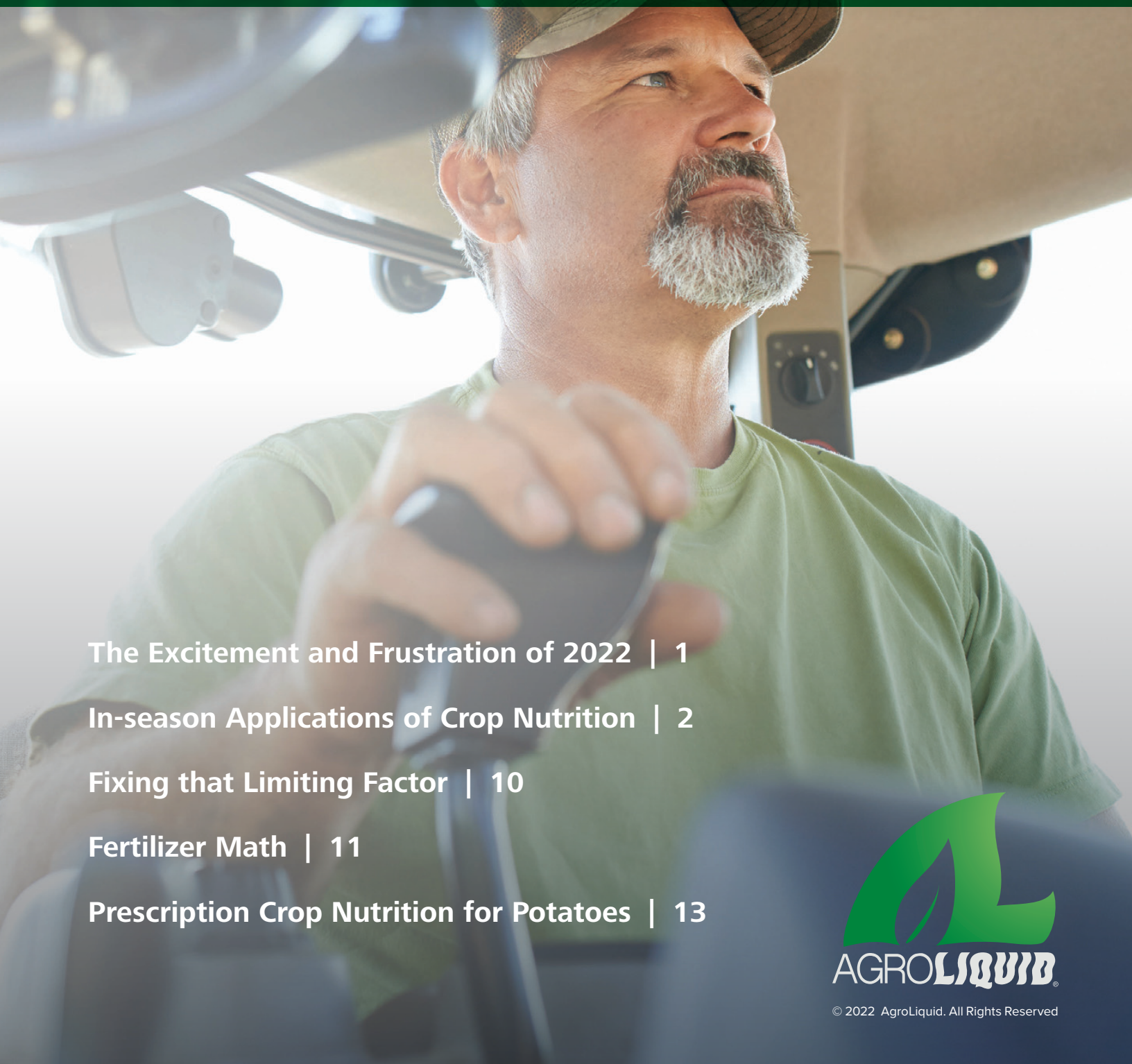
AgroLiquid NEWS

SPRING 2022



AGROLIQUID®

The Year of Excitement and Frustration

2022…who knew that we'd be so conflicted, waffling between excitement and frustration. Give a producer opportunity and hope for a profitable year, and they'll spring into action to maximize the opportunity. For the most part, that's what farmers see ahead in 2022. But that hope and excitement gets tempered at every turn. It seems everything is impacted by tight supplies of some sort. Equipment parts, irrigation parts, various herbicides that are staples of weed control programs, and of course, crop nutrients. It seems every day there is a new hurdle. If you irrigate, fuel costs certainly are weighing on decisions. And if you can obtain that favorite herbicide or make the list for a new sprinkler, the costs are very high.

Profit Trumps Revenue

In the end, profit trumps gross revenue. Yes, $6-7 per bushel corn (maybe higher, who knows?) will provide great revenue at today's yields. But elevated costs eat away at that revenue. The consequence is that every decision carries an elevated level of uncertainty of the outcome. Cost/benefit analysis has never been harder! However, the growing season is here, and many decisions are in the review mirror. Right or wrong.

Perfect information: complete knowledge of how the year will play out, would make decision making easier. When you are predicting the future, perfect information doesn't exist. Decisions are made based on the best information at the time. In the type of uncertainty we are dealing with, plan B and C may be needed.

There's Still Time

When it comes to fertilizer management, tight supplies of various nutrients may not have allowed the luxury of getting the needed nutrients out early. Mid-growing season may find crop potential exceeding available soil nutrients. For in-season decisions, review the soil test against what has been applied to provide an indicator of what you should look for. After that, feet in the field observing the crop and tissue testing can reveal possible deficiencies. If a nutrient appears to be limiting, then research the options to answer some questions: 1) what forms of the nutrient are available, 2) to what will the crop respond, 3) how will it be applied, 4) are there opportunity costs, meaning can we produce a positive enough response to offset something else we should be spending our time and money on. Answers won't be easy and no solution is right for everyone. In-season solutions do exist, however. Reach out to experts and then apply your circumstances to any advice you receive. These challenges will provide valuable experience and wisdom in the future. For this year, lean on others. Don't chase miracles. Be a realist. Seek sound advice. Address and overcome hurdles as they arise and you'll realize the opportunity presented in 2022…plus new found options and decision making skills to use in future growing seasons.

In-season Applications of Crop Nutrition— Beyond Nitrogen!

For crops like corn and wheat, in-season applications of nitrogen are almost a given. But many crops can benefit from in-season applications of nutrients such as phosphorus (P), potassium (K), sulfur (S), and micronutrients as well. Adding these nutrients to your nitrogen or crop protection applications helps bypass some of the soil issues encountered at planting [such as cold, infertile soil; nutrient fixation; drought; sodium, etc.] or insufficient root growth, which would cause soil-applied fertilizer to not be as readily absorbed. They can also provide a quick reaction to deficiency symptoms or low tissue analysis.

Plus, adding P, K, S or micronutrients to a sidedress, topdress or crop protection pass* has a relatively low cost, and allows us to target mid-season growth stages with specific nutrients. There is a large demand for those nutrients in the late vegetative and reproductive stages of development. It's an opportunity to increase the investment potential you've already made in getting that crop out of the ground by maximizing yield.

AgroLiquid has researched the value of applying phosphorus, potassium, sulfur and micronutrients through sidedress, topdress, or foliar applications and has determined that in-season applications of each of those nutrients, in combination with nitrogen or as an addition to crop protection, can increase crop yield and improve profitability. →

*Always follow label instructions and perform a jar test before mixing any crop nutrients and/or crop protection products.

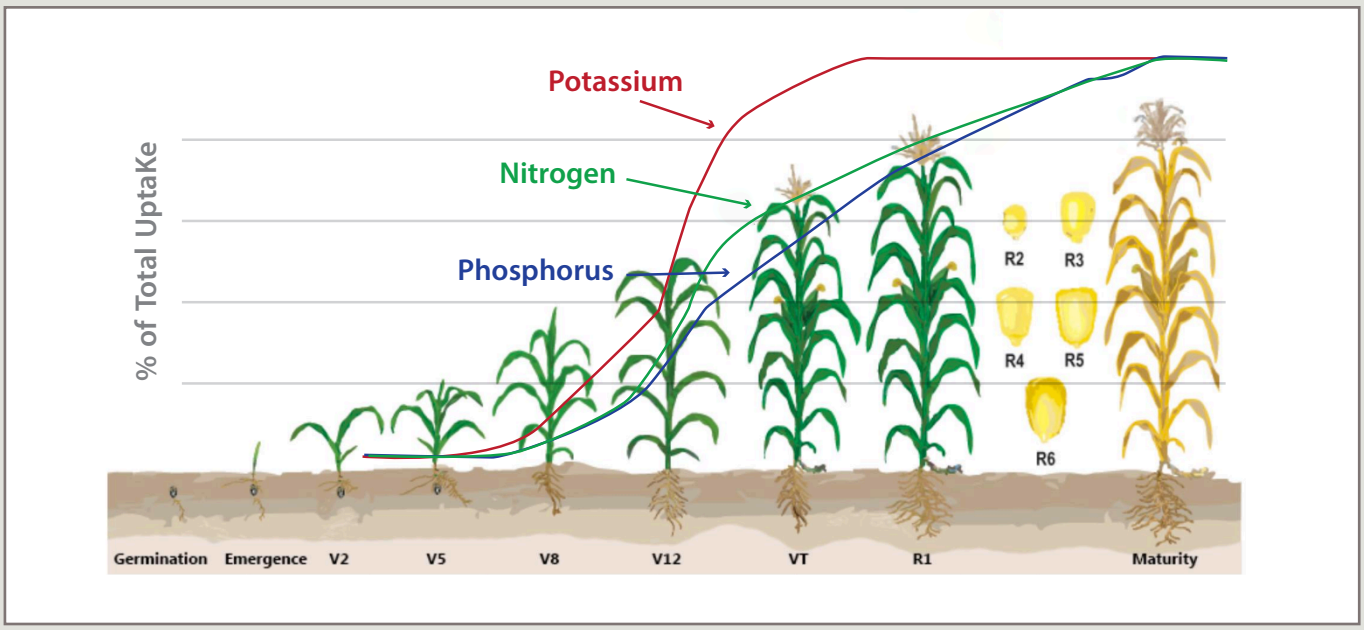
Corn

Reid Abbott, Agronomist

In the last several years, everyone in ag has had to knuckle down and learn how to manage inputs to maximize outputs and return on investment. While that often means spending more money in the eyes of a grower, cultural practice changes can have dramatic effects on the final outcome with little to no cost increase. For fertility management, spoon-feeding crops seems to be the fundamental change that the industry is trending towards, and the past few years has seen a rise in foliar feeding and applications such as Y-Drop as well. In-season fertility of nitrogen has been around for decades, but now growers are looking at adding phosphorus, potassium, secondary and micronutrients to enhance their programs at key times while the crop is growing.

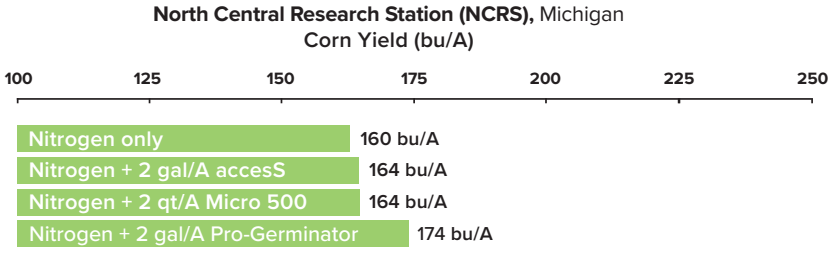
In-Season Applications—Not Just for Nitrogen!

Corn, and other crops, often benefit from in-season applications of nutrients such as phosphorus (P), potassium (K), sulfur (S), and micronutrients. There is a large demand for those nutrients in the late vegetative and reproductive stages of development. AgroLiquid has researched the value of applying phosphorus, potassium, sulfur and micronutrients through sidedress applications and has determined that in-season applications of each of those nutrients, in combination with nitrogen, can increase crop yield and improve profitability.

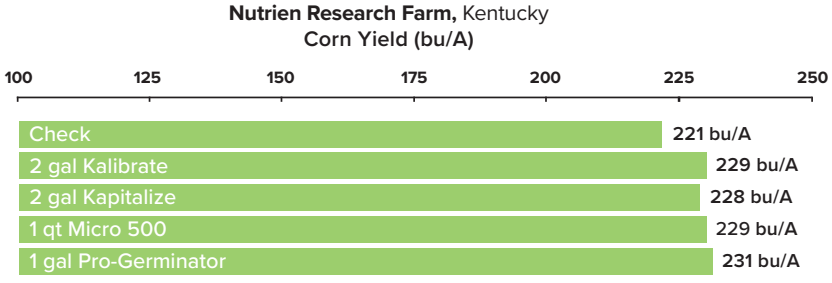


So, what does the research show?

A corn trial conducted at the North Central Research Station (NCRS) in Michigan on low phosphorus soils showed the value of adding accesS™, Micro 500®, or Pro-Germinator® to sidedress nitrogen applications through Y-Drop applicators.



A corn trial conducted at the Nutrien Research Farm in Kentucky showed the value of adding Kalibrate®, Kapitalize™, Micro 500®, or Pro-Germinator®, to side-dress nitrogen application through Y-Drop applicators.



Soybeans

John Leif, Agronomist

A good soybean crop nutrition plan must be based on crop need and soil analysis. That program will usually start with soil application of phosphorus, potassium, sulfur and micronutrients, as needed. Splitting the applications of those nutrients may be the best way to maximize yield. Soybeans require large amounts of potassium (K), sulfur (S), and calcium (Ca). They also require micronutrients such as manganese and iron to meet their yield potential. In addition to soil applications of those nutrients, soybeans often respond to foliar applications. Sure-K® and fertiRain® products are well suited to provide cost-effective crop nutrition when applied as foliar treatments.

So, what does the research show?

			10 year Soybean Yield average
No Fertilizer			69 bu/A
Sure-K	5 gal/A	In-furrow	75 bu/A
Sure-K	3 gal/A	Foliar V-4	76 bu/A

			Soybean Yield
No Foliar			71 bu/A
fertiRain	2 gal/A	R1	86 bu/A
fertiRain	1.5 gal/A	X3 (V3, R1 and R3)	93 bu/A

Especially with higher yield goals, foliar feeding may provide optimal results. Timely applications of nutrients can help rectify some nutrient deficiencies, but more important, foliar applications can provide necessary nutrients at times of high demand for plants.

Sure-K® is a flexible potassium product that can be used in foliar applications with very consistent performance and minimal risk of crop injury. AgroLiquid has conducted trials at the North Central Research Station (NCRS) in Michigan, as well as locations across North America, that demonstrate the performance of Sure-K in soybeans.

Sure-K was applied for 10 consecutive years in a corn-soybean rotation as a soil applied treatment and as a foliar treatment. Over the 10 years of the trial, the foliar application of Sure-K at 3 gal/A consistently performed as well as Sure-K applied at 5 gal/A in-furrow.

FertiRain® is a combination of nitrogen, phosphorus, potassium, sulfur, and micronutrients, specially formulated to provide balanced crop nutrition with minimal risk of crop injury when applied to foliage. Research with fertiRain demonstrates its performance as a foliar treatment, and its flexibility as a partner with other AgroLiquid products to provide the necessary nutrition for soybeans.

When applied alone, fertiRain provides excellent potassium nutrition along with nitrogen, phosphorus, and sulfur. Application timings are flexible, and it can be tank mixed with many crop protection products.*

**Always follow label instructions and perform a jar test before mixing any crop nutrients and/or crop protection products.*

Wheat

Stephanie Zelinko, Agronomist

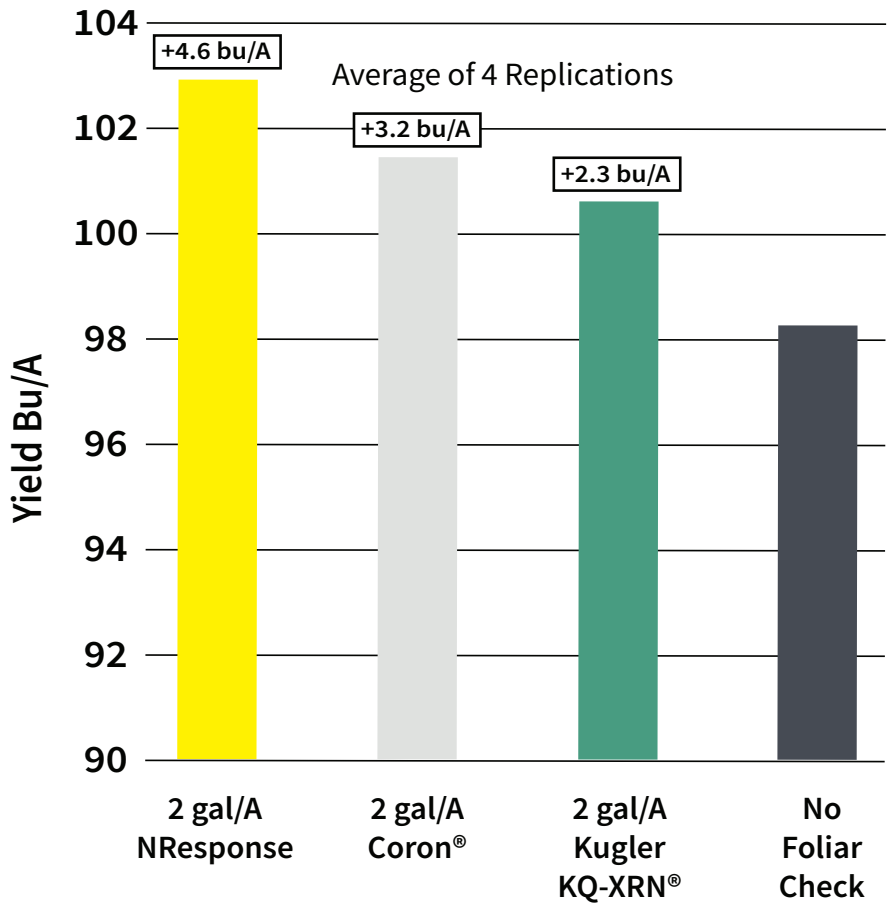
Nitrogen (N) applications make up the largest expense of a wheat growers fertility program. Additionally, nitrogen is at high risk of loss especially when applied broadcast — and no one wants that, especially in a year like this one. Obviously, it is important to manage a wheat nitrogen program to ensure the best use of the dollars spent. AgroLiquid has been evaluating nitrogen fertilizer source options for many years at the North Central Research Station (NCRS) to prove product performance and evaluate the benefits of adding other nutrients to those in-season applications.

To determine the benefits and make comparisons of NResponse™ versus other foliar nitrogen sources when made at flag leaf timing on soft red winter wheat, the NCRS established plots in the fall of 2020 with tram lines to allow for flag leaf foliar applications with a self-propelled sprayer without damage to plot harvest area.

So, what does the research show?

Flag Leaf Foliar on Winter Wheat

North Central Research Station—2021



All treatments received 150 lbs/A MAP + 150 lbs/A potash; 14 gal/A 28% + eNhance™(topdress at Feekes 4); 26 gal/A 28% + eNhance (topdress at Feekes 6).

As expected, all the nitrogen products provided a yield advantage over the no foliar check. The 2 gal/A application of NResponse provided a 4.6 bu/A yield response, which is a $34.68/A return on investment.

CROP NUTRITION
BACK 2 BASICS
EDUCATIONAL SERIES

High-yielding crops begin with proper nutrition,

and proper nutrition starts with a complete soil analysis.

Not that long ago, fertilizer management only focused on N-P-K. As yields climb, we know that we are having to increase the productivity of N, P and K through the supporting roles of secondary and micronutrients, such as sulfur and zinc all the way through molybdenum. But which ones? And how do we decide which of those pricey nutrients will be worthwhile?

The free Back 2 Basics video series is intended to take an in-depth look at the nutrients that may make a difference in your crop. We'll go in the order that we at AgroLiquid look at a soil test analysis and help you understand the role each nutrient plays in the plant, how it interacts with other nutrients in the soil, watch-outs and more.

Register now for this FREE video series at AgroLiquid.com!

Fixing That Limiting Factor

XtremeAg: Cutting The Curve Podcast

As one of the XtremeAg farmers, Kevin Matthews of Matthews Family Farms in North Carolina, is known for putting the newest technology in agriculture through its paces, pushing yields just a little higher. However, his record-setting yields and other successes on his farm may not always stem from the latest and greatest new technology; Kevin says he goes back to the basics every year.

XtremeAg's goal is to help farmers by openly sharing their accumulated knowledge around pursuing profitability and success. With over 200 years of combined experience, the five lead XtremeAg growers share insights on hundreds of topics relevant to your farm's success including soil and tissue sampling, new products, product trials, data analysis, equipment reviews, equipment set-up, seed selection, fertilizer ratios and mixes, fertility, planting populations, cover crops, biologicals, micro and macro nutrient applications, irrigation, tillage techniques, problem solving and much more. Check them out at XtremeAg.farm.

"Every one of us growers, no matter how much experience we have, really needs to go back and pay attention to the basics." This means addressing limiting factors that may be holding back that next level of production.

When it comes to crop fertility, identifying those limiting factors starts with a soil test. Kevin admits soil test analysis can seem daunting at first, but he advocates for a team approach to developing a crop nutrition plan. "When you look at that soil sample there are so many elements on there. So many possibilities… But, when you get the expertise of a good agronomy team, as a farmer I can sit back and put faith in them that they're going to guide me in the right direction. The last thing they want is a failure."

Stephanie Zelinko is the AgroLiquid Agronomist who works with the Matthews farm. She has been working with Kevin on a number of trial plots to determine what high rates they can run without risking crop damage, and what low rates will still affect yield. Kevin says trying new things means sometimes their trials are a success and sometimes they're not as successful, "but we had to see where those limiting factors were." He adds that Stephanie has the agronomic expertise to find the right crop nutrition components for his farm. "We [farmers] are wearing so many hats…All these things we're trying to do. One thing that stands out about the XtremeAg family is none of us are perfect at everything, but we have a few things that we're better at than others and we recognize each other's strengths and weaknesses and work with each other to make a team. Stephanie is part of that team."

Finally, while fertilizer may not be as exciting or sexy as a new tractor or combine, Kevin says it's every bit as important. "You get ahold of some bad fertilizer that don't go with anything; it doesn't mix well; it is just a nightmare in a 24-row planter…Let me tell you, clean, good fertilizer can be sexy. It can be a big reward that you like."

Fertilizer Math

Dr. Jerry Wilhm, Research Agronomist

Look at any bag, jug, or fertilizer label, and you will see three numbers separated by hyphens; these numbers represent nitrogen, phosphorus, and potassium content. Some fertilizers have more than three numbers, and in those cases the extra numbers represent other nutrients, but since the majority of labels feature just those three we'll keep our focus on them for now. In any case, it doesn't matter if it is liquid or dry fertilizer, as the numbers represent the percent by weight of each nutrient the product contains.

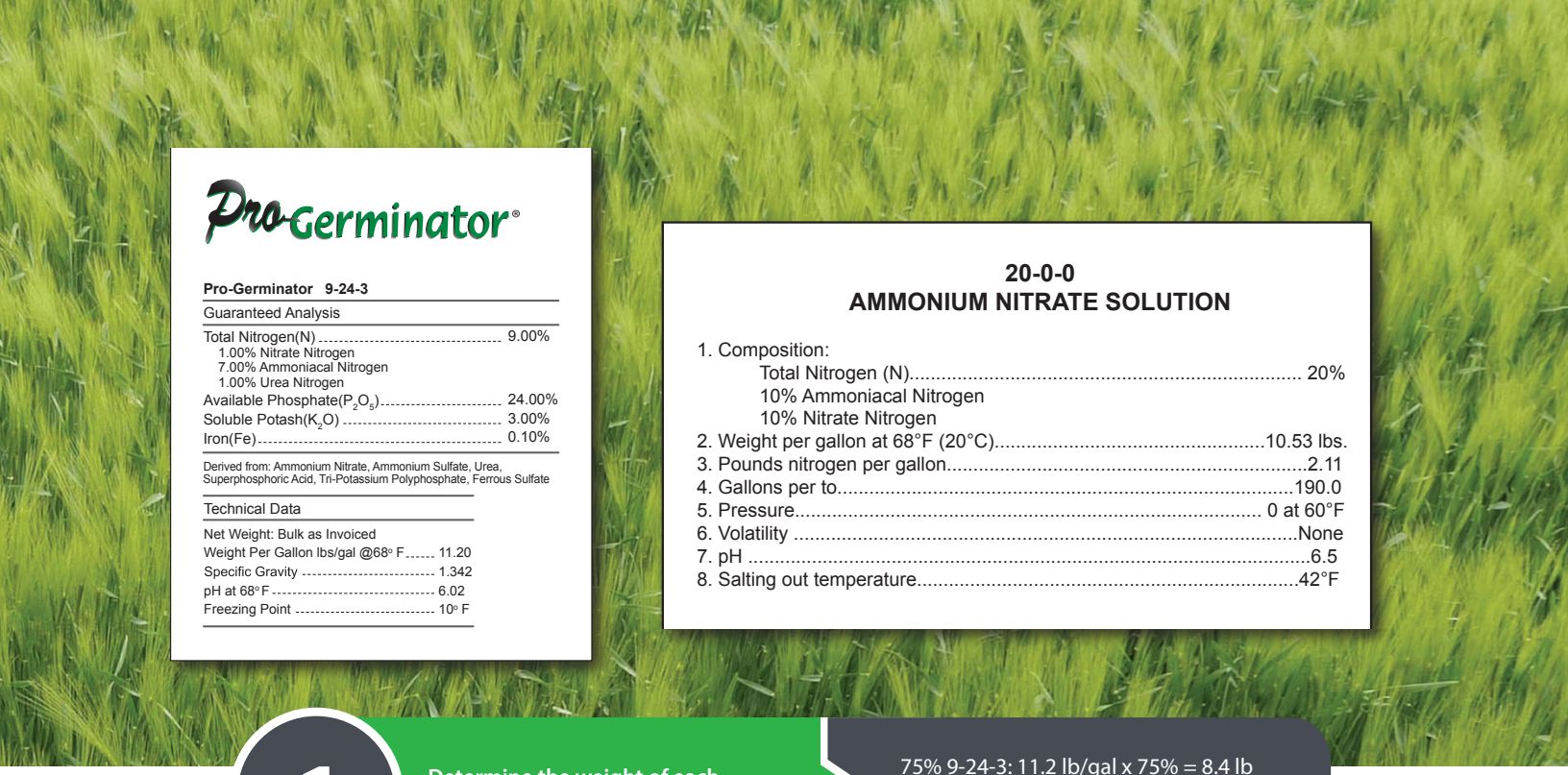
The first number, which represents nitrogen, is pretty straightforward. Where it gets a little complicated is with the second and third numbers, which represent not just potassium and phosphorus, but the oxides of those elements. This goes back to when fertilizers were heated with air to convert the phosphate and potassium to oxides – specifically P_2O_5 and K_2O – and these numbers were used for the nutrient analysis. (This was referred to as the gravimetric analysis.) While modern analytical techniques are used to determine fertilizer analysis today, the numbers are still presented in terms of the oxides for historical continuity. The complexity arises when you realize that the oxides themselves are never actually found in fertilizer.

Put This Knowledge to Work: Dry Fertilizers

The words written on a label for the elements of the three numbers are, "total nitrogen," "available phosphate," and "soluble potash." Since the numbers represent percent by weight, the conversion is easy for dry materials. One hundred pounds of 18-46-0 dry fertilizer has 18 pounds of total nitrogen (0.18 x 100 lb), 46 pounds of available phosphate (0.46 x 100 lb), and 0 pounds of soluble potash (0 x 100 lb). If you have a blend of equal amounts of 18-46-0 and 0-0-60, then the resulting blend would have an analysis of 9-23-30. Since the blend is half of each fertilizer product, the new analysis is simply the analysis numbers halved (divided by 2 or multiplied by 0.5) and added together. If the blended product is 75% 18-46-0 and 25% 0-0-60 the process is the same: multiply each of the numbers in 18-46-0 by 0.75 and each of the numbers in 0-0-60 by 0.25 and add the corresponding numbers together to get 13.5-34.5-15. In which case, according to the Association of American Plant Food Control Officials (AAPFCO), the nitrogen number can be listed as 14% for commercial sales purposes.

Liquid Fertilizers

Where the process of calculating the analysis of blends can get more confusing is with liquid fertilizers, where each product may not have the same weight per gallon. For instance, what is the analysis of a liquid fertilizer blend that is 75% Pro-Germinator 9-24-3 and 25% 20-0-0 ammonium nitrate solution? Refer to the product labels for the needed information.



Pro-Germinator 9-24-3

Guaranteed Analysis

Total Nitrogen(N)	9.00%
1.00% Nitrate Nitrogen	
7.00% Ammoniacal Nitrogen	
1.00% Urea Nitrogen	
Available Phosphate(P_2O_5)	24.00%
Soluble Potash(K_2O)	3.00%
Iron(Fe)	0.10%

Derived from: Ammonium Nitrate, Ammonium Sulfate, Urea, Superphosphoric Acid, Tri-Potassium Polyphosphate, Ferrous Sulfate

Technical Data

Net Weight: Bulk as Invoiced	
Weight Per Gallon lbs/gal @68° F	11.20
Specific Gravity	1.342
pH at 68° F	6.02
Freezing Point	10° F

20-0-0
AMMONIUM NITRATE SOLUTION

1. Composition:
   Total Nitrogen (N)..... 20%
   10% Ammoniacal Nitrogen
   10% Nitrate Nitrogen
2. Weight per gallon at 68°F (20°C).....10.53 lbs.
3. Pounds nitrogen per gallon.....2.11
4. Gallons per to.....190.0
5. Pressure..... 0 at 60°F
6. Volatility .....None
7. pH 6.5
8. Salting out temperature.....42°F

1 **Determine the weight of each product in 1 gallon of the blend**

75% 9-24-3: 11.2 lb/gal x 75% = 8.4 lb
25% 20-0-0: 10.53 lb/gal x 25% = 2.63 lb
Weight of 1 gallon of the blend = 11.03 lb

2 **Determine the amounts of N — P_2O_5 — K_2O from each product in the 1 gallon blend**

9-24-3: 8.4 lb x 9% = 0.75 lb N
8.4 lb x 24% = 2 lb P_2O_5
8.4 lb x 3% = 0.25 lb K_2O
20-0-0: 2.63 lb x 20% = 0.53 lb N
(there is no phosphate or soluble potash in this product)

3 **Add the numbers for each nutrient from the two products together**

N: 0.75 lb + 0.53 lb = 1.28 lb
P_2O_2: 2 lb
K_2O: 0.25 lb

4 **Determine the nutrient percentages per gallon. (The gallon weighs 11.03 lb)**

N: 1.28 lb/11.03 lb = 0.116 or 11.6%
(According to AAPFCO this can be expressed as 12%)
P_2O_5: 2 lb/11.03 lb = 0.18 or 18%
K_2O: 0.25 lb/11.03 lb + 0.02 or 2%

So the new blended product has an analysis of 12-18-2.

Now there are certainly various other math or computer program pathways to this answer, but this is how it can be determined by hand. This is the percentage of nitrogen, phosphate, and potash nutrients in an applied rate of fertilizer. The same process would apply to other nutrients such as sulfur that are on the label.

From here we can figure actual pounds per acre applied by multiplying the number of gallons by the weight per gallon (in this case 11.035). Then multiply this number by the percentages of nutrients, in decimal form.

Prescription Crop Nutrition for Red Potatoes =
brighter, deeper skin color and enhanced nutritional qualities

Dan Peterson, Agronomist

Effective management of nutrients is critical for potato production, as tuber yield and quality are directly impacted by source, quantity, and timing of nutrient applications. Growing healthy potato crops must also be balanced with an economical fertilizer program.

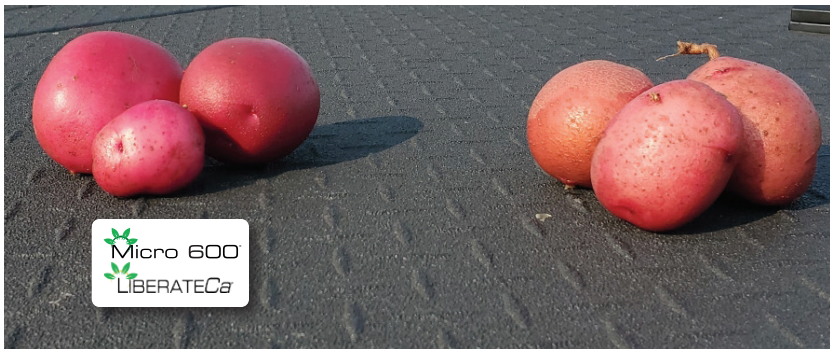
Last year, two fresh market red potato growers from Minnesota tested AgroLiquid supplementation to their conventional liquid in-furrow fertilizer. For these wholesale growers, an appealing red color and skin quality is far more important than yield. Based on soil tests and these growers' cropping goals, AgroLiquid determined a combination of LiberateCa® and Micro 600® had the best potential for improving skin color. Field side-by-side comparisons were set up using the cooperator's conventional 10-34-0 in-furrow starter blend against the same rate of 10-34-0 with 1 gal/A LiberateCa and 2 qt/A Micro 600. The LiberateCa/Micro 600 treated potatoes have a much brighter, deeper red color with a smoother skin, little to no scab, and no spider-webbing compared to the untreated potatoes.

Added Nutritional Value

In addition to the enhanced color, the LiberateCa/Micro 600 treated potatoes were found to have significantly enhanced nutritional qualities—more protein, nutrient density, and essential minerals. This chart illustrates the enhanced nutritional value of the LiberateCa/Micro 600 treated potatoes:

Parameter	Untreated % of dry matter	Treated % of dry matter	% versus untreated
Nutrient Denisty	259.0	321.3	124
Protein	3.7	7.4	200
Calcium	398.0	404.0	102
Phosphorus	73.0	162.0	222
Potassium	783.0	1393.0	178
Magnesium	50.0	112.0	224
Iron	1.5	2.8	182

The LiberateCa + Micro 600 treated potatoes have double the protein, nearly 25% better nutrient density, and significantly better mineral nutrition than the untreated control.



The LiberateCa/Micro 600 treated are on the left.

The LiberateCa/Micro 600 treated are on the left.

Micro 600

Micro 600 is a specially formulated combination of soluble sulfur, iron, and four micronutrients that are synergistic in nutrient efficiency and uptake in plants coupled with a high degree of plant safety. These nutrients work together to provide a yield benefit and to improve the quality of tubers. Potatoes require significant amounts of plant available sulfur and iron. Micro 600 protects these nutrients from tie-up in the soil and places them in an efficient band with the seed piece at planting. Our potato research in several states plus Canada continues to demonstrate consistent results with Micro 600 creating more sacks per acre and better tuber quality.

LIBERATECa

LiberateCa is a highly soluble and plant available calcium source that we protect in the soil with our unique and highly effective organic chelation using our Flavonol Polymer Technology. This protection keeps the calcium soluble and available for root absorption yet protects it from reacting with other minerals in the soil – thus making it far more efficient than other calcium sources. Calcium is highly important for plant health and nutritional qualities – amply demonstrated in this field comparison.

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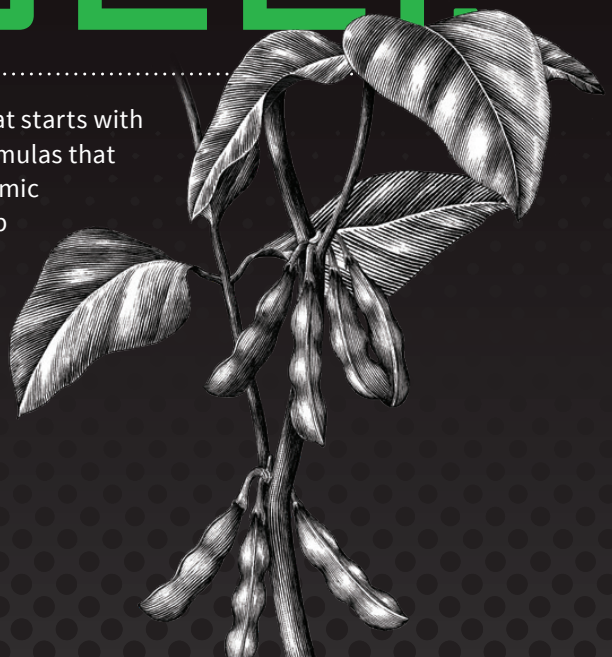
Apply less, expect more?

PRECISELY

It's time for a crop nutrition plan that gets more return from every drop. One that starts with a full line of crop nutrients, from nitrogen to molybdenum, features custom formulas that deliver the right nutrients at the right time, and keeps going with robust agronomic knowledge and customer support. AgroLiquid has precisely what it takes to help you succeed like never before.

Find an AgroLiquid dealer near you. **AgroLiquid.com**



Pro-Germinator® FERTIRAIN®
Sure-K® Micro 500®