



NeWold Times



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The Long View

By: Ed Baumgartner

Agriculture continues to be an exciting if not an unpredictable field to be involved in. Just when you think you are going to have a good spring due to exceptional early growing conditions, Mother Nature decided that we still need our annual dose of cold and rain. The difference this year being that a large portion of the crop was planted early in the unseasonably nice weather and soil conditions. It then had to endure saturated cold conditions for a lengthy period of time. This was perfect for Durayield hybrid and inbred selection conditions. I have been impressed with how well the corn trials in general have come through it. We do not use seed treatment when making our selections to ensure tough early season hybrids. We definitely can rate significant differences on early vigor this season and will have an opportunity to see how much of an impact early vigor can have on final yield.

The other main event in the seed industry this spring comes from two industry giants trying to figure out if one can swallow the other. This actually makes me quite uncomfortable, as I do not see a positive outcome for the future of agriculture with more consolidation in either seeds or chemicals. However, this does provide us plenty of subject matter to discuss over beers on a regular basis. (Debbie would say that I did not need any more beer subject matter.) The seed industry is becoming like a soap opera of who should merge with whom. Is this potential merger (or others like it) really going to bring more options to the farmer and the seed retailer or is this merger just going to concentrate the money into select investor pockets? Anyone want a beer?

I see many questions coming to the surface at this point in time. Has there been enough value brought to the farm and consumer with GMO traits to justify all of the negative discussion they receive worldwide? What is the value of each of these GMO traits in our seed? Should some be

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removed? What is the value of the genetics that provide the base for the GMO's? Can we farm without having glyphosate in the grower's toolbox? Are Bt traits now outdated since we need to pyramid them and use chemicals in conjunction with them to control the targeted pests? Should we begin to use GMO's like we use spray pesticides; only when there is a high likelihood of them being needed? Can GMO's really impact complex issues such as drought tolerance? Can modern plant breeding still make enough gains for important traits?

At 3MG R&D we believe that we can make the genetic gains through our modern breeding techniques (NeWold) without the use of GMO's. We see tremendous progress in our inbreds and hybrids from when we first embarked on this idea of Durayield traits. Due to being able to breed corn all year around we are now in our 3rd breeding cycle of proprietary material since we started 10 years ago. We went from just getting

temperate corn to survive a summer in Puerto Rico to corn surviving the summer and surviving the insect onslaught without insecticide sprays in Puerto Rico. Now we have corn surviving the summer, the insect pressure and producing corn on half to two thirds of the normal water amount required to produce corn in Puerto Rico. We have been aggressively yield testing the resulting inbreds developed under these conditions in various hybrid combinations against the elite products of our industry. The hybrid yield levels are now very competitive with commercial products being sold today. From the very beginning when we started testing our first inbreds we could compete competitively in low yield level situations but got lost in the high yield environments. The past two years we have seen Durayield hybrids compete across all yield environments while performing very well in the difficult environments. I can't wait to see where breeding cycle 4 takes us! Stay tuned.

This continued improvement in yield performance with biotic and abiotic stress tolerance creates many options for the

inbreds and hybrids we have developed. They can answer many of the questions I have stated earlier. They can handle all of the conditions that GMO's were designed to perform in with the exception of the herbicide traits. We have not targeted native herbicide tolerance in our breeding program. We do not want our products dependent on one particular vendor of a specific herbicide. Many good products from many companies currently exist, new and old, to provide excellent weed control in corn even if a mega merger or two were to occur. We have selected for weed tolerance in our breeding program for the market that requires this ability to endure weed pressure when it happens. Our inbreds can be combined with various GMO traits from the other side of the pedigree to offer herbicide traits and

even broader pyramided protection against insect pests currently targeted by Bt genes.

There are a few additional benefits from NeWold breeding methodologies that are added to the products. The inbreds are more reliable in seed production fields due to their ability to handle stress. Pollen shed, silking and seed set are all improved. The inbreds and hybrids have improved seed and grain quality. The

Durayield inbreds tend to be larger plants with larger ears than average. Test weight and kernel hardness goes up in the Durayield hybrids. This does make it a bit harder to find dry down but die down does not happen.

We are excited to get to this year's harvest results to continue to build our knowledge on Durayield and identify a few new hybrids to produce this winter to have available. It is just a matter of time until the value of our Durayield products is recognized by the industry. The unpredictable weather along with current market conditions for farmers will push many of the questions I raised to be asked loudly. We are here with the response; ready to assist you meet your customer's needs. Let's start the conversation and be proactive. You will find good value in working with us too! We will continue working on Durayield with a long-term view to meet the long-term needs of our industry.



Proof of Concept

by Raechel Baumgartner

A good portion of my last two weeks has been spent working with customer conversion nurseries; first with a round of glyphosate spraying, then on to the strip-testing. While making live/dead and positive/negative counts, it occurred to me just how easy it was to tell if a plant had the particular trait being tested. Conversely, it occurred to me just how not-easy it is to determine the presence or absence of our DuraYield traits. In a world of simple yes/no answers regarding traits, no wonder we are met with raised eyebrows when we try to explain this list of complex traits with technology.

We have been talking about proof of concept and parameters for the last few years, and we still don't have our "checklist" fully fleshed out. I can't tell you that a DuraYield hybrid will produce X ppm of protein Y that will prevent insect Z. I can't tell you that it has genes M and N, for which you can test in the field.

Here is what I can tell you:

DuraYield inbreds are developed under high insect pressures with reduced or no insecticide. Will you see feeding damage? Yes. Will the plant set a good ear anyway? Yes.

About a year ago, Dad and I were visiting with a guy who has a background in analyzing protein expression, primarily in the medical and health fields. He was fascinated by the Bt genes in corn and their promoters, which are always ON, meaning that Bt protein is being produced whether the plant needs it or not. He was fascinated by the energy draw that would have on a plant, to constantly be producing a protein even when it is not needed. Most promoters are not always ON, but are instead triggered by certain environmental conditions inside or outside of the organism, which is a more efficient way of operating. We think this is why many of our insect-tolerant plants will have a small amount of feeding on them: the initial feeding triggers the protective mechanism, turning the genes on, triggering the protein expression, and stopping the insect feeding in an efficient manner. But how do we explain to you that this plant with a few insect holes really is insect tolerant, especially when it is in a field next to a completely clean Bt-inbred? We know it is insect tolerant because we watched it survive in multiple nurseries while its neighbor plants did not. Without the high insect pressure of Puerto Rico, the visual proof is hard to see except in an exceptional season.



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DuraYield inbreds are developed under reduced irrigation, reduced fertility, and high stress conditions. Most of our fertilizer at 3MG is applied through the irrigation tape. When we reduce irrigation, we reduce fertility. We still expect plants to set good ears under these conditions. We have these expectations because we know it can be done. When we irrigated our first limited-irrigation nursery with 2/3 the normal amount of water, we harvested more ears out of each family than we had out of almost every other family we ran in the previous five years! The material was Cycle 2 material, meaning we developed both of the parents in those family crosses. After that nursery, we further reduced the water (and therefore fertility) and have been devising new ways to “put the hurt on” corn plants under development. All that said, we run into the same problem: how to prove it to you. We know, because we have seen it and have the ability to limit the water. When we move these materials into an environment without extreme water stress, how can we convince you that these materials will handle dry conditions, especially in a year like this one, where just about everywhere but Olivia, MN is too wet?



DuraYield inbreds are developed at temperatures that often exceed 86 F and also must survive the summer in Puerto Rico. If the weather is hot, these inbreds will still set seed. We are sticklers for synchrony in our inbreds...such sticklers that right now I have quite a few plants in our Olivia nursery that are already silking, and I am waiting for pollen to actually be able to do anything. Before we release an inbred, it must be able to self-pollinate without special treatment, even under difficult conditions.

I could continue, but I hope I have said enough. These are complex traits that are not easily categorized. They do not fit into the neat little boxes that we are all so used to dealing with in the world of GMO traits, or even single-gene native traits. We are looking at characteristics that are likely influenced by a great number of genes, some of which are triggered by environmental conditions. We do not want to be those people who just say, “Trust us. It’s there.” Those words have been misused so many times throughout even recent history. We are working on amassing the information, the “proof of concept” that will help define DuraYield just a little bit more. We will never be at the negative/positive or live/dead ease of understanding. We will keep collecting our data the only way we can: with trained eyes, boots in the field, extensive notes, and some computer time to analyze everything.



A New Agricultural Paradigm

by Erin Rodríguez

As you may have guessed, I am the person with the least amount of agricultural experience in this company. I am a city girl who started her first garden in her 30s. I studied Political Science in college and my background is in marketing. Maybe that is why I tend to look at agriculture through a social filter rather than an agronomic one. I am constantly looking at the ways our food supply - or lack of - affects communities, the environment and public policy. I am interested in the ways environmental issues affect us. As I look at the world we live in, I am overwhelmed by all that I do not know. This naiveté does afford me the opportunity to ask questions of better informed people (smart people like the ones I work with: biologists, agronomists & field workers-people who teach me new things every day).

Before the industrialization of agriculture, farmers were more reliant on and subjected to the whims of Mother Nature. I have to ask, has this shift in processes also produced a shift in perception? Have we as human beings and more importantly as farmers become disconnected from nature? Have we lost a sense of husbandry to the land? Are we too quick to dominate nature rather than work with it to produce food for an ever increasing population? I do not presume to know the answers to these questions. My hope is to start a conversation and a friendly debate that will provide all parties involved with a better understanding and more balanced approach to agriculture.

It seems to me that in the last 70 years the focus in agriculture has shifted from working in conjunction with nature to dominating nature. First, we began the mechanization of farming through technological innovations and the creation of farming machinery. Second, we started developing pesticides to control weeds, diseases and insects. Finally and most recently, we have developed genetically modified organisms to use in conjunction with pesticides. We have been able to minimize the risks in farming to the best of our ability. At 3MG we understand that farmers need to control weeds, pests and diseases. We are looking for ways to do this with the least amount of impact on our environment and doing it in a way that is sustainable in the long term.

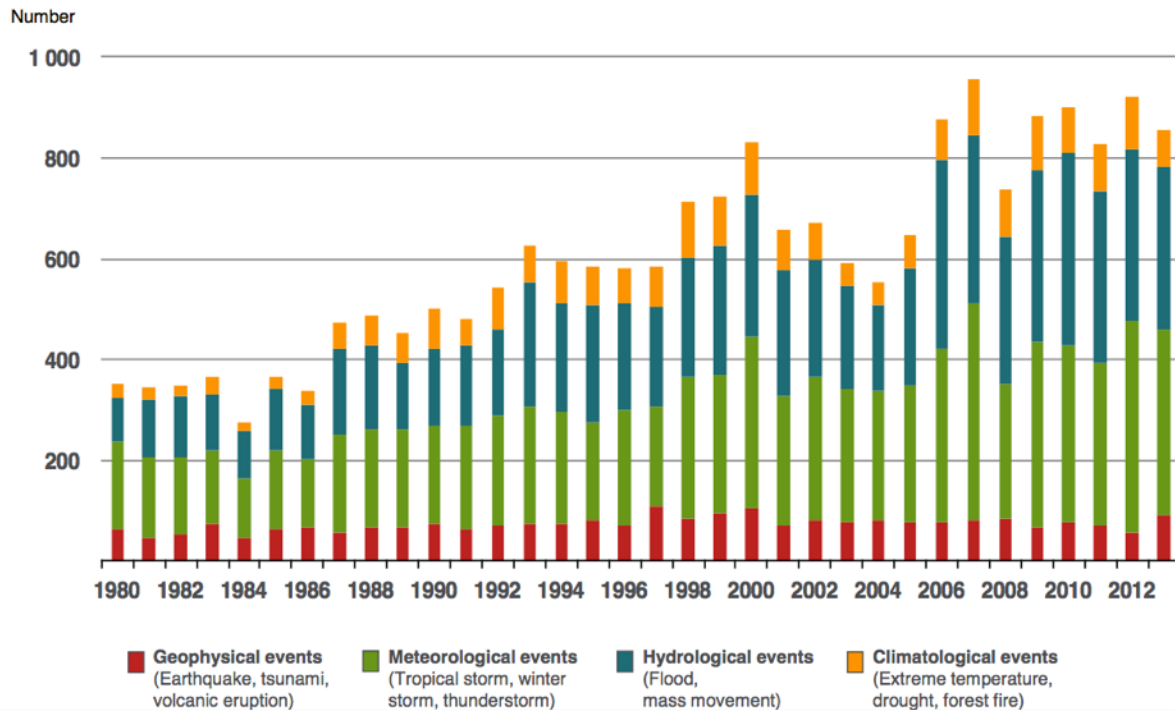
Even in our greatest moments of scientific advancement we must admit that although we can control and alter many natural organisms, we still have not been able to control the weather. We pray for rain and curse the floods with little or no recourse either way. We cannot stop tsunamis nor can we predict earthquakes and irrigation will only go so far in a drought- as Californians will tell you. We are powerless to prevent and often to predict these extreme weather events. Sure, we can prepare the best we know how, but that is the extent of our control over weather.



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We have reached a point in our collective history when extreme weather events have been increasing in both intensity and frequency (as shown in the graph below). Is the current agricultural paradigm a sustainable one in the context of increasing extreme weather? These natural occurrences force us to consider our options and to create a proactive approach to dealing with these challenges.



Source: <http://www.skepticalscience.com/news.php?p=3&t=236&n=817>

Rather than lament our limitations, let us focus on preparation. It is important to have a balanced approach to solving any problem. The advances made through the biotechnological pursuits in agriculture are valuable. However, it is equally important to look to nature as a means of solving the challenges presented in nature. For example: our breeders have noticed that on both ends of the temperature spectrum (extreme heat and extreme cold) there are naturally occurring genes that can protect the plant. When we breed for heat tolerance, we have found that those same genes protect against cold. We breed for insect tolerance and have found that as sugar levels increase, insects are less likely to attack the plant and likewise these sugar levels make silage more digestible to livestock. These are prime examples of how nature is capable of providing solutions in the face of environmental challenges.

At 3MG we are conscientious of the role farmers play in the larger social system and fabric. By working to ensure that people have access to food - regardless of Mother Nature's mood- we are able to contribute to the greater good. By using sustainable farming practices we are able to ensure longevity. We breed for drought tolerance so that if access to water is limited, farmers will not have to sacrifice yield. We breed for heat tolerance to prepare for that freak heat wave that might hit or that early cold snap. We are continuously breeding for insect resistance in preparation for the possibility of a rise in insect populations. We believe in continuous improvement in our practices and our products. At 3MG we consider this not only a sound business practice but also an integral part of being environmentally responsible and sustainable.

I feel fortunate to work in a place that is consistent with my personal values. I am impressed by the sense of social and environmental responsibility that permeates this company. I am humbled by the desire shown to give back to the community we serve. I am grateful for the continuous education I receive by working here. I love being a part of this company and this industry. My hope is that I will be able to reciprocate all that I have gained here.



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Founded in 2012, 3MG R&D has been involved in the creation of innovative products that we hope will be in the forefront of the seed market. Guided by our principle that we can develop food crops that combat environmental pressures naturally and economically, we continuously research new solutions using a mix of millennia-old breeding techniques with high-end modern genetic technologies.

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