Hello from the PPB team! Fall is always a busy time – we hope this newsletter finds you well, and you are able to take 10 minutes from your busy schedule to reflect on this past season.

Of the participants we were able to visit this year, thank you welcoming us on your farms. Additionally, thank you for your updates and hard work. We have already received a few wheat and oat selections ready to be cleaned for next year. I know many potato participants have their potatoes harvested, recorded, and stored. This work would not be possible without your curiosity, dedication, and participation. There are currently 73 farmers breeding their own varieties of wheat, oat, and potato.

This newsletter is chocked full! You will find information on sending samples to the University of Manitoba, a summary of Katherine and Michelle’s farm visits this season, answers to common questions for selection and the broader program, and a PPB Honduran connection.

Sending samples to the University of Manitoba

If you haven’t done so already, please e-mail and make arrangements with Michelle to send your wheat and oat samples to the University of Manitoba for threshing and cleaning.

When your samples are clearly labelled, boxed up and ready to be sent in, please email me the dimensions of your box (L x W x H, cm) and weight (kg) and I will send you the shipping label. When the shipping label is taped to your box, you can drop it off at your local post office.
National PPB Connections
This past summer, Katherine and I had the privilege to visit many participants across Canada. During our visits, we were able to take a look at how the populations are doing on your farms, and what kind of qualities each participant was selecting for. This is a brief overview of the visits, some crops are skipped in some areas.

British Columbia
Three farmers are growing wheat, one farmer is growing oats, and two farmers are growing potatoes.

Potato
One of the participating farmers is a large commercial organic farm close to the pacific coast which sells to the fresh market. They don’t need to worry about Colorado Potato Beetle pressure, however, they are concerned with tuber flea beetle, cutworms, and wireworm damage. Specific agronomic needs mentioned were late maturing, upright growth pattern, and no regrowth after topping. The main diseases they deal with are scab, rhizoctonia, and silver scurf. They received a new set of potatoes from Duane this year, and it will be interesting what they have dug up!

Wheat
One farmer I visited is in his 4th year of selecting his wheat. This population was from a cross between Red Fife and a modern wheat variety. He grew CDC Go next to it as a check. Notice any differences?
Prairies
There are 14 oat participants, 9 wheat participants, and 3 potato participants stretched across Manitoba, Saskatchewan and Alberta.

Potato
The potato farmers participating in the PPB program in the Prairies are located in the southern Manitoba, with diverse varietal needs. As some farmers are looking for very unique colour and shape qualities, others are looking for a potato that is able to deal with their wet conditions. Agronomically, farmers are looking for an erect, tall growth pattern, and early maturity (to try to avoid late blight).

Wheat
Wheat that has been selected by farmer breeders across the Prairies end up look very different due to their vastly different geographical locations, sizes, and markets. The program has farms as big as 3500 acre grain farms to 37 acre mixed livestock farms. Most farmers are selected for low disease pressure, tall height, and against lodging. The majority of farmers are conducting positive selection, looking for plump, large heads at harvest.

Oat
Similar to wheat, due to the wide geographical area, oat populations tend to differ significantly between farmers. Most farmer breeders are selecting their populations around harvest time, and choose panicles that look best to them (large full heads), or plants that stand straight after a bad storm or seems to have the least disease pressure.

Ontario
There are four oat, three wheat, and six potato participants in Ontario.

Potato
All potato farmers are located in the southern part of Ontario, the majority in southwestern Ontario. Their main market is through direct marketing to consumers and restaurants in their nearby communities and Toronto. Therefore, many of them are looking for a potato that performs relatively well, but looks and tastes very good. Some are looking for a specific skin and flesh colour (usually yellow, waxy) but others were open to whatever came out of the ground. Early maturity was of importance to all farmers. Additionally, southwestern Ontario is where mini-tubers and crosses are being made for new populations available 2017 and 2018.

Oat
Two farmers are located in southwestern Ontario, and two farmers are located in the Ottawa region of Ontario. Some agronomic qualities they are selecting for are full heads, and do positive selection at the end of the season. One farmer tastes spikelets and tries to select for sweetness.
Quebec
Currently, there are eight oat, five wheat, and four potato farmer breeders in 2016.

Wheat
We were able to visit two wheat farmer breeders in the summer. One farmer is principally a livestock farmer, but wants to include grains in their rotation somehow and possibly experiment with pasture cropping. The other wheat farmer breeder is a grain farmer. Both are in the advanced stages of selection (3 or more years). They positively select for large heads and low disease.

Oat
This season we traveled to the region north of Ottawa to visit two oat farmers. Both are grain farmers, and are selling their oats to the food market. They are selecting for large oat seed heads, disease resistance and early maturity. They do the majority of their selection at the end of the season. You can see from the picture the value of Participatory breeding, where farmers need varieties that respond to different weed pressures and species.

Atlantic Canada
Currently, there are two potato, and two wheat and oat farmer breeders in New Brunswick and Prince Edward Island.

Wheat/Oat
Both wheat and oat farmer breeders are on Prince Edward Island. One farmer participating in wheat, oat, and potato selections. Both farmers like AC Dieter as a registered oat variety. The agronomic qualities for both wheat and oat each farmer is looking for are good height, early maturity, disease resistance, and large attractive heads. Straw strength is an important factor as well.

Thanks again to everyone who welcomed us on their farms. The whole PPB team feel very lucky to be able to work with and interact with such an innovative, enthusiastic community.
Answers to some common questions

Questions about selection and the program are commonly asked during visits and through email. Here, I hope to clear up any ponderings you may have.

At the end of three years of selection, what are my options?

At the end of three selection years, you have two options. You can either keep selecting (so select for more than 3 years) or you can save the seed, increase it on your farm, and integrate it into your production system. As you continue to grow out your landrace, even as a crop, the population will slowly change and adapt to your environment as natural selection will carry on. Some farmers choose to select for more than 3 years but this is up to you.

The overall goal of this program isn’t necessarily to end up with a genetically identical population, but with a diverse population that is able to adapt and mold itself to your farm.

For potato, the goal is for you to end up with one to three varieties that perform well on your farm, and match the market demand you have in mind.

What about registering a variety of wheat, oat, or potato?

The team has been wrestling with this notion for a while now. The next newsletter will address this issue to greater detail.

Each year I’ve been planting my populations in areas of my farm that I know differ quite a bit in soil type and moisture so that the populations are exposed to all conditions, is this a good strategy?

Yes, this is a great strategy. Good genetic expression is more likely to occur under different environmental conditions. What is genetic expression? The ability for a population to express its genetic potential. This may be height, for example. The true height of a plant may be stifled by environmental stressors, like weeds or lack of moisture.

Are there genetic differences between multiple panicles or spikes on the same plant?

No, all the panicles/spikes on one plant are genetically identical.

If I harvest 4 panicles/spikes from the same plant, does this count towards my 500?

Yes.

Why do you need 500 panicles/spikes?

We ask for 500 in order to account for losses during the cleaning process and have enough to send back to you. If there is extra, we archive them in case your populations are flooded out, or eaten by deer.

I have smut in my populations, I’m worried it would affect next year’s population. Can I seed treat this population, grow them out, and then select?

Yes, you may do this. Of course, on your non-certified organic land...

500 panicles/spikes take a long time, can I rogue out plants I don’t like and then collect the whole plot?

We don’t recommend this, we tried this earlier in the PPB program as an experiment and found that genetic advancement doesn’t move fast enough from year to year in this way. We still recommend that you hand select your spikes and panicles.

If you have any other questions you may not have seen here, shoot me an e-mail.
Edible beans grown hillside in Honduras. Photo: FIPAH

International PPB Connections

The cooperation between researchers, organizations, and farmers is what makes participatory plant breeding a unique opportunity to open doors to new ways to thinking, evaluating, and breeding. So what are other areas in world up to? Can we draw inspiration or learn lessons from them?

Participatory breeding in Honduras was catalyzed by the need for varieties that perform well in the marginal hillsides of north-central area of the country. For generations farmers were selecting their own seed without formal breeding knowledge, which resulted in low, but steady yields. I have heard from multiple farmers in BC that Prairie wheat varieties are not well-suited for their areas, so they look to American sources.

In 1993, the International Centre for Tropical Agriculture began to train farmers in research skills. In 2000, a partnership between these farmers, scientists at the Pan-American Agricultural School in Zamorano, NGO (non-governmental organization) agronomists, and funded by 2 NGOs started to specifically focus on the participatory bean breeding process.

Interestingly, the original plan created by the Zamorano scientists was to centralize the plot in one common area and selection would take place at one site until F6, then farmers could test for adaptation on their farms. But farmers took the matters into their own hands and took the early generation populations back to their farms to start selecting right away. This stands out to me, as a farmer’s ability to recognize the importance of diversity, and how different they knew their needs were. I may be stretching here – but I can just imagine the farmers saying to the scientists, “no, we’ll grow them on our farms, don’t worry, we’ll take it from here.” And the scientist slowly took a more supporting role in the work.

Through the program, selection knowledge has spread to other locations in Honduras, and 23 new bean varieties suited to different environmental, agronomic, and marketing needs have been created. Farms differ by soil, precipitation, weed pressure, as much as they do in Canada, even season length; communities differ in altitude. Similar to our work in Canada, farmer-selected bean populations were evaluated commonly at F6 or higher, alongside checks, and consistently out-yielded check varieties. They differed agronomically as well, as low height was disfavoured due to weed control constraints and disease pressure from high humidity, pod colour enabled easier identification at harvest, longer season varieties were better suited to areas with a longer spring cycle, and early maturity was important to avoid an upcoming dry cycle in some areas. I’m sure many of you can relate to some of these needs as well.

Table 1: Farmers’ evaluation of PPB varieties in Honduras (Humphries et al., 2005)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>PPBY-8</th>
<th>PPBY-14</th>
<th>PPBY-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturity</td>
<td>Moderate</td>
<td>Early</td>
<td>Late</td>
</tr>
<tr>
<td>Uniformity of maturation</td>
<td>Uniform with attractive red colour</td>
<td>Uniform but a lighter red colour</td>
<td>Uniform but with white pods*</td>
</tr>
<tr>
<td>and colour</td>
<td>Medium</td>
<td>Medium-low*</td>
<td>Medium-high</td>
</tr>
<tr>
<td>Disease Tolerance</td>
<td>Excellent, medium height with well distributed pods</td>
<td>Good, low-height* with well distributed pods</td>
<td>Good, medium height with distributed pods</td>
</tr>
<tr>
<td>Architecture</td>
<td>Good yield</td>
<td>Average yield</td>
<td>Excellent yield</td>
</tr>
<tr>
<td>Yield</td>
<td>Good</td>
<td>Good</td>
<td>Poor*</td>
</tr>
<tr>
<td>Commercial Value</td>
<td>Good</td>
<td>Good</td>
<td>Poor*</td>
</tr>
</tbody>
</table>

*Traits considered unfavourable by farmers
Salley Humphries, a Canadian contact with the University of Guelph in this article emphasizes “the potential for farmer-centred approaches to support climate change adaptation and mitigation. The diversity of varieties created through the participatory plant breeding puts them at the cutting edge of climate change adaptation.”

Do you have an idea for a webinar subject you’d like our team to host in the winter?

Let me (Michelle) know!

Thank you for your participation in the on-farm breeding program!
If you have any questions about this program or would like to become involved please let us know.

Michelle Carkner and Martin Entz

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