldn't hurt to provide more instruction with it.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. (sp) diamond back moth, armyworm and wheat midge.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? $300-500 seems fair.
9. Follow spray/no spray recommendation? Yes. It seems like it would be better than anything else available to us so… sure.
10. Anything like this out there you have looked into/purchased? No

Interview#: 28

Postal: S0K 4V0	Age: 35-44	Acres: 2000	Rcrt ID#: SK24

Notes:

Questions
1. First Impression? I like it. It looks good.
2. Benefits? Wind direction and min/max temps. I like the disease index idea a lot. During the spray season these would be great to have. You could read these over in the morning and see if it got too cold over night for spraying to be worthwhile and that sort of thing. A lot of data to take into account before decision time and I like that.
3. Anything to add? I would like access to better wind speed and direction data. Maybe a days forecast for wind rain and temp.
4. Anything to remove? If you forced me to choose something I would say "growing degree days" and related information you have there. But I wouldn't take that out -because it is interesting and I know some others will want it.
5. Easy/hard to understand? It is a lot to look over. Needs some time – but I don't think that is a bad thing. I couldn't make out some of the key at the bottom – fax quality was a little poor so some of it is too blurry. I thought some of the numbers and stuff at the bottom was in too small a font to read in fax quality.
6. Other diseases? (probe: Any other weather factor issues like insects?) Sclerotinia and CLD are our problems around here. Ascochyta is showing up but I haven't seen any yet. (sp) Yeah I would add diamondback moth, armyworm, wheat midge and flea beetle if you thought you could do a half decent job of predicting it.
7. Aided cost **$800** SU **$700** SU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? I would be very interested in a shorter term version of this program – 2-3 weeks during the height of the spray season. I would pay $80-100 a week for this information at that time.
9. Follow spray/no spray recommendation? Yes. I would put full faith in what the numbers told me.

10. Anything like this out there you have looked into/purchased? Just local forecasts and website information which is not nearly this detailed or accurate – but it is free.

Interview#: 29

Postal:S0G 3W0	Age: 55+	Acres: 3400	Rcrt ID#: SK30

Notes:

Questions
1. First Impression? Interesting… local conditions all down on paper like that. I can see this coming in quite handy. I am not sure how good it would be to use in terms of crop planning but it would give me something solid to take into account. It would be interesting to see how this would work.
2. Benefits? Disease indexes mainly. Monitoring risks to the crop. I can also see using this as something you could go to in the winter – look back over the past year and make some decisions on seeding and other crop management decisions.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? A lot there. I couldn't just glance it over. I wouldn't look at everything so I didn't spend as much time on some things as others but over time I would get to know the whole thing. I found the chart on the second page a little hard to make out – the print was too small to be able to read easily.
6. Other diseases? (probe: Any other weather factor issues like insects?) Anthracnose I suppose… but then that might be too similar to Ascochyta to bother separating them. Powdery mildew in peas would also be a good addition.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments?
9. Follow spray/no spray recommendation? Yes. I would still take other sources into consideration but I can see this becoming an important part of the decision
10. Anything like this out there you have looked into/purchased? No

Interview#: 30

Postal:S0H 4K0	Age: 35-44	Acres: 2000	Rcrt ID#: SK42

Notes:

Questions
1. First Impression? Not sure what we would do with this but I can see that it would be a big help to some people I know.
2. Benefits? Looking back over this at the end of the year and before the next one. Could be a big help with some planting decisions.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Straight forward. There were a few spots that were hard to read because it was a fax. The layout is good. It all makes good sense.
6. Other diseases? (probe: Any other weather factor issues like insects?) Ascochyta is really the only one we worry about around here. Some blight in the barley as well. No others to suggest.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? Those prices seem fair – I just question whether we would make enough use of these things to make that worth it to us.
9. Follow spray/no spray recommendation? Yes. I don't see why not.
10. Anything like this out there you have looked into/purchased? No

Interview#: 31

Postal: S0L 1S0	Age: 35-44	Acres: 2400	Rcrt ID#: SK43

Notes:

Questions
1. First Impression? There are years that this would be wonderful to have but overall I would say we are a little to dry around here to worry about disease to the extent that this program is hoping we are. We have maybe one year out of ten that are wet enough to monitor to this extent.
2. Benefits? Disease index is the main point. And that is really the only use I can see. I would look at it once and a while – but not daily or even weekly. If it were an odd year I would give this a lot more attention.
3. Anything to add? No except perhaps a glimpse into the future. This gives very local readings – if they could somehow extrapolate them to give something of a short term forecast I would be interested. This area isn't covered very well and forecasts are generally really far off.
4. Anything to remove? No
5. Easy/hard to understand? This is really well laid out. I can see that a lot of work went into this. I wish it was more useful to me because it deserves excitement.
6. Other diseases? (probe: Any other weather factor issues like insects?) Ascochyta is really the only one we worry about around here. No others to suggest. (sp) no insects.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? I can see this saving us some money in field scouting and that is the amount that I would want to pay for it. I would have to sit down and figure out how much that would be – but I know that $500 still seems a little high.
9. Follow spray/no spray recommendation? No. If it said I should spray I would still scout or get the opinion of my retailer/agronomist.
10. Anything like this out there you have looked into/purchased? I looked into those weather stations a few years ago when we were in a wet year. I didn't buy because it was too much to be worth it for those one or two years we are wet. That is why I hope this is successful because when I do need this sort of information that rare year it would be nice to know something like this was out there… It would be far more affordable than a station.

Interview#: 32

Postal: S7K 3J9	Age: 55+	Acres: 5000	Rcrt ID#: SK34

Notes:

Questions
1. First Impression? Not a bad idea at all. I like the look of this for what it is. I did expect it to be more of a forecast tool when you called the other day so I am still relating this to my thoughts of past vs future as a tool for decision making. I think I could make important decisions the way this is laid out though.
2. Benefits? Disease risk assessment. Beyond that… I enjoy weather and like to keep involved in watching it. I suppose any farmer is a bit of an amateur meteorologist and perhaps I am more than most. I enjoy drawing my own conclusions and making my own predictions based on my own observations – so this would be handy in that way. Going back to the disease side of this for a moment… time is such a factor with some of them – you really have to have an edge on them. At times you have
3. Anything to add? I am curious as to how accessible this information will be. If the monitoring stations are collecting the data anyway… will we be able to get recent data off of it in some way? Would be good if we could. Another thing… metric system bugs me. I strongly advise some method of letting us receive this in one or the other –you could do both but I think most would find that to be annoying. It is an easy calculation for these guys to make and it would make my life a lot easier.
4. Anything to remove? No.
5. Easy/hard to understand? Easy. I saw no surprises and everything seemed to be in the most logical place. (sp) The fax came through well – I was able to read everything.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. We see those around here and not to many others. We are a fairly high risk area for Sclerotinia and Ascochyta. (sp) I might ask if they could add diamond back moth…. That would be about it.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments?

9. Follow spray/no spray recommendation? It would certainly act as a first alert. I would go on running to my chem. retailer who provides us with scouting services.
10. Anything like this out there you have looked into/purchased? No but I count on my chem.. guys to let me know if they see anything that will help me make better decisions. They tend to keep up on all the latest.

Other comments: You should approach the retailers with this. Maybe get some of the chem. companies on board. I can see something like this benefiting them as much as producers so it would be nice if they would subsidize this a bit for us.

I would also say that ACE should offer something in the way of a test drive. It would get me going and answer a lot of the questions I have that I suspect this will more than handle – but I would still like to see it at work before I reach for my wallet. Year two will be an easy sell. Once this proves itself – and I have little doubt that it will – word will spread fast. Target the retailers for the first year because they are smart guys. They will know exactly who on their lists to call and mention this too.

Interview#: 33

Postal: S0K 4L0	Age: 55+	Acres: 2200	Rcrt ID#: SK35

Notes:

Questions
1. First Impression? Probably a good thing. We do the weekly report for the province so we both follow the weather carefully and get the full reports back from them for the region. This looks much more detailed and yet much easy to read through.
2. Benefits? Keeping track of rainfall and temperatures – this would let us keep track of a lot of the things we don't monitor ourselves. Heat units would be interesting to watch – that is a good example of something I don't know much about but see that there must be a value to following it. Would be interesting to see different aspects of the weather than what we are familiar with.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Easy. Logical. Much better than what I am used to.
6. Other diseases? (probe: Any other weather factor issues like insects?) A lot of peas grown around here so I would like to see powdery mildew added. I would also add diamondback moth and wheat midge which are weather related and predictable.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? Things are snug out here… but this is interesting enough that I think I would have a hard time not subscribing at those prices.
9. Follow spray/no spray recommendation? Probably. I have good faith in the figures.
10. Anything like this out there you have looked into/purchased? No

Interview#: 34

Postal: S7K 3J9	Age: 35-44	Acres: 5000	Rcrt ID#: SK33

Notes:

Questions
1. First Impression? I like! I really like! I see a lot of really good information here and I really have a need for something like this.
2. Benefits? Growing degree days. Rainfall. Just how local this information is going to be… we currently get all our information out of the airport at Saskatoon which is a world away. Weather changes a lot within a mile or two let alone between Saskatoon and here. I am not at all happy with how things are and need to walk my fields to have any sense I am keeping an eye on threats. There has to be a better way and these look to be it. These disease indexes look great. Disease is a problem around here – especially Sclerotinia. Also some Fusarium showing up. I can see using this to figure out yield potentials throughout the season as well. This information could give you a lot of hints.
3. Anything to add? Total rain cumulative from May1 on… it looks like they are doing something like this – I would just want to make sure that is the plan – because it is a really good idea.
4. Anything to remove? No. Definitely not.
5. Easy/hard to understand? Easy. Easy to read. The layout and the charts are exactly what I would hope they would be and the whole thing follows a very logical path. Don't change a thing.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. CLD and Sclerotinia are our big ones. There isn't much pulse around here so the others have largely left us alone so far.
7. Aided cost: **$800** SL **$700** SL **$600** VL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? I would compare to monitoring stations first. That would be your main competition.
9. Follow spray/no spray recommendation? Yes. Of course it would depend on crop conditions – if I knew my crop was susceptible and I saw risk I would spray but if I knew my crop was ok and in good shape I would trust that it could handle a few days in high-risk conditions.

10. Anything like this out there you have looked into/purchased? I have looked at – and will continue to look into – monitoring stations. This is a very interesting option though. I would have to look at both closer.

Interview#: 35

Postal: S0N 0A0	Age: 44-55	Acres: 2650	Rcrt ID#: SK9

Notes:

Questions
1. First Impression? Nice and fancy… good information here but not very practical from my point of view. Maybe if I still had lentils and was watching Sclerotinia risks like I used to.
2. Benefits? Mainly watching for precipitation levels – but I would like to see them being even more specific than 12 miles because I think I would have to be watching dew point. I see differences in precipitation – up to 5 or 6 inches just within the 5 miles from one side of the field to the other. We haven't had a good general all over the field rain here in many years – so I even question whether a monitoring station would be able to give me a good picture of my situation.
3. Anything to add? No. You guys covered what you need to – it just isn't my way of farming.
4. Anything to remove? No
5. Easy/hard to understand? Easy. I am used to reading this stuff. I am a systems engineer and am involved in a lot of this kind of thing.
6. Other diseases? (probe: Any other weather factor issues like insects?) Root rot… what we used to call "take all" – I don't know the technical term. Other than that we watch for sawfly.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments? You are going to find that it is going to depend on what a grower is growing. If I had 1000 acres of chickpeas I would be looking at this through very different glasses. $300 a year would have been what I expected it to be at.
9. Follow spray/no spray recommendation? Yes. If I were going to use something like this it would be because I would trust it so I would spray to its recommendation.

10. Anything like this out there you have looked into/purchased? I think Manitoba Agriculture has developed a unit that sits in your field. Solar power. Sends data to your computer or to a website that you get access to. I seem to remember hearing that was about $50 a field to sign on… but I seem to recall that it was a student program through the university or something so I would imagine that it was heavily subsidized if not free to the farmer for helping with the data collection for their project. I don't recall all the specifics but it seems to me it was very similar to this program… could even be this program.

Interview#: 36

Postal:S0N 0P0	Age: 44-55	Acres: 3500	Rcrt ID#: SK29

Notes:

Questions
1. First Impression? When you called the other day (to recruit me) I had an image in my mind of what this was going to be and it is almost exactly what I expected.
2. Benefits? Disease mainly. Spraying. It would have to be chemical related these days wouldn't it? (laughs). Good thing though. Not sure I would use it every year but it would depend on what I was growing and the type of weather we were getting. And the price of this thing, which I am sure we will be getting to any minute now…
3. Anything to add? Not off the top of my head.
4. Anything to remove? No
5. Easy/hard to understand? Quite easy. A few things I would like to know more about. Not sure what everything is here – but the things I am familiar with are easy to find and follow.
6. Other diseases? (probe: Any other weather factor issues like insects?) Not really. You have the top 4 problems I am aware of. (sp) no insects. I don't think they can be predicted off weather in the same way. They are related but not in the same way.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SU
8. Unaided cost? Or, if answered Q7, comments? I am being asked its value without really knowing its value. I would have to sit down with someone and here the full pitch and then take a few days to look at what this could do for me.
9. Follow spray/no spray recommendation? Probably. I wouldn't sign up and pay that kind of money if I didn't think I would… so if I did sign on it would be because I had decided I would follow its advice.
10. Anything like this out there you have looked into/purchased? No. Heard about the stations but haven't really looked into them on any real level.

Interview#: 37

Postal: S7H 4X8	Age: 45-54	Acres: 1600	Rcrt ID#: SK41

Notes:

Questions
1. First Impression? A lot of very technical looking information. A lot there that I simply don't understand. They are making an assumption that the general population will understand them on their level but I have to say that I think they are wrong. All these abbreviations for example… I have never seen these before – I find it strange that they seem to expect that I have.
2. Benefits? The Fusarium index and those other ones. Once I knew how to use this and read all the technical stuff I could probably use it to make better spray decisions.
3. Anything to add? We have a pretty good idea what happened last week and yesterday. I would like a hint of what is to come even if it is not as local as this information. The risk assessment aspect is good but they have to look into balancing it with a little bit of future prediction.
4. Anything to remove? No
5. Easy/hard to understand? Those abbreviations have to be explained. Either dumb it down or have a layman's guide. I am not a meteorologist – some farmers may enjoy being treated like one but my mind is full up with other stuff.
6. Other diseases? (probe: Any other weather factor issues like insects?) Yes. Add Anthracnose. (sp) Maybe wheat midge but that would be it.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SU
8. Unaided cost? Or, if answered Q7, comments? I give it somewhat unlikely across the board based on what I see in front of me. It isn't complete and I don't know what the complete package would be. I would need to see some support before I bought it for any price. Once they do assure me of support and I am comfortable with it I would expect $250 as an introductory price.
9. Follow spray/no spray recommendation? Once it won me over – more than likely.
10. Anything like this out there you have looked into/purchased? DTN – but that isn't very local. Different ballpark.

Interview#: 38

Postal: S0L 1S0	Age: 45-54	Acres: 3500	Rcrt ID#: SK40

Notes:

Questions
1. First Impression? A lot here. Very specific information. Moisture aspect useful. Not a lot of disease around here – we have more of a drought problem if anything.
2. Benefits? Disease prediction for specialty crops. Field peas and lentils you could predict Ascochyta for example. The daily Fusarium index would also be popular around here. While Fusarium isn't a big threat it is growing and on a lot of people's minds.
3. Anything to add? Wind speed is important for the timing of applications. Yesterday's wind speed and direction wouldn't be good enough.
4. Anything to remove? Heat units not a big deal to me – I don't grow corn. Some would find it useful though so I wouldn't remove it – I am just saying that I wouldn't pay attention to it.
5. Easy/hard to understand? I wouldn't say "easy". I would have to spend more time with it than I have. I would get used to it…in time I would just pick out what I need in a matter of a minute.
6. Other diseases? (probe: Any other weather factor issues like insects?) Fusarium is the big worry. In the pulse crops it would be Ascochyta - you could add Powdery Mildew which comes a close third. (sp) Wheat midge is the only insect I would consider to be weather predictable enough for your purposes.
7. Aided cost: **$800** VU **$700** VU **$600** SU **$500** SU
8. Unaided cost? Or, if answered Q7, comments? I even have trouble keeping the magazines I subscribe to.
9. Follow spray/no spray recommendation? Would depend on it's proven accuracy but I would say - probably.
10. Anything like this out there you have looked into/purchased? No.

Interview#: 39

Postal: S0L 3L0	Age: 55+	Acres: 2400	Rcrt ID#: SK36

Notes: Difficult to get more than a few words out of this guy.

Questions
1. First Impression? Good info. I'd like to know more. (Asked a lot of questions, which I largely left unanswered).
2. Benefits? Mainly keeping an eye on Ascochyta, which hits chickpeas pretty hard.
3. Anything to add? Forecast maybe.
4. Anything to remove? No.
5. Easy/hard to understand? The print was poor – the fax quality.
6. Other diseases? (probe: Any other weather factor issues like insects?) Ascochyta is the main issue around here because of the dew we get. Really killed us last year. That is the only disease we really watch. (sp) Armyworm and midge might help if you included them as well.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? $500 and you are catching my interest. $400 you would probably get me.
9. Follow spray/no spray recommendation? With chickpeas I would. They are worth more so I am more cautious with them.
10. Anything like this out there you have looked into/purchased? No.

Interview#: 40

Postal: S0L 1L0	Age: 35-44	Acres: 1800	Rcrt ID#: SK37

Notes:

Questions
1. First Impression? Very interesting. The Fusarium index is about the only thing I wouldn't make use of. The way everything is laid out in daily and weekly totals is fun. The heat units excite me – I don't grow corn so they are a little more unfamiliar to me but I have heard of farmers using these more and more to make various decisions so I would like to keep an eye on them out of curiosity.
2. Benefits? Keeping track of all this over time. Post applying fertilizer and, of course, watching the disease indexes. Having all this information in one place is very interesting – I pull a lot of this stuff from about 6 different sources. Even with all those sources this is more complete.
3. Anything to add? No
4. Anything to remove? No! All this is useful.
5. Easy/hard to understand? Didn't give me a headache. Nicely laid out. The charts were ok on the screen but I had trouble printing them out (we e-mailed the info to him).
6. Other diseases? (probe: Any other weather factor issues like insects?) We have Ascochyta and very small amounts of CLD and Sclerotinia. Fusarium is not an issue. I can't think of any other diseases I would add. (sp) diamondback moth and aphids – maybe wheat midge would be the insects that we watch and weather is related in them all to some extent.
7. Aided cost: **$800** VU **$700** VU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? You almost have me! $300 for sure. I would have to know more and think about it properly.
9. Follow spray/no spray recommendation? If accurate. Once it proves itself.

10. Anything like this out there you have looked into/purchased? Just monitoring stations but I haven't looked at them too closely.

Added: Keep realistic. We farmers like to think we are poor so we are going to be hard sells. We do buy what is worth it – so hook us with a low price and then raise it next season. If you are worth it we will stick with you.

Appendix VII. Independent Crop Input Dealers Interviews with regards to Climate driven risk management tools

Recruit ID#: R1	**Interview#: 01**

Notes: Put a lot of thought into his answers. Had especially interesting responses to the pricing questions.

Questions
1. First Impression? Good idea! Really onto something here. I see here a new concept with good merit. Popularity will depend on cost and accuracy but I can see this causing some excitement.
2. Benefits? Disease index is the main thing that stands out. Right away I think of my chickpea growers because they are the hardest hit with disease and are the ones that spray the most. Next I see A good tool for condition history. Like a logbook. Would save growers some energy. I also see a way for growers to cover their butts with chemical companies. This is third party data that will do well in letting growers prove conditions when they have problems with a chemical.
3. Anything to add? I'd like to see more graphs. The ones you have there are the highlight of the report. A last year's season summary graphed out would be wonderful as it would let producers see what conditions were the year before and they can look up what decisions they made in similar conditions. They could look back and see their good and bad decisions and insure the best decision for current conditions.
4. Anything to remove? No way!
5. Easy/hard to understand? The graphs are a little piled up. You could simplify them. Maybe split into another graph. I would get used to it though… a lot of information is just a little overwhelming at first.
6. Other diseases? (probe: Any other weather factor issues like insects?) Ascochyta is the big one around here so good to see that in there. No other big problems… (unaided) I would suggest that maybe wheat midge could be added. Wheat midge hatching is directly related to heat units so it would be easy to throw in there. You could probably give a good week's warning on midge.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL

8. Unaided cost? Or, if answered Q7, comments? I can think of quite a few customers that would be easily convinced to spend $200 on this. $4-500 would get a few of them but they'd drop off fast beyond that amount. I bet if you also marketed a weekly report – a sort of summary (suggested a fee per access web page summary) – you would pick up a lot of the people that otherwise wouldn't buy it – and I would bet without loosing those that would buy the whole service. I see two different distinct markets when I think of the guys that come in here. You would also probably win a few of those over to the full service after they see the program prove itself in terms of its accuracy.

9. Margin? 15%

10. Barrier? Usage more than cost. A lot of people will be interested but not convinced that they will get use out of this. No matter how good something like this could be or what I tell them I know there will be a lot of head shakers. I get two types of farmer in here… the traditional farmer with a section or two (or acts as though they have only a section or two) and then you get your businessman. The traditional guy is going to say "I have a windsock and that has been good enough for me for 35 years". I won't even sell this thing to people like that… no point. I know they are going to come back on me with claims I took their money for something they don't need. I will sell this to the business farmers – they have a mindset that insures they can't get enough of stuff like this. They have more on the line and watch the margins more – they know that that is where the money is and will recognize that buying an $800 dollar tool to save even $810 worth of crop or spray and they have won.

11. Number of producers that will buy? I can think of 6 guys I know for sure will. I would tell them, "you have to have this" and they would sign on without hesitation. 12 other guys would be a harder sell but I would win a few of them over. If these guys (ACE) are smart they will let us dole out a few of them as trial versions… I would pick the right guys and word would spread. If this program does what it says it will do – and I have faith it will – the second season would be an easy sell. Price low, be competitive, prove yourself and you are going to have an easy time next year.

12. Would you purchase? (Enthusiastic) Yes!

13. How much would you pay? Well… first I would have to say that I would be willing to do some leg work selling this thing so I would hope I wouldn't have to pay anything. I would expect that if I sell a certain number I would get my copy free… other than that I would say that I would hope you wouldn't charge me any more than a producer unless you are suggesting some way for me to make money off it. A farmer stands to make or save money with his copy so I would have to be the same – not just look at this as a value added service because my customers are leaving here happy without it.

14. Follow spray/no spray recommendation? Yes. I believe in the numbers as long as they show themselves to be accurate. Like the program itself, you are going to find that the first year will be a hard sell as far as accuracy and people following the recommendations as well. Farmers are cautious. I have met some that will base spraying on whether their dog rolls around more than usual… so even questionable sources of information – if they decide for themselves that it is a good guide they will follow it

15. Anything like this out there you have looked into/purchased? Not a thing. Nice to see around here – I know that up north they have something like this going in for canola growers.

Recruit ID#: R5	Interview#: 02

Notes:

Questions
1. First Impression? I don't know. I suspect that there is more interest in up-to-the-minute weather. This is history.
2. Benefits? Not sure. I would have to see it in practice before I made up my mind. I would put it on the table and mention it as a possible spray tool… but I honestly can't tell you what the reaction will be to it around here.
3. Anything to add? Add current wind. A day ahead POP and an up to the minute summary on demand.
4. Anything to remove? No. I do like what is there. Wouldn't want to see any of it taken out.
5. Easy/hard to understand? Mostly easy. I don't get some of these acronyms. GDD BMT RFD… I would have to know what they are or I would just (continue to) ignore them.
6. Other diseases? (probe: Any other weather factor issues like insects?) No… You got the big ones. Sclerotinia is the biggest around here. Some Blackleg and Cereal Leaf. Generally dry enough around here that we aren't in much of a risk.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** SU
8. Unaided cost? Or, if answered Q7, comments? If there was up-to-the-minute and a bit of forecast they would pay 400-500 for it… As it is now I really don't know.
9. Margin? 15%
10. Barrier? Cost. Will they pay? The big factor is going to be weather – if we have another dry season no one is even going to notice this thing. If we get wetter this year the barrier is going to be much smaller. Need versus cost. Right now we are a low-need area so it has to be low cost.
11. 5 probably
12. Would you purchase? Doubt it.

13. How much would you pay? 2-300
14. Follow spray/no spray recommendation? Yes. As long as data is seen to be accurate I would have no trouble with that.
15. Anything like this out there you have looked into/purchased? No – but I haven't really looked.

Recruit ID#: R2	Interview#: 03

Notes: I think this guy represents your midpoint. On the side of being quite positive – sees all the strengths that the really positive guys have pointed out – but also voices the weakness that many of the pessimists have mentioned. Over all this guy is positive but cautious.

Questions
1. First Impression? I like it. If you get enough guys into this thing and it is priced right you really have something here.
2. Benefits? Great as a disease tool and predicting crop development. I like the average rainfall for the area. It would be great to compare with my own records. I like that this could make dealing with chemical companies a lot easier. Producers and chem. companies are always bashing heads over conditions – this would be a good third party source. This would also get good use as a journal. Things like heat units… you could look back on something like that and make decisions like whether to grow corn which is see increased popularity around here and has a few people scratching their heads.
3. Anything to add? No. My first thought is short-term forecast – but for the kind of decision these guys have to make even a forecast they get in the morning isn't going to cut it.
4. Anything to remove? No. Some of it is a little confusing but once I got to know it better I'd figure it all out.
5. Easy/hard to understand? Acronyms. RFB at the bottom of that one page. Don't know what that is. Some of that has to be explained… I guess they will send a manual though. I'm sure it would all be made clear. Maybe they could have a guide on their website.
6. Other diseases? (probe: Any other weather factor issues like insects?) Fusarium and Sclerotinia are the big ones around here. I would say leave it with what you have… you start throwing in too much and people would loose interest.
7. Aided cost: **$800** SU **$700** SU **$600** SU **$500** SL
8. Unaided cost? Or, if answered Q7, comments? Farmers are tight these days. If they have money they spend it – so maybe as things start to pick up. As a farmer I would pay $300 without thinking about it too much.
9. Margin? 15%

10. Barrier? Cost. When slump is over they will spend. It is an easy sell other than that. It is both a time and money saver. Could sell with very little energy.
11. Number you can sell? 6 at the prices you just mentioned. If we don't pay too much attention to the price or times get better – lots. Interest level will be high. I will put it on the counter they will leaf through it and most will say – good idea and ask lots of questions. Unfortunately one of the first questions will be price. I said 6 because that is how many lost a lot of money to Fusarium and Sclerotinia last year. They would reach for their wallets pretty quick.
12. Would you purchase? Yes. Would be nice to offer as a service. I would use it on our farm too.
13. How much would you pay? $500
14. Follow spray/no spray recommendation? Definitely. Having seen what happened to those guys last year with their disease problems – I would spray off its recommendation. If those guys had something like this there is no way they would have been hit
15. Anything like this out there you have looked into/purchased? Heard about monitoring stations but haven't seen any around here yet.

Recruit ID#: R10	Interview#: 04

Notes:

Questions
1. First Impression? Interesting idea. Very similar to something we were trying to set up around this area on a small scale. A few growers had monitoring stations so we tried to get organized to share information for a price to help get the price down.
2. Benefits? Disease mainly. People have been doing a lot more of this sort of monitoring in the past few years. Seems to work. Seen a few stations go in so they must be seeing benefit.
3. Anything to add? Yeah… Ground temperature. I know that the stations I have seen go in around here have had the ability to measure ground temperature as well as air. People swear by it as being very important in disease prediction.
4. Anything to remove? No… all valuable
5. Easy/hard to understand? Easy. Fax was a bit of a mess at the bottom so I couldn't read the definitions. Faxes out of my machine will be like that more often than not. I'd want to subscribe through e-mail.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. You have the big 4. CLD and Sclerotinia are the worst around here… Fusarium and Ascochyta are not a problem.
7. Aided cost: **$800** SL **$700** SL **$600** VL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? Not bad. I was expecting you to start higher – but then I know what those stations cost.
9. Margin? 15%
10. Barrier? None. Easy sell. We have been involved in marketing a program very similar to this on our own and even that wasn't very difficult. This would mean a lot less work for us and we'd be offering just as strong a product!
11. Number you can sell? 10-15% of our client base. I would guess 22-25 people easily.

12. Would you purchase? Depends. If we are going to be selling the thing I would expect not to have to.
13. How much would you pay? 600-800
14. Follow spray/no spray recommendation? Yes. Based on the success of our little project last year I would. If your program was even accurate to within 90% of what ours told us, I would trust it.
15. Anything like this out there you have looked into/purchased? Our program. It was an experiment that came out of 3 producers setting up monitoring stations. A couple of them had them put in as part of a university project they were helping with. We played around with sharing the data around with a bunch of other customers. It was all for free – just an experiment – but we saw that there was a value to it. We were just experimenting – I think we'd all go for your professional version.

Recruit ID#: R8	Interview#: 05

Notes: Interesting idea regarding marketing. Tied to Sask govt.'s insurance changes. (see Q10)

Questions
1. First Impression? More likely to be local than what we get around here. We get weather out of Alberta that is not accurate enough for our needs. Would be good to see something closer.
2. Benefits? Disease indexes are an interesting idea. We do some field scouting so this would help us out a lot.
3. Anything to add? Would be nice if their was a time series – a one day forecast on all the basics. Just one day though because you don't want this to be seen as a prediction tool – you will loose a lot of peoples respect because everyone loves to hate forecasters. One day prediction only in the way of a guide to spraying.
4. Anything to remove? No
5. Easy/hard to understand? Difficult – but in a good way. If this had been to simple I wouldn't have sat down with it for the amount of time I did. It is difficult in a way that gets your respect.
6. Other diseases? (probe: Any other weather factor issues like insects?) CLD and Asc. Are the big ones here. Fusarium and Sclerotinia are low risk around here. I would suggest insects but I don't think you would be accurate enough with them to bother.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? 300 I become very likely.
9. Margin? 15%
10. Barrier? Convincing people that it will be a benefit. People that aren't wrestling with disease won't see how it can help them… What will be interesting is how this will fit in with the Sask. Govt.s recent decision to put an end to crop insurance. They are setting up a few monitoring stations themselves for what they are calling rain insurance. This would give producers and government good third party data to rely on… because you know this is where the new battles are going to be fought once this program kicks in.

11. Number you can sell? 60-70 would look real close. Many would buy – especially if they want to cover their butts for the rain insurance.
12. Would you purchase? Depends on price. I probably would for the help it would give our scouting business.
13. How much would you pay? Same as farmers. $500 anyway… more if I see the value.
14. Follow spray/no spray recommendation? Sure. Especially on peas. It would depend on the year and the overall risks… and markets. On the whole I would recommend off something like this… provided it proves itself to be accurate.
15. Anything like this out there you have looked into/purchased? Just monitoring stations.

Recruit ID#: R7	Interview#: 06

Notes: This guy got really into helping us. He got a bunch of guys in the office to share their ideas with him and had his brother join him on the phone to share his opinions too.

Questions
1. First Impression? Really good. I see a real need for something like this.
2. Benefits? Huge benefits. Disease risk assessment especially. Easier decisions
3. Anything to add? I would like to see some information offered that could be accurate to within 15 minutes (by web or phone) because a lot of this stuff is very specific. You could be looking at averages that show one thing but current conditions could be leading you in a different way. You could have low average humidity and high temperature – but what it doesn't show you is that they all tipped into the high risk for a few half hour periods over the night.
4. Anything to remove? More is better. No.
5. Easy/hard to understand? Easy. The layout is really good and is logical to follow. Averages don't excite me so much… what I want to see is how long did it sit in the high risk period.
6. Other diseases? (probe: Any other weather factor issues like insects?) Fus. And Scler. are the biggest concerns. The ones you have there are all good. Been a fairly high risk the last couple of years. None to add.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** VL
8. Unaided cost? Or, if answered Q7, comments? Depends on its accuracy and the level of accessibility to the information. Being able to call in or log in to get recent readings would be a big factor in what you can charge.
9. Margin? 15%
10. Barrier? None really. 15% is plenty because we don't view this as something that is going to make us rich. It would be a great value added service and something I would love to be able to offer as a product.

11. Number you can sell? 15-20% of our cliental. I could sell 15-25 of these easily. What I would like to see is a price breakdown by acres in some way. This is going to save a guy with 5000 acres a lot more than those that have 1000 so why should they pay the same? I would like an option to be able to sell this to those 15-25 people however you want to price it – but then be able to offer small farmers the information in some way… shared cost or something. If a 5000 acre farmer pays X I should be able to get 5 1000 acre farmers together to pay X/5.
12. Would you purchase? Yes. If it is localized enough.
13. How much would you pay? 500-600
14. Follow spray/no spray recommendation? No. I would be very careful about what conclusions I personally make off the data. I would leave it to them to interpret. If I tell them to spray or not to spray I am opening a door to liability concerns. I would hate to have this come back on me if I interpret and am wrong. I would be happy to point out to producers what the data says – but I would never even suggest what decisions they should make from it.
15. Anything like this out there you have looked into/purchased? We have been looking into monitoring stations. What these things can do is fascinating – I am really curious as to how they can aid in decision-making. This program would easily compete because it lends itself well to experimenting for a year. You aren't forking out $5000 for something you are curious to try.

Recruit ID#: R6	Interview#: 07

Notes: This guy made it very clear that he was not in an area with much crop farming – so take that into account when reading his answers.

Questions
1. First Impression? It looks OK but I don't see much need around here. We are largely cattle farmers around here.
2. Benefits? Disease indications is the main thing. Also offering a history that you can hang onto as a record.
3. Anything to add? No. You have everything I can think of.
4. Anything to remove? No
5. Easy/hard to understand? A little difficult. A lot to take in. I saw that it wouldn't be much use to me so I may not have given it the time it would deserve from others.
6. Other diseases? (probe: Any other weather factor issues like insects?) We only get a bit of Sclerotinia around here. So I wouldn't be able to suggest any others.
7. Aided cost: **$800** SL **$700** SL **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments? Those prices seem about where I would expect them to be. Unfortunately there is only about two of my customers that would see the benefit to this program being high enough to warrant paying for it.
9. Margin? 15%
10. Barrier? None. Cost only. If it is valuable (accurate) I wouldn't have any problem selling to those that could use it around here. Just a very limited market for me to sell to.
11. Number you can sell? 2 or 3
12. Would you purchase? No. I don't deal enough with crop growers to make it worth my while.

13. How much would you pay? NA
14. Follow spray/no spray recommendation? Not really. I would be happy to point out the risks but I would leave the decisions up to the growers. They are the experts.
15. Anything like this out there you have looked into/purchased? No but haven't looked.

Recruit ID#: R7	Interview#: 08

Notes:

Questions
1. First Impression? Got my interest. Could have a place here – it is a very solid looking program and a unique idea.
2. Benefits? The disease indexes are what makes this look especially solid. The disease tracking potential is obviously the main thrust of this program but there are some other benefits. If the producers want to track the actuals and keep track of where their crop is in terms of rain levels and temperatures this will allow them to. I think they will be able to look back on their season in the fall and before the next seed. Catch some of the issues that made the past season a success or spot some of the things they will have to improve on. The disease side of it is still the most interesting though.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? Not easy. You do have to give it some attention. I sat down with it for longer than I was going to give it when you sent it through but I didn't mind because it was interesting. Even though it wasn't easy to understand I was willing to give it the time it needed to understand it. (sp) The fax was fine. No problem.
6. Other diseases? (probe: Any other weather factor issues like insects?) Fusarium and Ascochyta are the big ones around here. They could add Anthracnose for peas as well.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments I would like to make it clear that (the above) responses are for "most people" – some would pay any of those prices. For $300 it would be a really easy sell. For every hundred you add it gets a lot more difficult.
9. Margin? 15%

10. Barrier? Demand is the main one. There are going to be a lot of people that are not even going to know if the product is right for them… so there the cost comes into play. If you price it around the $300 mark for the first year you are going to have a lot of people take chances on it – and probably find out that it is a big help. $500 you are going to loose all but the ones that know they need it… any more than that and you are even going to loose a few of them.
11. At the prices mentioned above I would guess 5% of my business. About 10 people.
12. Would you purchase? No. We do scouting and I doubt we would add this program to what we already do… at least not in it's first year. Perhaps after it proves itself.
13. How much would you pay? That is a tough question. 2-300 dollars in it's first year. Second year I would pay what it is worth to my business. That could be $600… and it could be a lot more.
14. Follow spray/no spray recommendation? Yup. I have faith in the numbers. I would tell them to spray if the numbers suggested they should.
15. Anything like this out there you have looked into/purchased? No. I know some of that stuff is out there but I haven't looked into it to date. As far as those monitoring stations go I would much rather go with something like this program. It would mean less headache. It is really just a question of that first year – we will be tough sells because I know that our customers will be tough sells.

Recruit ID#: R3	Interview#: 09

Notes: I didn't get the sense that he was completely ready and could have used more time with the sheets but I had called numerous times and finally just took what he could offer.

Questions
1. First Impression? I like the looks of it. I didn't have much time to give it much more than a glace but what I saw looked like something there is a need for
2. Benefits? I am a farmer as well as a retailer. The benefits are obviously the disease indexes above all else. A lot of other information too. Could be a good addition to field scouting but I doubt this would replace that in any way.
3. Anything to add? No
4. Anything to remove? No
5. Easy/hard to understand? I didn't have enough time to sit down with (the data sheets) so I would imagine that will be a problem with some others as well. Some of the information seemed a little difficult to understand and I just didn't have time to read all the fine print at the bottom.
6. Other diseases? (probe: Any other weather factor issues like insects?) No. You got the ones that are the concerns around here.
7. Aided cost: **$800** SU **$700** SU **$600** SL **$500** SL
8. Unaided cost? Or, if answered Q7, comments I would have to know more than I do about this program before I could honestly give you a proper idea of its price value.
9. Margin? 15%
10. Barrier? Demand. This isn't going to appeal to everyone so it is a question of how many people around here would need this.
11. 5-10 based on my gut. Not sure.
12. Would you purchase? Perhaps as a producer. I would have to know more.

13. How much would you pay? That is a tough question. As above.
14. Follow spray/no spray recommendation? Not at first. As a producer I would watch and see. I would need to have trust in the thing first. As a retailer I would continue to advise from scouting – this would have a role in the total information I provided – how big a role would depend on a number of variables.
15. Anything like this out there you have looked into/purchased? No.

Recruit ID#: R11

Interview#: 10

Notes: Another one that tried setting up a program like ACE… but he is a bit more pessimistic as a result.

Questions
1. First Impression? This is something we could use in a couple of ways. I can see selling this to growers but I am more excited about using it for my own custom spray business.
2. Benefits? Would give us good information on when to spray and would help prove conditions if we had to. If this could be modified for soil temps it would also give us when granular herbicides could be applied as there are a couple that are activated by soil temp.
3. Anything to add? Ground temperature if possible… I know most of these monitoring stations have that function so I don't see why not.
4. Anything to remove? No
5. Easy/hard to understand? Easy on all counts. Fax came through easy to read. I like the layout and the charts made sense.
6. Other diseases? (probe: Any other weather factor issues like insects?) Anthracnose.
7. Aided cost: **$800** VU **$700** VU **$600** VU **$500** VU
8. Unaided cost? Or, if answered Q7, comments I don't know how to answer that question so I answered for the majority. The majority wouldn't pay those prices – nor should they because they aren't going to use this for more than a week, I guarantee it. At those prices you just read out I would get customers willing to pay that would go up with every 100 you dropped. At $300 I think I could sell this to roughly 10% of my client base – which is all the people that should and would use this. At $500 I would loose even some of them.
9. Margin? 15%. Even 15% is nice – most of the stuff we sell out of here we can't get 6 or 7% for.

10. Barrier? I don't know how to describe it…. Personality. There are a vast majority of farmers that would use this for one or two weeks when disease is all they think about but then they switch on to something else. Most farmers are like that. Try talking disease one week after the main spray season is over and they look at you like you're nuts – they have already switched over into the next mode and that will be all they worry about for the next week – even though diseases should continue to be watched out for. Now this 10% of growers I mentioned earlier don't farm that way. They farm by the numbers and are smart to do it that way. They are sort of the new breed of farmer that keep an eye on everything all at once. They would love this because monitoring plays a big role in their way of farming.
11. That 10% would be around 60 people
12. Would you purchase? Yes. I would like to use this as part of my custom spray operation. I would also be interested to know whether there will be an option for me to buy this and sell to growers. I could probably come up with some info-share program with this and hook a bunch of farmers onto it – then you could sell direct to them next year.
13. How much would you pay? That is a tough question. $500 – but tell them $200-300 so they sweat a little. And I am talking about for my own use there not what I would be willing to pay if we worked out a group rate for a group of farmers or something.
14. Follow spray/no spray recommendation? Sure. It is better than our current system.
15. Anything like this out there you have looked into/purchased? I tried to set up a program like this a couple of years back. I proposed 5 monitoring stations evenly spaced with all 5 sharing information with each other for free and then pooling the data to sell to other farmers around the area to share costs. Didn't fly because everyone is very interested for two weeks and then they get collective amnesia when they are onto the next thing. Couldn't hold the interest.

Appendix VII. Financial risk assessment of the lease and purchase of hardware for the development of a climate driven risk management system in Saskatchewan

Revenue Models

1.Leasing Stations

Cash Flow	2002 Lease	2003 Lease	2004 Lease	2005 Lease	2006 Lease
Cash In	400,000.00	650,000.00	930,000.00	1,330,000.00	1,510,000.00
Operating Expenses	669,000.00	847,125.00	1,041,025.00	1,348,150.00	1,463,400.00
Capital Expenses	0.00	0.00	0.00	0.00	0.00
Net Cash	-269,000.00	-197,125.00	-111,025.00	-18,150.00	46,600.00
Cash Flow per Station	-1,222.73	-606.54	-238.76	-27.29	61.72
Net Cash to Date	-269,000.00	-197,125.00	-380,025.00	-398,175.00	-351,575.00

The above cash flow shows that grants or loans would be required for the first four years. Over the four years the total loans or grants would be $351,575.00 assuming that $46,600.00 would be paid back in year five. The stations are leased for five years in this model and discounted at a 9.5% interest rate.

- This model reduces the cash out put over five years
- The stations have an eight year life and would be released for three years after the first lease expires.
- The fast ramp up to 200 stations and $400,000.00 in revenue in the first year has a higher financial risk.
- Extra efforts are needed to achieve 390 stations in revenue and the break-even point as soon as possible

2. Purchase Model

Cash Flow	2002 Purchase	2003 Purchase	2004 Purchase	2005 Purchase	2006 Purchase
Cash In	400,000.00	650,000.00	930,000.00	1,330,000.00	1,510,000.00
Operating Expenses	429,000.00	457,125.00	483,025.00	550,150.00	557,400.00
Capital Expenses	1,153,200.00	720,750.00	807,240.00	1,153,200.00	518,940.00
Net Cash	-1,182,200.00	-527,875.00	-360,265.00	-373,350.00	433,660.00
Cash Flow per Station	-5,911.00	-1,624.23	-774.76	-561.43	574.38
Net Cash to Date	-1,182,200.00	-1,710,075.00	-2,070,340.00	-2,443,690.00	-2,010,030.00

The purchase model shows a much higher cash requirement. Grants or loans would be required for the first four years. The total cash short fall for the first four years is $2,443690.00. After the fourth year loans could be paid back as the operation would be self-supporting in year five.

- The purchase plan could work with lower cash out put if the stations are purchased with a low interest loan.
- With stations needing replacement at year eight the pay back on the investment is in year 12. This is with cost of capital at 0% interest.
- Cash flow per station is positive and increasing as the revenue increases over time. This would indicate the project is self-supporting.

Recommendation: The stations should be leased at the current rates with grants or loans to make up the cash short fall in the first four years. This will reduce the total cash support required. Ensuring that finances are self-sustaining.

Risk Assessment

Financial Risk- the following unanticipated changes could cause adverse economic outcomes to the organization using these plans.

- Changes to the commodity prices the farmers receive could change the demand elasticity for the mesonet products.
- Reduction in acreages of key crops will reduce demand and adversely affect forecasts. This would reduce the break-even.
- Higher interest rates would change the lease discount rate.
- Unable to secure necessary operating credit lines.

Strategic Risk-**the following outcome could invalidate plans of organizations using the Mesonet business strategy.**

- **The target customers do not see the same value as the first costumers (early Adaptors).**
- **Target customers get the same value from another source i.e.: Internet, local retailer.**
- **The reuse rate is lower than the adoption rate as a result growth is slower than plan. This will invalidate the all of the plans.**
- **Segment size at the time of market is smaller than market research had indicated.**
- **Changes in technology shift users in a different direction**
- Delays in installation of stations causes a missed season
- Stations placed in inappropriate locations

Operating Risk **– the following outcome could lead to negative net income.**

- Price is to high for the market
- Overhead costs are higher than expected
- Not enough profitable customers
- Higher maintenance and operating costs than expected
- The stations are not as reliable as expected

Accidental Risk **– *Adverse risk caused by non-economic factors***

- Natural problems like fire, lightning, flood or wind
- Property losses thief, equipment breakdown or failure
- Liability losses product defects or service problems

CANADA SASKATCHEWAN LIVESTOCK FARM WATER PROGRAM

Project Proposal - Terms of Reference

Project Title:

Risk management strategies for agriculture using climate-based models.

Study Consultant:

March Agricultural Ltd. provides consulting services to the agricultural community across western Canada. Mark Goodwin, M.Sc., P.Ag. would conduct the study. Mr. Goodwin has an integral knowledge of the agricultural industry and, more specifically, the operation of the Agrometeorological Center of Excellence in support of the agricultural industry in Manitoba.

Objectives:

To assess and evaluate the costs and benefits of operating real-time weather monitoring networks in support of climate-based models used in implementing risk management strategies for Saskatchewan agriculture.

Background:

Technological advances in the field of real-time weather monitoring and climate-based modelling and forecasting are beginning to allow for real-time monitoring of climatic impacts on crops, livestock and soils. New models for water management, soil moisture, evapo-transpiration, drought monitoring and crop and forage pest and disease infestations will enable farmers, extension personnel, consultants, suppliers of crop inputs and crop insurance agencies to more effectively respond to drought, to be more cost effective in managing crop production systems, including controlling pests and diseases and to better plan and implement risk management strategies. The benefits of attaining these technologies in Saskatchewan need to be weighed against the costs of implementing and operating networks and the support mechanisms for generating and analyzing modelling results. The technologies are rapidly developing and these technologies have, to a significant degree, already been implement in some jurisdictions.

Methodology:

<u>Phase I</u>

The province of Manitoba, in co-operation with agricultural producers and other private and commercial interests established the Agrometeorological Center of Excellence (ACE). ACE operates and maintains a network of approximately 200 climate stations which provide the real-time data needed for the generation of numerous agricultural based products. These products include risk forecast maps and interpretations for agriculture with respect to soil moisture, precipitation, heat units, late blight in potatoes, sclerotinia in canola, ascochyta in pulse crops, fusarium head blight, and the occurrence of a number crop pests such as wheat midge, Bertha army worm and the diamond back moth. Phase I of the study would be to conduct an in-depth benefit-cost evaluation of the ACE program in Manitoba including, but not limited, to the following investigations and reporting:

- Conduct interviews with ACE and its sponsors, agricultural producers and producer groups, chemical and grain companies and Manitoba Agriculture
- Collect and assemble all relevant data bases/sources
- Document the creation, evolution and workings of ACE, including involvement of government, user groups and the private sector
- Evaluate and document the ADCON network operated by ACE, including instrumentation, mode of operation, network density and real-time data transmission capabilities
- Evaluate and document products generated by ACE, including level of use and benefits to producers, producer groups, other private and commercial interests and the province and the use of these products in developing and implementing risk management strategies
- Evaluate the ACE program and the operation of climate networks in implementing drought risk management strategies in the agricultural sector
- Conduct an in-depth benefit-cost analysis of the ACE program in Manitoba, including a multi-level analysis considering individual producers, procuder groups, other private and commercial interests and the province
- Document the success and short-comings of the ACE program and actions needed to correct any short-comings identified
- Document and report on investigations, findings, conclusions and recommendations

Phase II

Phase II of the study would be to conduct (using the results of Phase I) a detailed benefit-cost evaluation of an ACE-type program in Saskatchewan including, but not limited, to the following investigations and reporting:

- Conduct interviews with agricultural producers and producer groups, chemical and grain companies and relevant government agencies and departments
- Review existing reports and literature relevant to establishing a Mesonet in Saskatchewan and other jurisdictions such as Oklahoma
- Collect and assemble all relevant data bases/sources
- Evaluate the suitability and applicability of an ADCON network in Saskatchewan, including instrumentation, mode of operation, network density and real-time data transmission capabilities, interconnection with existing climate networks operating in the

province

- Evaluate products generated by ACE for use in Saskatchewan, including level of use and benefits to producers, producer groups, other private and commercial interests, crop insurance and the province and the use of these products in developing and implementing risk management strategies (Note: Some ACE products are already generated for Saskatchewan by extrapolation and estimates using data from existing climatic data networks in the province. The task will be to demonstrate that with a denser network these estimates can be improved.)
- Evaluate the ACE generated products and the operation of climate networks in implementing drought risk management strategies in the agricultural sector for Saskatchewan
- Explore alternative delivery mechanisms, including the expansion of ACE into Saskatchewan
- Conduct an in-depth benefit-cost analysis of the ACE program (and alternate delivery mechanisms) in Saskatchewan, including a multi-level analysis considering individual producers, producer groups, other private and commercial interests, crop insurance and the province
- Develop a business case, including the framework and action plan needed for successfully implementing ACE or alternate delivery mechanism in Saskatchewan, and including involvement of government, user groups and the private sector
- Document and report on investigations, findings, conclusions and recommendations

Deliverables:

Investigation, research, interviews and preliminary write-up of Phase I by February 28, 2002

Investigation, research, interviews and preliminary write-up of Phase II by March 15, 2002

Final report prepared and submitted by March 28, 2002.