**ALA1: Defining breeding objectives for self-pollinated, cross-pollinated, and clonal crops**

**Prerequisites**

eModule-1 from Crop Improvement course:Basic Principles of Plant Breeding Objectives

**Background**

Every plant breeder starts by defining a list of breeding objectives for his/her program. A breeder must consider numerous factors when creating this list of breeding objectives.

**Purpose**

To understand breeding objectives for different crops, and learn to determine objectives as a breeder.

**Background**

Every plant breeder will set defined breeding objectives for his/her program (germplasm or cultivar development). Numerous factors are considered by a plant breeder to establish and achieve these breeding objectives. This exercise is to get students to explore different crops and to define breeding objectives.

**Tasks**

Choose a specific crop (e.g., cassava, maize, wheat, etc.) of your interest to use as an example for this exercise.

**Part A. Defining how your example crop is used and processed.**

**Question 1**. Why/How is this crop produced and sold?

1. List the economic part of this crop? (e.g., food or feed, grain, foliage, root, other uses?)
2. Who are the typical users of the economic part (produce or product)?
3. Is this crop used mainly by rural people (e.g., sorghum, finger millet) or city dwellers (e.g., rice, maize meal)?
4. Is this crop primarily grown by small-scale farmers and used mainly by the farm family (e.g., sweet potato, yam)?
5. Is it grown by small-scale farmers and then sold in significant quantities for consumption by others (e.g., maize, bananas)?
6. Is the buyer usually the consumer (eg. beans), or a middle-man who transports the product (eg. bananas, vegetables)?
7. Is the product usually sold directly to a consumer or to a processing company (e.g., soybean, rice, sesame)?

**Question 2.** Is this crop typically produced by small farmers, larger growers, or industrial scale producers? Why?

Are the growers typically men or women? For example, cassava and sweet potatoes may be grown especially by women.

**Question 3.** Who are the stakeholders for this crop? That means, who are the people with a specific interest in the production and/or use of this crop? Examples could include: the farmers, consumers beyond the farm family, the processors, and end-users after processing.

**Question 4**. Who supports the breeding of this crop? Examples could include the government, non-governmental organizations (NGOs), industry, etc.

**Part B. Defining traits that are important for this crop.**

**Question 5.** Think of five traits that are important for your crop.

**(Be sure to answer all three parts of this question):**

1. Explain why these five traits are important and to whom they are important too? For example which stakeholder(s) in Question 3 would care about which trait.
2. Do various stakeholders (users, others with a particular interest in the crop characteristics) want different characteristics for the traits you have chosen?
3. Explain why each stakeholder would be interested in each trait. For example, a person that extracts oil from soybeans is interested in the quantity and quality of oil and the ease of extraction, but these traits not matter to the farmer that produces the seed unless the quantity and quality areprice he/she receives

**Part C. Defining breeding objectives for the important traits for this crop.**

**Question 6.** Based on your answers in Parts A & B, what would be your breeding objective(s) for the five traits you listed for Question 6.

(An example that shows the difference between a trait and an objective is that “yield” is a trait (i.e., a characteristic of a genotype, which we will assume for this exercise is under genetic control); while “increasing yield” is an objective (i.e., your target).

**Part D. Defining the reproductive and genetic characteristics of the crop.**

**Question 7: What are the reproductive and genetic characteristics of the crop?**

1. What is the mode of reproduction of this crop species? (sexual (seed) or asexual (clonal))
2. What is the system of pollination of this crop species? (self- pollinated or cross-pollinated)
3. What type of cultivar do you intend to produce for commercialization (e.g., pure-line, hybrid, open pollinated variety (OPV), synthetic, or clonal)?
4. Is the cultivar homogeneous (i.e., all plants are genetically the same) or heterogeneous (i.e., a mix of genetically different plants)?
5. Are the alleles at a locus typically homozygous (i.e., both copies/alleles of the same gene/locus are genetically the same) or heterozygous (i.e., the two copies/alleles are genetically different)?

**Part E. Prioritizing your breeding objectives.**

**Question 8:** Consider the 5 traits you have chosen. How many breeding objectives do you develop? (List at least 5, but no more than 10).

Rank these objectives in order of priority and identify to whom (which stakeholder) this objective is most important.

**Part F. Group Discussion.**

1. How can we ensure that a cultivar we develop will be adopted and used by the farmers?
2. Do the traits listed for Question 5 differ in priority among the different stakeholders?
3. Which traits were common to all crop species?
4. Which traits were listed only for a single crop (i.e., crop specific)?