



An Endangered Species?

There are two sides to variety development: lab work and field work, and it seems the latter is dying out. Training in classical or field breeding is essential to gather the knowledge and skill of selecting plants for a breeding program. Molecular biology or biochemistry are important components of a field breeder's repertoire, but the ability to select plants only comes from hands-on experience. Unfortunately, young science students seem to be foregoing plant breeding training for the more sexy pursuits of molecular biology or biochemistry.

By Stephanie Fehr

“ONE OF THE MOST IMPORTANT things about plant breeding is it is as much art as it is science,” says Bert Innes, President of Eagle Group, a plant breeding consultancy based in Canada. “That means you have to develop an eye for it, an image in your mind of what the perfect plant looks like, and you have to recognize very subtle differences between plants. If you have a nursery with 10,000 plants you’re looking at a lot of plant material and it takes a lot of experience to distinguish what you want. That’s not easily taught, it has to be learned – and the only way to learn is through experience.”

One of the problems Innes sees is an increase of students going into the “new” science of molecular biology and ignoring plant breeding as a profession. To

compound the problem, those students who do pursue plant breeding often find there are decreasing numbers of seasoned breeders to train them. “A good number of university plant breeders retired in the late 1980s and early 1990s, so we’re running out of people to train these folks,” says Innes. “Consequently, very few people are coming out of school these days with any actual hands-on experience.”

Additionally, with a decrease in breeders at universities, it’s harder to get more students. “If you don’t have a critical mass of four or five breeders in a university it’s hard to get the peer group of grad students needed to make it interesting enough to attract others,” says Allen Van Deynze at the University of California – Davis. “When I went through breeding there were 5 to 10

people in my peer group and we could bounce ideas off each other.”

North America isn’t the only region finding that field breeders are an endangered species. Petr Kosina, Training Coordinator at CIMMYT, the International Maize and Wheat Improvement Center, says the number of field breeders is going down internationally. “The number is decreasing and especially in the public sector, which unfortunately often cannot offer conditions comparable with the private sector,” says Kosina. “Obviously the situation is not the same in all regions of the world, but clearly many developed and developing countries are facing this problem.”

Kosina says it is still difficult for the U.S., Europe and even international centers like CIMMYT to find really

good, experienced field breeders. Although there isn't one main reason, this lack of classical plant breeders doesn't bode well for agriculture. While biotechnology is very useful in developing beneficial traits, without the delivery mechanism that classical breeders bring, farmers won't see these benefits in their fields. "If fewer people go into field breeding, then we cannot expect very intensive growth of production (in respect to yield and quality) in the future," says Kosina. "Consequences would finally touch even the results of molecular breeding because, whether we like it or not, the last step of molecular crop improvement happens in the field – plants must be tested, adapted, and so on."

If farmers in developed countries will have a lack of improved varieties to choose from, the developing world will be particularly hard hit with a lack of new varieties adapted to their growing conditions. "In developing countries where populations are still in exponential growth, the consequences can be disastrous – more so if the worst scenario of global climate change occurs," says Kosina.

Without plant breeding, history might look different as well. Consider the Green Revolution. "CIMMYT's practical hands-on training courses on maize and especially wheat improvement were famous during its 40-year history and practically formed a basis for the Green Revolution," says Kosina. "Norman Borlaug (the father of the Green Revolution) always says that without trained field breeders there would be no Green Revolution."

Kosina says the Food and Agriculture Organization of the United Nations has completed an extensive survey on strengthening national plant breeding and related biotechnology capacity in a global context, which shows there is a

clear demand for improved training of practical field breeders, especially in developing countries. "I expect that results of this survey will be used extensively in the near future for general support of sponsoring capacity building in the area of plant breeding," says Kosina.

If one thing is clear there is a real need to train plant breeders. Both the public and private sector recognize the problem and they need to work together to fix it. And there is some work underway. The University of California – Davis has set up a Plant Breeding Academy through its Seed Biotechnology Center. This new program is aimed at teaching the basics of plant breeding to people already working with breeders or in a breeding program without a breeding background. (see story on page 14)

There are other ideas to train breeders. Van Deynze points to a model in South America where grad students attend one university for a semester and learn something very specific and go to another university to learn another topic. He believes this model should extend to co-operation between academia and the private sector as well. "Right now, it's starting to become really clear that something needs to be done," says Van Deynze. "In the future, it's got to be an integrated effort; otherwise I think we're in trouble."

As with any endangered species, it will take a while to get the population growing again. It's clear that biotechnology and field breeding are both important, but it will be to agriculture's disadvantage to have a stronger focus on one over the other. These two pursuits go hand in hand; in the end it's all about getting new traits into germplasm – which can't be done without field breeders. SW

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