Plot2 Farm

RESEARCH GUIDE

Alberta Grains

IMPORTANT

Please take the time to read carefully through this document. It contains information that will be crucial to the understanding and success of your trial. If you have any questions or if any of the information in this package is not clear, please reach out to:

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Tools List

You or your agronomist will have received the Plot2Farm kit. It contains the tools required to implement your trial. Ensure the box contains all of the items listed below:

- ❑ Trial design + In-Season Data Collection Form
- ❑ Pen
- ❑ Rain gauge
- ❑ Measuring tape
- ❑ Flags (second box)

As we approach harvest, a second shipment will be sent to you containing items that will be used to collect and ship grain samples for analysis.

On-Farm Research Goals

Part of running a successful farm business is to innovate and develop new strategies that allow for increased profitability and adaptation to market trends. Alberta Grains recognize this and fund research projects that provide valuable crop production management practices and tools for farmers. However, understanding how these tools will work on your farm can sometimes be a challenge. This is where on-farm research can provide specific information to your operation that can better help you implement new management practices. On-farm research is just like it sounds, research trials conducted on a farm utilizing the equipment, practices, and land specific to that farm. This means that the information derived from on-farm research reflects farm specific conditions (soil, agronomic and environmental) can be implemented, or not implemented, with greater confidence.

On-farm research will help you answer crop management questions to gain a better understanding of how specific management tactics may impact crop yield, quality and profitability. These questions are likely questions you have already asked yourself. For example, "does a fungicide application increase net returns?", "will increasing my seeding rate increase yield and quality?", or "will increasing nitrogen rates provide a return?" These are all questions that can be answered using on-farm research. That being said, careful consideration needs to be taken if you do decide to implement an on-farm research trial.

This benefit of understanding how crop management practices may impact your farming operation requires some investment of both time and inputs. For example, testing how an additional fungicide pass works on your farm will require additional upfront costs. This upfront cost, however, may be quickly recovered if, through on-farm research, it is determined that fungicides do in fact pay. Conversely, the implementation of a management practice across an entire farm that was not trialed would likely cost the farm more than the on-farm trial if it did not provide an economic benefit.

On-farm Research Considerations

For on-farm research to be successful, certain variables must be considered to ensure that data collected from the trials was not impacted by an external factor. Possible examples include field variability, equipment capacity, poor data collection, and trial design.

Site Selection

Site selection is an important factor to consider when implementing an on-farm trial. Productivity in a field can vary greatly from one location to another. For this reason, it is best to avoid fields that are known to be highly variable. Some considerations would be to avoid fields with a history of uneven manure application, old yard sites, old livestock feeding areas, old railways or pipeline burials that result in uneven soil or nutrient areas.

If a field is sloping east to west, having treatments running in a north south direction would mean that the treatment strip on the west side of the field would naturally have a higher or lower yield than the treatment strip on the east side of the field. Instead, aligning the treatments to run east to west, in the same direction as the slope, means each treatment strip will cover both the high and low parts of the slope. Figure 1 demonstrates a poorly placed trial. In this figure, treatment 1 would likely experience different growing conditions than treatment 4 due to field slope. This creates increased variability within the trial. Figure 2 demonstrates more appropriately placed treatment strips. With this design, each treatment is equally impacted by east to west variability of the slope.

Figure 1: Incorrect trial placement. Blue arrow represents direction of field slope.

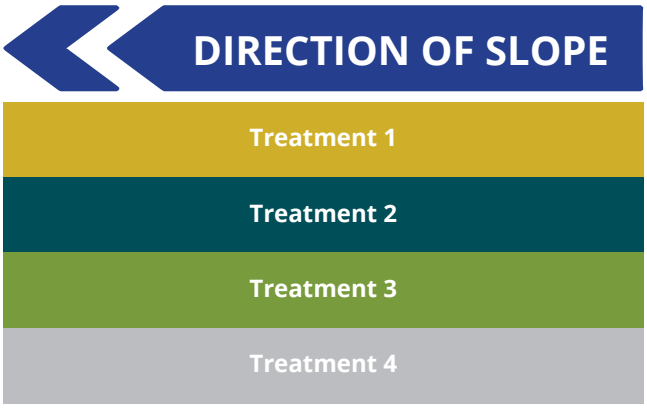

Figure 2: Correct trial placement. Blue arrow represents direction of field slope.

Tip: A great way to review a field for variability concerns is to use Google Earth. This will give a detailed birds-eye view of the field and display potential concerns.

Blocks, Replications, and Randomization

Blocks, or replications, are another important consideration when designing a farm trial. Choosing the appropriate treatment direction should eliminate some of the variability across the field. By also replicating your work through blocks, you can capture and account for even further variability within smaller and more uniform areas of your field.

When designing a trial, each block will contain all treatments within the trial (Figure 3). For example, if the trial has 2 treatments, each block with have both treatments. If the trial has 3 treatments, each block will have treatment 1, treatment 2, and treatment 3. Figure 3 demonstrates a block design with 3 treatments and 4 replications. Each block is a replication.

It is important to implement randomization within each block. As seen in figure 3, each block has 3 treatments. The treatment order is different within each block. This helps to ensure that if there is an interaction between two adjacent treatments, then the interaction will not bias results. Without implementing this, the trials aren't truly randomized and data may be inaccurate.

There must be at least 3 replications to provide acceptable statistical analysis. A total of 4 replications is ideal. More replications are valuable if possible.

Block 1	Treatment 1
	Treatment 2
	Treatment 3
Block 2	Treatment 2
	Treatment 3
	Treatment 1
Block 3	Treatment 3
	Treatment 1
	Treatment 2
Block 4	Treatment 1
	Treatment 3
	Treatment 2

Figure 3: A block design with 3 treatments and 4 replications

Pre-planning equipment size

Ensuring the plot size is appropriate for your equipment size is important. Each farm will have different seeder, sprayer, and combine sizes which will affect sprayer tracks within the plots and how harvest occurs. Although each trial and farm will be different, it is important to try and avoid sprayer tracks interfering with your combine passes. It will be nearly impossible to completely avoid having any sprayer tracks in your trials but with the correct planning, it is possible to maintain at least one sprayer track-free combine pass within each treatment within each block. One method to reduce the impacts of sprayer tracks is to run the sprayer tracks perpendicular to the direction of seeding. However, this option will depend on the trial being implemented. Be sure to sit down with your agronomist prior to trial implementation to understand where sprayer tracks will be and how that may interfere with harvest.

Treatment Design and Field Layout

Research trials should be seeded in 1-2 passes per treatment with yield data collected by multiple combine passes per treatment. In other words, a 70' seeder would accommodate 2 combine passes with a 30' header or 1 combine pass with a 45' header. A 50' seeder applying one treatment in 2 passes (100' total) would accommodate 2 combine passes by a 35' header or 3 passes by a 30' combine header. At the very least, this will allow buffer room between treatments for a single clean pass for each treatment. The treatment pass should be at least 500 ft, or extend as long as possible given the topography of the field.

Data Collection

One of the most important factors of a successful Plot2Farm research trial is data collection. Data collection during the trial allows us to properly analyze the results and draw conclusions from them. For this reason, it is important that great care be taken in the planning process of who will collect the data, as well as when and how. Typical data that will be collected is:

- Equipment type and widths (used for planning trial set up, seeding , spraying and harvesting)
- Soil and seed testing data
- Product application times/methods/amounts
- Visual differences/photos
- Rainfall/weather events
- Varieties and seed treatments
- Crop stand density
- Tillers per plant
- Lodging
- Yield
- Quality

Collecting this information in an organized and consistent way allows for easier analysis of the information and helps to gain an understanding from the results. Regularly observing the trial to look for and take notes on observations can also improve the analysis of the results. Visual observations such as stand variation, crop maturity differences, unexplained damage, and anything else that seems to stand out should be recorded. Your In-Season Data Collection form will help to guide you through the data collection process for your Plot2Farm trial. When in doubt, be sure to contact Alberta Grains or your partnered agronomist.

Research Guide

Additional steps for a successful trial

- The applicant has read the Research Guide document.
- The applicant has secured a partnered agronomist unless they are an agronomist (P.Ag).
- The applicant has a weigh wagon or grain cart with scales for weighing yield. Alternatively, the applicant can source a weigh wagon or cart with scales from a third party.
- The applicant has GPS technology on their seeder, sprayer, swather, and combine.
- The applicant has a field large enough to implement multiple replications of multiple treatments.
  - > Example of a seeding-based trial: if you have a 50ft seeder and want to test 3 seeding rate treatments:
    - The trial would require 3 treatments x 4 replications = 12 plots
    - A plot can be 1, 2, 3 or more seeder passes
    - The applicant will need a field that can comfortably accommodate at least 12 side-by-side seeder passes (50' x 12 passes = 600 ft) plus at least 2 seeder passes (on each side) between the trial plots and field borders/ tree lines etc. (600 ft + 200 feet = 800 feet total)
  - > Example of a sprayer-based trial: If you have a 120-foot sprayer and want to test 3 treatments:
    - 3 treatments x 4 replications = 12 plots
    - A plot can be 0.5, 1, 2 or more sprayer passes depending on your sprayer width (i.e. 100 ft) and combine header size (i.e. 30 ft)
      - The applicant will need a field that can comfortably accommodate at least 600 feet (0.5 x 100 ft = 50 ft/ plot x 12 plots = 600 feet) plus at least 2 seeder passes (on each side) between the trial plots and field borders/ treelines etc. (600 ft + 200 ft = 800 ft)
- The applicant must ensure their drill has the capacity required for the trial. For example, if a particular trial involves testing urea nitrogen (N) fertilizer rates of 75 and 150 lbs of actual N, the seed drill must have the ability to apply 326 lbs of actual N/acre as urea. If the drill can only apply 300 lbs urea/acre, this trial is not possible.
- The applicant must be willing to do seed and fertilizer calibrations for each treatment, before seeding each treatment. For an experiment with 4 treatments, this means 4 calibrations must be done in the field on the day of seeding the trial.
- The applicant must have the capability to load different fertilizer treatments if multiple tote bags are involved.
- The applicant must have well maintained equipment including seeder, sprayer, combine, headers, and grain carts.
- The applicant must have sufficient quantities (plus at least 15% extra) of quality seed for the trial.
- If the applicant uses variable rate, they must be willing to shut off the variable rate in the area that the trial will be conducted.
- Applicant must apply basic agronomics such as seeding rates and fertilizer rates that are based on government or extension recommendations:
  - > Targeting low plant stands and unbalanced, limited fertility can hide treatment differences making the trial meaningless.

Instructions

Below is a list of instructions that will help guide you through the trial. Each task is assigned to either the AGRONOMIST, the FARMER, or both. For some of the AGRONOMIST tasks (such as being present at treatment application time) assumes the FARMER is present to conduct the action

TASK AND DETAILS	FARMER	AGRONOMIST
Thoroughly review the Research Guide, the trial design and the In-Season Data Collection Form. These documents will guide you through best practices on performing on-farm Plot2Farm research trials, as well as provide direction on collecting in-season data required to complete your trial. Ensure you have an idea of when and how each step of the trial will be conducted. Contact the commissions if you need further instruction on carrying out your Plot2Farm trial.	✔	✔
If lab testing has not been previously completed on the seed lot to be planted for this trial, send a sample for analysis to 20/20 Seed Labs prior to seeding. Seed lab results must include at least: **a.** Germination % **b.** Vigour **c.** Thousand Kernel Weight (TKW) **d.** Fusarium spp.	✔	
Input the results from your seed test into your In-Season Data Collection Form in the Additional Agronomics – SEED QUALITY section. Please share this information with your agronomist and finalize seeding rates and fertilizer rates in consultation with your agronomist prior to April 1st.	✔	
BEGIN TRIAL SEEDING/IMPLEMENTATION		
Install rain gauge on day of seeding. Collect rainfall totals for each month including May through August		✔
Be present during the application of experimental treatments (this may occur at seeding, herbicide timing, plant growth regulator timing, or fungicide timing, etc.) to ensure treatments follow the experimental design.	✔	✔
Fill out the treatment order in the 'Treatment' columns on each page of the In-Season Data Collection Form at the time of treatment application to avoid mislabeling the order of treatments within the trial. This will also be found in the paper copy of your Plot2Farm trial information booklet.		✔
During and after implementing the experimental treatments, mark field locations of each treatment within each replication using the flags included in your Plot2Farm kit. GPS can be used in addition to the flags.		✔
Fill out the remainder of the In-Season Data Collection Form throughout the season. Refer to the detailed instructions within the In-Season Data Collection Form for specifics on timing and steps for data collection. This may include any of the following depending on the selected trial (responsible party for specific information is listed below): **i)** Soil type - FARMER & AGRONOMIST **ii**) Tillage used in the spring or fall prior to seeding - FARMER & AGRONOMIST **iii**) Previous crop - FARMER & AGRONOMIST **iv**) Fertilizer applied in trial area and how it was applied - FARMER & AGRONOMIST **v**) Plant-stand counts - AGRONOMIST **vi**) Rainfall by month - AGRONOMIST or FARMER **vii**) Herbicides used on trial area - FARMER & AGRONOMIST **viii**) Fungicides used on trial area - FARMER & AGRONOMIST **ix**) Insecticides used in trial area - FARMER & AGRONOMIST **x**) Number of tillers - AGRONOMIST **xi**) Lodging data - AGRONOMIST **xii)** Yield data - FARMER & AGRONOMIST **xiii**) Supplemental irrigation applied - FARMER & AGRONOMIST **xiv)** Seeding and harvest dates - FARMER & AGRONOMIST	✔	✔

TASK AND DETAILS	FARMER	AGRONOMIST
Harvest the trial and collect harvest samples using the sample bags and sticker labels provided in your Plot2Farm kit. AGRONOMIST to be present to assist with grain sample collection, labelling, and shipping. **a.** Be sure to properly label each grain sample bag. **b.** Be sure to collect representative samples while the combine is unloading into the grain cart. This will require a grain scoop and a bucket. Yield data collection must be done using a weigh wagon or a calibrated grain cart with scales. If desired, supplemental combine yield monitor data can also be collected. See In-Season Data Collection Form for instructions.	✔	✔
Send harvest samples to SGS BioVision for quality testing using shipping box and pre-paid shipping labels provided in your Plot2Farm kit.		✔
Save a copy of Pre and In-Season Data Collection Forms. Keep these as a backup.	✔	✔
Use the pre-paid return envelope provided in your Plot2Farm kit to submit the In-Season Data Collection Forms and any additional information collected to Alberta Grains within 30 days of harvest. Email can also be used to submit this information. Email to jboychyn@albertagrains.com		✔
Notify the commissions if treatments do not occur as per trial. Write a detailed description of what occurred.	✔	✔
If desired, in the additional space provided in the In-Season Data Collection Form "Data Section I", make note of any observational information, for example, emergence timing, heading timing, photos, presence of leaf disease before or after fungicide application, maturity differences, any insect or hail damage to the site, any drowned-out areas in the trial, any application errors in the field (i.e. herbicide misses, etc.).	✔	✔

Alberta Grains will:

1. Provide technical assistance to the AGRONOMIST and FARMER to ensure proper implementation, flagging and data collection.
2. Provide all tools listed on the "Tools List" in your Welcome Letter to help you carry out your Plot2Farm trial.
3. Perform statistical data analysis and provide a report with this information to the FARMER.
4. Cover the cost of pre-season seed lab analysis if seed had to be sent specifically to fulfill the requirements of the Plot2Farm project. Pre-season seed lab analysis for the Plot2Farm project must be carried out by 20/20 Seed Labs. Notify Alberta Grains prior to sending seed so that invoicing between 20/20 Seed Labs and the commissions can be arranged.
5. Cover the cost of post-harvest grain analysis for quality and grade. Post-harvest seed lab analysis for the Plot2Farm project must be carried out by SGS BioVision. Notify Alberta Grains prior to sending seed samples for analysis so that invoicing between BioVision and the commissions can be arranged.
6. Consider conducting a public tour at the site and extend the study findings.
7. Require access to the field during the growing season to collect photos, videos and possibly tour the site. The commissions will provide ample notice to the grower and biosecurity measures will be strictly followed.
8. Cover the cost of any additional drone imagery required as per trial requirements (i.e., drone lodging imagery).

Notes: