

Breeding Resistance to Special Interests

Stephen Jones

Farmers have certain fundamental rights, and one of them is to plant back what they harvest. I think it takes incredible arrogance in our generation to do away with a right that's been around since the beginning of organized agriculture, which is about 10,000 years. That's what's happening right now, and it's happening with the help of most tax-funded, land grant universities. Of course it's happening with corporations, but if you're a land grant with a breeding program, odds are you're working with one corporation or another on herbicide-resistant crops. Every land grant that has a breeding program is working on types of plants that take away farmers' rights to plant back what they grow. To me, that's hard to understand. The usual excuse is that the money is needed to keep the land grants going. But why keep them going if they are no different from the corporations?

Our number one strategy in the Washington State University wheat breeding program is to involve the growers. Our program has worked with them every year, for 110 years.

One way that we work with growers is through evolutionary participatory breeding. "Evolutionary breeding" was a term coined at the University of California at Davis in the 1940s. It's basically getting populations that are highly variable into different parts of a field. We then let nature act on the variation in the field and in the population to select for the best plant types in that environment. Growers then join in and help the natural selection to develop their own varieties. We like to call this "genetic anarchy," although that term gets misunderstood. It is actually a very natural and predictable process. We are just letting nature and the farmers have more power on what type of plants emerge as superior.

It's very simple. In wheat you take an acre-size field. Farmers can go out with a weed eater and take out plants they don't like. If they don't like tall ones, they take them out. It's very easy to walk an acre of wheat after supper and in a few nights go through the selection. Then the grower harvests that acre and plants the seed back next year.

We view our service at the university as creating variation. We can make crosses in the greenhouse and put them in our field to increase. This works like Mendel made his crosses, taking pollen from a plant with one set of characteristics and fertilizing a different plant. Over a few generations of increasing this population, all the variation present in the genes can be observed and selected from. We harvest with our little combines enough

for a grower to plant 60 or 100 pounds of seed.

We haven't done participatory breeding on a wide scale so far. There are about 2,500 wheat growers in Washington, and I talk to at least 800 a year, directly, in groups of two or 200. But I haven't said, "Hey, let's all go and breed your own varieties." While some would be interested, it won't appeal to everyone. We're growing our traditional wheats in 25 areas throughout the state. These 25 growers are the ones we work most closely with, and it's within this group that we're doing participatory breeding.

I envision it getting larger and even going out of state. It would be very simple for a grower from Kansas or California to call us and say, "These are the varieties that we grow in this area, can you make the cross, blow up 50 or 60 pounds for us and send it back?" We want to get into that type of service.

One of our favorite locations is our first one. He's a grower that came to us and said, "We want to get the granddaughters interested in farming; they're going to inherit the farm." So we told him, "Why don't you have them breed a variety and name it after you?" And he liked that. So, the oldest granddaughter took it on as a Future Farmers of America project. She has the plants in the field right now, and this fall will be the first fall that she goes out with her grandfather after supper and selects the plants. She is a sophomore, and this is a project that will go on 10 or 15 years. It's working very well. She has a little notebook, she takes pictures, she really enjoys it. She came to the greenhouses and made the crosses herself. We do a lot of that in our program, bring a lot of school kids into the greenhouse.

Basically it's straight farmer participatory breeding except that we're adding a strong natural selection element to it. You need strong selection. You need the forces of nature out there working for you: disease, so you can find the plants that best resist it, cold for the most winter hardy plants, drought for the drought-tolerant. Otherwise you're wasting your time out there.

One thing we want to do is give growers varieties adapted to certified organic situations. Modern varieties aren't as tough as needed for the demands of organic conditions such as low soil fertility, weed pressures and diseases. They have been bred with synthetic fertilizer and pesticides. So, we certified 11 acres on our 230-acre research farm in Pullman. We did that to go through the same hassles that the growers do, and to show the growers when they come out to the farm what organic can look like. We did it so that we'd have to deal with upset neighbors, too, just like farmers do. Some of our upset

neighbors were the farm manager and other researchers in the department who thought we were just crazy.

We are very proud that we have that 11 acres certified. We also have a goal in Washington that every university research farm put some acreage or an acre into certified organic. The school has nine research farms in the state, and we want all of them to have certified organic acreage to show what's possible.

We set up a breeding program specifically for organic. A lot of breeders say, "It's all the same, the best variety is the best variety." We don't know that, because the best varieties have not been selected under certified organic systems. Since about 1950, the selection in other wheat breeding programs has been under high-input, chemical-intensive systems. Are genes lost if not selected for in breeding? Yes, they are lost just by chance. We feel strongly that if we have not selected under low-input systems, we've lost genes favorable to that system.

We have great diversity in our program—wild wheats, old wheats, new wheats. What we're looking for are qualities that were in lines adapted to the area before the 1950s. We have found all 162 heritage varieties that were originally grown here, and all have been crossed to the modern varieties hundreds of times. These old wheats are beautiful, but a lot of them get very diseased and have traits that are not desirable. We can improve them.

Something else we look at is the end-use qualities of these old varieties. There's a lot of folklore that they were all great—that they all made great bread and cookies and noodles and pizza crust. But that's not true. We have a quality lab on campus run by the U. S. Agriculture Department's research service, and they make cookies and bread out of these old lines. Some loaves of bread made from these old wheats turn out like a brick. So we're trying to dissect the folklore as well.

Every year we have traditional farmers that come to the university for a farm tour. They are very surprised when they see a certified organic wheat field that looks like ours. It's as clean as theirs, it looks as good as theirs. We have beautiful looking wheat. They see our raptor poles and kestrel nesting boxes that work really well for gopher control, and they get interested in that. That's some of the value of having certified acreage on a university farm. Some of the older growers come up to me and say, "Hey, I can do organic, that's all we did when I was a kid."

A lot of times, during more political discussions about breeding at public institutions, people ask, "What can we do?" The things that I think should be discussed are very simple. Biotechnology is about ownership. The argument doesn't go there enough. It stays on the environment and on food safety. But it's about ownership and ownership only. It's about having a gene, and putting it in a vessel, and selling that vessel to the grower, and making them buy it every year.

So here is what I think—you can say that these things will be impossible to achieve, but I don't believe so:

- No patents on life. That would solve the problem, the story would be over.

- Get corporations off of our college campuses. They came on very quickly and they're having undue influence.

- Repeal the Bayh-Dole Act of 1980. This allows public researchers to obtain patents and to get royalties from them.

For example, if I were to put herbicide resistance into a wheat, it could go on 1 million acres the first year. Under the act, I would be the inventor of that wheat variety and get 40 percent of royalties. Let's say the royalty was a dollar an acre back to the university, from Monsanto or BASF or whoever is at the other end of it. I would get \$400,000 a year on a million acres of production.

This goes on at every public university and they're very proud of it. If you're interested in the Bayh-Dole Act, do a Google search for five minutes and you'll find that big-name schools' intellectual property offices love to brag about it. You'll find some good discussions about it, too.

So if we don't work with corporations and take royalties, what sort of funding do we have? I hear a lot that we have to work for these corporations, because there's no other money, and that everyone's doing it. The university administration pushes that we need to work with corporations, that we can't survive as public scientists.

But I have a list of funders for my program with over a million and a half dollars represented, and you don't see Monsanto and BASF among them. We're funded by the Washington Wheat Farmers, Fund for Rural America, Sustainable Agriculture Research and Education, and Organic Farming Research Foundation. We have a special grant on perennial wheat from the Agriculture Department, the Washington Department of Ecology, for buffers and borders, and The Land Institute.

And we have a woman in Idaho that we've never met who sends us \$25 a year. So we make raptor poles with it and send her pictures of them.

In 2003 some 100 growers, researchers, political folks and activists gathered to talk about corporate influence, and the plant breeders decided we would form a sort of oath—something public breeders can sign that says we won't receive extra money for what we do, and we won't take away farmers' rights. Not much has happened since, because it's a touchy issue. But all of us agreed we would sign something like that. The venue to get it out is what we're working on. The group met again in 2005, and we are working on a 2007 meeting.

The position is delicate. I've given many talks where

by the time I get home I have a phone call or letter from someone who didn't like what I said. I've received letters from other land grant administrators to my land grant administrators.

The safety net that we have is the program itself. I have tenure. But mostly we just do a good job at breeding traditional wheat. There is pressure continually from within the system to do herbicide wheat, no doubt about that. But our best strategy has always been the same, and that is to be successful: Get grants, write papers, release varieties, have students, teach and do the things we're supposed to do. That's my strategy, and it's working so far.

The growers we work with are very excited. They like the idea of developing their own varieties, and they

like it because for now, the United States is probably the most wide-open country in terms of wheat seed. In Canada, for example, you have to grow registered varieties of wheat, you can't just choose what you want to grow. It's like the cotton districts here, where you can only grow one kind of cotton. That's not true with wheat, and wheat growers really like that—your variety doesn't even have to have a name.

The people who won't like it are seed dealers, the university and the corporations. Think about it: the farmer developing their own seed? Their own variety? That's not good, right? That's dangerous stuff.

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