A Lifetime of Grass Breeding: Successes, Failures & Surprises

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In 45 years of working on perennial grasses, I've (hopefully) learned some lessons about setting research goals, priorities, and methods, the most important of which are: trust your instincts; avoid dogmatic thoughts, even if they are your own; and don't be afraid to fail (just don't fail all the time, which would severely undermine your self-confidence). This article tells three stories about grass biodiversity, and each story contains elements of success and failure. Occasional failures were important in making me a better researcher. As Friedrich Nietzsche pointed out, "That which does not kill us makes us stronger." As I reflect upon 45 years of grass biodiversity research, I am thankful for the colleagues and friends, and especially the forage and livestock producers, who have influenced my career and helped make it thoroughly rewarding and enjoyable.

The single most important event in my entire career was when Carl Fredericks called me and asked me to attend a meeting of livestock producers to discuss conducting some on-farm research to support the grazing community. This invitation and meeting changed my career and life.

During the next few years, I completely altered the objectives and my approaches to grass breeding, focusing on developing improved grasses to support the grass-based grazing community. I spent a lot of time thinking about which species should receive attention and how best to go about developing new and improved varieties. While attending a family reunion in Minnesota, we visited my maternal grandparents' gravesites, and I discovered a very healthy population of smooth bromegrass growing in the sod. I spent the 7-hour drive home formulating a research plan focused on determining if bromegrass collected from cemetery sods could be good source material for a new grazing type of bromegrass.

I visited 111 cemeteries in Wisconsin, Minnesota, and Iowa and made collections from 30 of them. I received a lot of interest and recognition for this project – after all, who else do you know who has collected and evaluated grasses from cemeteries? However, after all the evaluations, a few of the sod populations were only marginally better than ordinary hay-type bromegrass. Plus, even before I could make the decision about whether or not to proceed, that decision was made for me by another game-changing phone call.

Charles Opitz ran a very large grazing operation near Mineral Point, WI. He had an unknown grass that his cattle loved and asked me to identify it. My initial identification was incorrect, thinking it was a hybrid between ryegrass and fescue, something that we call "festulolium." Later, after Charles showed me how he had propagated this grass through his farm by feeding hay with ripe seed during the winter, I focused on learning more about this grass. Charles already knew that his cows produced significantly more milk on this grass than on any other grass on his farm.

Charles had discovered meadow fescue, a grass largely unknown to us at the time. With funding from the University of Wisconsin Center for Integrated Agricultural Systems and collaboration with Randy Jackson and David Duncan, we have discovered meadow fescue on over 400 farms in the Driftless Area of Wisconsin, Minnesota, Iowa, and Illinois. Following our research and interviews with local landowners, we have the following conclusions: meadow fescue was brought to this area by settlers and perhaps in the guts of cattle that grazed in the Southern states during winter; meadow fescue survived the intensive agriculturalization following WWII in remnant oak groves that were not logged or cropped; and meadow fescue began spreading out from those oak groves in the 1970s as many landowners quit cropping their land and initiated grazing operations following the New Zealand model.

Geoff Brink, a fellow scientist at the U.S. Dairy Forage Research Center, entered the picture at this time and conducted extensive agronomic testing of my candidate varieties. His data showed meadow fescue had ~5%

lower forage yield compared to other popular forage grasses, but its fiber digestibility was up to 10% higher than other grasses. The higher fiber digestibility clearly indicated superior quality that would be translated into increased milk or meat production. As a result, we have released three new meadow fescue varieties: Hidden Valley, Azov, and Driftless.

Hidden Valley meadow fescue originated in this small grove of burr oak trees on top of a hill next to the south milking parlor of Hidden Valley Farms. *Photo by Michael Casler (2002)*.

The last story involves my work in collaboration with the University of Wisconsin and U.S. Department of Energy to develop a high-yielding switchgrass variety for biomass production in the northern U.S. Our strategy for increasing biomass yield was to find late-flowering plants capable of surviving harsh winters in Wisconsin. This was a big challenge, since local ecotypes are early-flowering, reaching peak biomass in early August. That left a good 6 weeks of growing season wasted.

During a 10-year period, we traveled thousands of miles in the southern U.S., collecting late-flowering populations of switchgrass from prairie and savanna sites preserved by state, local, or private organizations. When we planted these populations in Wisconsin, very few plants survived, but we dug up the few survivors and made crosses among them, generating seeds for the next generation of selection.

After three generations of selection, we had a very late-flowering population having 95% survival after three years at four locations in Wisconsin. That population will be released as the variety Cedar Creek and will undergo seed increase for dual use as a potential biomass crop or as a forage grass. At the same time, we conducted two generations of selection in big bluestem, using the same strategy. The new big bluestem population will also be released, as the variety Empire.