RESEARCH PROTOCOL: SEED PRODUCTION & BREEDING 2018
Early Yielding Pea Breeding

Farmer-researcher
Duane Falk, Mimosa Breeding and Research

This document outlines the steps that Duane will follow to execute his breeding project, *Early Yield Pea Breeding*, including design, execution, data collection and data sharing. It also serves as a Memorandum of Understanding between Duane and EFAO for 2018.

Breeding Goals
Duane would like to develop a truly winter hardy garden pea. Specifically, he would like to combine the winter hardiness of Austrian Winter Field Peas with the qualities of a garden pea (Lincoln, etc). This type of pea could be planted in the autumn and would yield early peas in the garden before the heat and drought set in, producing much better quality and ahead of the main season for farmers markets, etc. This should take 3-5 years to get uniform lines with the combined traits of hardiness and quality; these traits are both complex.

Methods and Materials
Predictions
Duane thinks it is possible to breed a good quality culinary garden pea with adequate winter hardiness for most of Ontario and Eastern Canada.

General management
The area for this project is up to 1/4 acre as part of Duane's normal 5 year rotation on his organically managed farm. He cultivates 5 separate 1-acre plots of the best land on the 85 acre farm (most is in hay). The plots are in a rotation of:

1. Winter rye (underseeded with red clover) - this year will likely work well here as it is also a winter crop
2. Red clover for hay and seed
3. Oats and barley for breeding and research projects - peas can fit in odd spaces around the margins or between plots
4. Cover crop of spring grain and legume mixture (peas will not fit here)
5. Potatoes for commercial production and breeding (peas could be used as in-fill here)

Because the first grow-out in the field will be mostly F1 hybrid seed from hand crosses, they will likely be grown in his extended garden area so that Duane can keep an eye on them and stake them regularly as they grow. In the fall, the next generation will be planted at the margins of the winter rye area, and he may use the rye as a support crop in the following season. This will be following potatoes, so there should be some stimulation of N-fixation in the peas due to N use by the potatoes. Eventually, final selections will be grown in the garden area because that is their intended use.

Breeding Methods
Duane will cross winter types with garden types and then compare measurements listed below of the resulting progeny to current varieties and the parents. Breeding methods will be traditional hybridization, and possible backcrosses to both parents, and then pedigree/single seed descent to F3-F4 with family progeny after that. Purification of final selections will be made in advanced generations. Controls with be parents and best commercial cultivars for specific traits.

Maintaining good field records and accurate recording of plots and harvested material is critical to tracking progress in selections over generations and across years. Data management of field observations and post-harvest information is crucial in making decisions for selection of the best lines in each generation.

The project will take 3-5 years to get final results. Winter peas do not require vernalization to produce flowers, so crosses will be made in the growth rooms from winter plantings and/or garden from spring plantings in 2018. The initial crossing and first few generations will require very little time as Mother Nature will do most of the selecting for winter hardiness. The survivors will be evaluated for plant type and eating quality on an individual plant basis in 2019, to be followed up with progeny family evaluations, which will take more space and time in 2020 and later years.

In future years, 2019 onwards, the advanced selections will be tried on other farms in other ecological zones to see how the resulting lines perform. This could also be done in conjunction with small seed companies who might be interested in marketing the resulting varieties. Following Open Source Seed Initiative (https://osseeds.org/about/), the resulting varieties, if deemed to be commercially viable, would be licensed to one or more small seed companies across Ontario, Canada, and potentially the USA, for small-scale vegetable producers and home gardeners. Selections derived from this project will be released publicly as per the Pledge below. In addition, partner seed companies that sell pledged varieties will acknowledge the EFAO farmer-breeders in their variety descriptions, and include the Pledge and information about EFAO's farmer-led research program in their catalogs and on their websites.

Measurements
In the research, Duane will track:

- Winter hardiness of original parents and derived populations
- Winter hardiness of selected plant progenies
- Culinary quality of selected plant progenies
- Disease resistance of selected plant progenies
- Plant type and growth habit of selected plant progenies

Materials and Research Expense Budget. Prices are approximate; NA or in-kind for any materials that you already own or have access to. Please indicate if you intend to give any of the supplies to EFAO's Tool Library for others to use after you are finished with them.

Material	Quantity	Unit	Total Cost	EFAO's Tool Library (Y/N)
Seed	10-15 selected garden varieties	packet	$2-$4each	
Scissors, tweezers			In-kind	N
Small scale			In-kind	N
Seed cleaning and sizing equipment			In-kind	N

Deadline for data, progress report and photo submission

October 31, 2018

Memorandum of Understanding

Please refer to **efao.ca/research-mou** for Memorandum of Understanding.

Pledge for Breeders

You have the freedom to use the seeds generated from your farmer-led research project in any way you choose. In return, you pledge not to restrict others' use of these seeds or their derivatives by patents or other means, and to include this pledge with any transfer of these seeds or their derivatives.

Acknowledgements

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