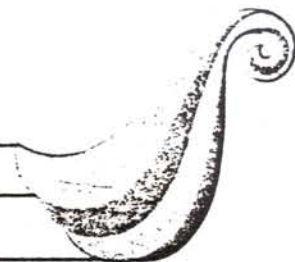


FLUID DIGEST

Research Update from the Fluid Fertilizer Foundation

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Winter wheat

Splitting fluid applications adds 10 bu/A and saves fertilizer

In this case, 60 lbs per acre of UAN, split into two 30-lb applications, produced more yield on soft red winter wheat than one 90-lb per acre application (Figure 1). Location of the experiment was Charles City County, Virginia. Corn was the previous crop,

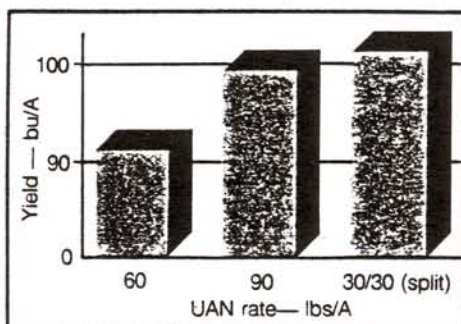


Figure 1. Effect of split applications on winter wheat in Charles County, Virginia, 1985.

which received approximately 180 lbs of N per acre.

Fertilizer (14-115-230-36Mg-73S-7Cu-14Zn-37Mn) was applied prior to disking and seeding was performed in October. Soil samples were taken in February, followed by the first split treatment. The second treatment was applied in April. Plot size was 16 x 17 feet. Soil pH was 6.3. Experimental design was a randomized complete block with four replications.

Though warm, sunny conditions were ideal for N volatilization — especially in this region where winter rainfall and low cation exchange capacity soils make N susceptible to leaching and denitrification losses — none of the N-loss inhibiting amendments contributed to significant yield increases. Very dry weather conditions probably caused this. N-loss inhibitors used were ammonium thiosulfate, dicyandiamide and NH_3 volatilization inhibitors.

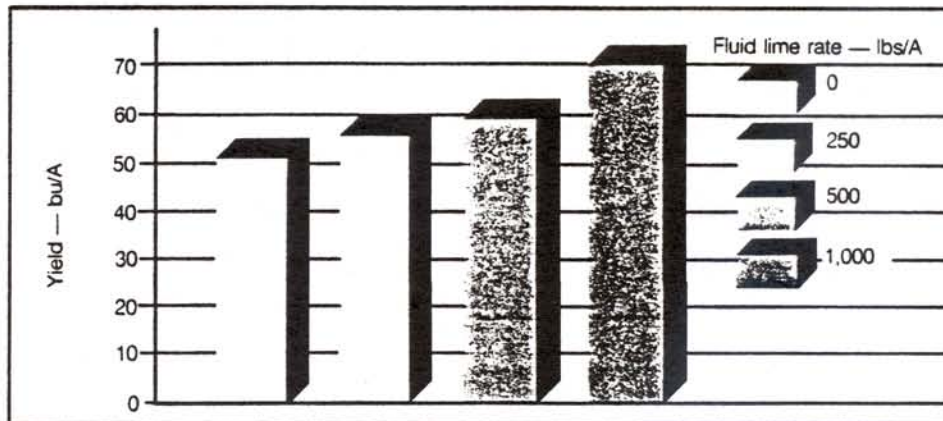


Figure 2. Yield comparisons of treated and untreated winter wheat plots in Moscow, Idaho, 1983 and 1984.

Fluid lime boosts winter yields 45%

Low PH a problem?

Demonstration plots near Moscow, Idaho, offer powerful argument for applying fluid lime to acid soils growing winter wheat. Benefits are twofold: crop yields are increased and response is superior with fluid lime (vs. dry ag-lime).

Yields bumped

Figure 2 shows that yield increases in four field studies spanning the years 1983 to 1986 ranged from as high as 45% when 1,000 lbs per acre of fluid lime were applied. Note that increases were recorded over the control *regardless* of time of application. Soil was Palouse silt loam. Applications were broadcast on 9 x 20-foot plots, arranged in randomized complete block design with five replications, and incorporated to a depth of six inches with a disk.

The 200-mesh fluid lime (CaCO_3)

suspension contained 48% lime, 50.5% water and 1.5% suspension clay. Variety used was Stephens, seeded at rate of 70 lbs per acre.

According to project leader R. L. Mahler, fluid lime applications were beneficial when rates exceeded 500 lbs per acre. In general, larger applications produced the best yield responses.

Fluid form superior

When fluid and ag lime were compared at equal rates, soils treated with fluid lime usually produced larger wheat yields than those treated with the coarser ag-lime.

Field scientists also report that another chief advantage of fluid lime is its quick reaction in soil. Studies have shown that pH often rises as soon as one month after application. Small particle size allows fluid lime to neutralize soil acidity more rapidly than standard grade ag-lime.

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Foundation News from your Research Director, Julian Smith



Welcome to the first edition of *Fluid Digest* — a publication born out of the research endeavors of the Fluid Fertilizer Foundation (FFF). Never heard of or read it? You will — and increasingly so, if you wish to continue contributing to economic and environmentally sound food production! The FFF is indebted to the editorial skills of Ned van Buren in providing you access to the wealth of information available from FFF research.

The FFF is a non-profit corporation based in St. Louis, Missouri, established six years ago under the auspices of the National Fertilizer Solutions Association (NFSA). Since its inception, the FFF has sponsored over a million dollars worth of research at universities and land grant colleges in the U.S., Canada and England. Significantly, research programs of the FFF follow the mandate of practical, field-based fluid fertilizer use. As a result, FFF research is quickly put into practice by farmers.

FFF projects, 26 in 1988, cover a diversity of geographic regions and agricultural systems. All major crops are covered. Past, present and future FFF research projects are serving to provide agriculture with an unparalleled data base.

Research, however, is useless unless communicated to farmers! The FFF research program, as well as close working relationship with leading agricultural scientists, enables us to produce the *Fluid Digest* — aimed specifically at putting in brief form first-hand knowledge of cutting edge research, which results in better fertilizer management and improved profits.

J. Julian Smith, PhD.
Executive Vice President, Research Director

Spoke point injection: Boosts average yields in Iowa experiments

A new spoke point injector, manufactured by Cady Systems, Inc. in Ankeny, Iowa, is passing shakedown tests being conducted by a team of scientists headed by Jim Baker of the Agricultural Engineering Department at Iowa State University.

The point injector is a vehicle-pulled wheel device that feeds fluid fertilizer into a stainless steel axle that is ported to allow fluids to flow out the bottom of the axle into spokes as they rotate around the hub.

In the studies conducted by Baker in '86 and '87, corn yields on no-till plots fertilized with the injector registered as high as 19 bus per acre more than those where fluids were knifed in.

Plots were five rows wide so wheel traffic would be between rows 1 and 2 and 4 and 5. Treatments were

randomized with each of six replicates. One day before planting, applications were either point injected in the row or knifed in 5 inches from row. Fluid fertilizer was also point injected 5 inches from the row at the V6 or V6 + V16 stages or knifed in at the V6 stage.

Fluid fertilizer used contained 156 lbs per acre of 28% UAN, 40 lbs per acre of 10-34-0 and 89 lbs per acre of KCl. Rate of application was 160 gallons per acre.

Baker says one of the chief advantages of the spoke point injector is it allows the application of fluid fertilizers at any time during the growing season. "This is significant," Baker notes, "because improved fertilizer management has become increasingly important for economic, energy conservation and environmental considerations.

Multi-nutrient starters produce 15-bu/A increase

Spring may be a way off, but not too far to start thinking now about how best to formulate fluid starters that contribute to maximizing yields.

Figures 3 and 4 amply demonstrate the yield return benefits of applying

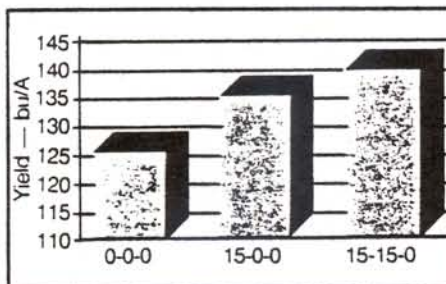


Figure 3. Effect of starter combinations on corn yields on high fertility soils, Alabama.

fluid starters with more than one nutrient.

In tests conducted at Auburn University by Touchton (Figure 3), no-till corn yield increased 15 bus per acre with an NP combination of 15-15-0 applied at the rate of 150 lbs per acre. As can be seen, this same combination produced approximately 4 bus per acre more than a 15-0-0 starter. Soil was loam, testing high in P. Applications were made two inches below and two inches to the side of the seed.

At the University of Nebraska,

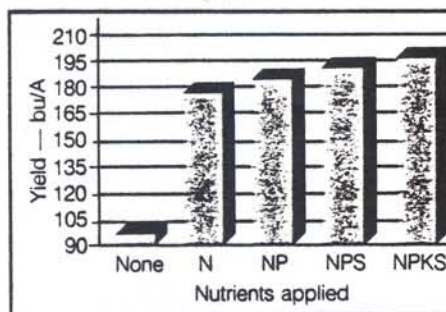


Figure 4. Effect of starter combinations on corn yields on sandy soils, Nebraska.

studies conducted by Havlin show the benefits of adding K and S to NP combinations (Figure 4). The applications were knifed four inches below and two inches to the side of the seed on no-till sandy soils testing high in K and S. Making per acre additions of 40 lbs of K and 20 lbs of S to the combination of 250 lbs of N and 40 lbs of P boosted corn yields another 9.5 bus per acre. In terms of ROI, this amounted to a 175% net return for every dollar spent on fluid K and S. Something to ponder in planning for the coming spring season.

Placing fluids near plant roots produces yield jump of 21 to 29 bu/A in no-till irrigated corn

Field studies in Nebraska, Kansas, Arkansas and Illinois show yield benefits of banding fertilizers

Figure 5 offers dramatic proof of the advantages of banding over broadcasting of fluid fertilizers. Surface and subsurface banding outyielded broadcasting by 21 and 29 bus per acre, respectively. The study was conducted in 1985 by Havlin of the University of Nebraska, using a fertilizer grade of 250-40-0-20S. Soil test for P was medium.

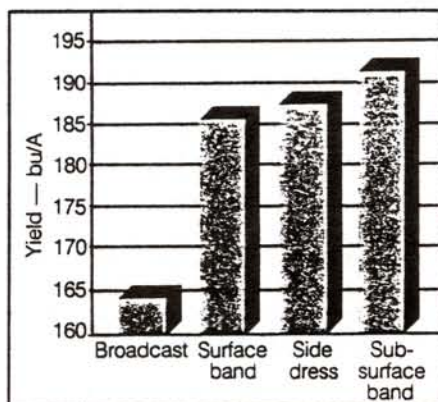


Figure 5. Banding vs. broadcasting on no-till irrigated corn, University of Nebraska, 1985.

Figure 6 shows an 11- to 12-bu per acre advantage for banding over broadcasting tests run on wheat plots by Leikam in 1983 at Kansas State University. Rates of N and P applied were 75 and 50 lbs per acre, respectively. Researchers here

concluded that subsurface banding of fertilizer for wheat was superior to broadcast applications — especially on soils testing low in P.

Similar positive responses to precision placement have been demonstrated in studies run in Arkansas and Illinois. In 1987, research conducted by Wells at the University of Arkansas showed a 9+ bu per acre advantage of dribble over broadcasting on wheat plots, using an application rate of 60 lbs of N per acre. During the same year, Varsa at Southern Illinois University produced nearly 14 bus per acre more by banding on corn plots, using 120 lbs of UAN per acre. Interestingly, split banded applications out-performed single banded applications by nearly 4 bus per acre (see related story on split applications, page 1).

Arguments for banding over broadcasting of fluids have been waged since the early '80s. An abundance of documented research has been assembled that attests to the benefits of placing fluid fertilizer where it has the best chance of uptake by the plant — near the roots. Although research has not shown banding superior to broadcasting in every case (variances can be caused by climate, soil condition and other environmental factors), the

preponderance of evidence favors banding over broadcasting.

If you have not been won over to

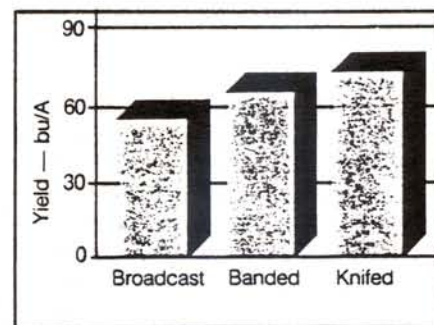


Figure 6. Banding vs. broadcasting on wheat, University of Nebraska, 1983.

banding, consider, while doing your fall planning for next spring, the following inefficiencies of broadcasting that experts note — ones that have full potential of robbing crops of valuable yields:

- nutrient loss through erosion
- P and K tie-up with soil
- surface volatilization and N loss
- biological tie-up of nutrients when surface trash breaks down
- nutrients readily available to weeds
- nutrients not in root zone
- fertilizer can't enter soil solution at shallow depths during dry conditions.

Fertilize soybeans?

You bet. A lot of people are skeptical about this — think it's unnecessary. But there's a bunch of accumulating evidence that it does pay back in significant yield increases.

Take studies at three locations in southeast Arkansas conducted by R. J. Mahler and associates during 1985-86. Average yield increases of nearly 4 bus per acre were recorded when soybeans were fertilized. Varying combinations of rates used are shown in Table 1.

In a three-year study conducted at nine farmer locations in Missouri,

yields were raised as much as 5 bus per acre by using K applications at rates of 40, 80 and 160 lbs per acre. Tests were conducted with a soluble potash made into a clear solution.

Some of the most spectacular research conducted is that of Roy Flannery of Rutgers University. In a three-year study (1980-1982), top soybean yields on the irrigated plots he managed averaged 99-bu per acre. NPK combinations at varying rates were applied, some of the grades incorporating micronutrients.

Table 1			
Fertilizer rates for soybeans at three locations, 1985-86.			
Location	Nutrient rate — lbs/A		
	N	P	K
1	0	45	45
	0	90	90
2	0	50	100
	0	100	200
3	0	50	100
	0	100	200

N efficiency

Nitrification inhibitors increase yields in field studies

Several forms of inhibitors showing positive responses in recent research projects are: N-Serve, ammonium thiosulphate (ATS) and dicyandiamide (DCD).

In an experiment conducted during 1987 by S. A. Ebelhar of the University of Illinois at Dixon Springs, Illinois, an average 8-bu per acre increase in corn was produced when N-Serve was used with UAN. A similar experiment at Millstadt, Illinois, was even more impressive, showing an average 12-bu per acre increase (Figure 7).

ATS also proved viable as a nitrification inhibitor during '84-'85 experiments conducted by Fox and associates in Pennsylvania (Figure 8). As can be seen, the use of ATS produced 9- to 13-bu per acre increases in no-till corn. ATS (5% by volume) + UAN was applied to a Murrill silt loam

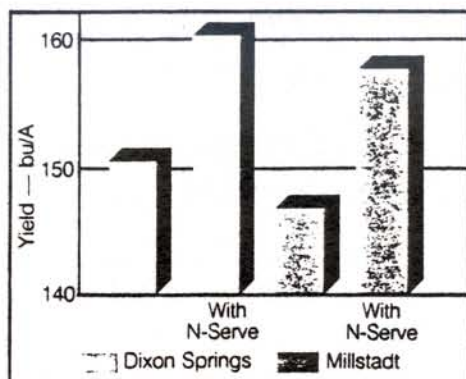


Figure 7. Effect of N-Serve on corn yields on sites at Dixon Springs and Millstadt, Illinois, 1987

soil. Even better results were reported in Ohio by D. J. Eckert. Using ATS with 150 lbs of N per acre in no-till corn resulted in a 22-bu per acre increase. In Tennessee, a 1986 study conducted by D. D. Howard produced a 9-bu per acre increase in corn when N (+ ATS) was applied at a rate of 75 lbs per acre. At an N rate of 150 lbs per acre, however, there was no yield difference between plots using or not using ATS. Kansas studies led by Lamond also have shown yield increases in no-till grain sorghum (as high as 14 bus per acre) when ATS was

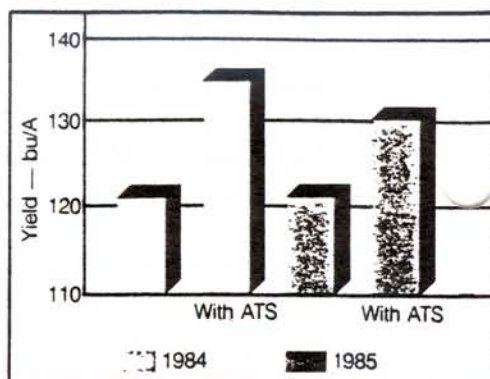


Figure 8. Effect of ATS on corn yields on sites in Pennsylvania, 1987.

combined with UAN.

Though supportive data for using DCD as an inhibitor have been less conclusive in FFF research, R.H. Fox, in his 1987 studies of corn plots at Landisville, Pennsylvania, notes that adding DCD to UAN (7.5% of N as DCD) can increase N uptake at silking.

One cautionary note: scientists in general feel that continuing field research is needed concerning the reducing of N volatilization with nitrification inhibitors before more conclusive data are compiled.

New child on the block

You have in your hands the first edition of *Fluid Digest*. Initial plans call to publish it four times a year: March, June, September and December.

Its purpose? Quite simply: to inform you quickly about agronomic practices that *pay* in terms of increased yields and ultimately more dollars in your pockets. In less than 10 minutes (all it

takes to read an issue of *Fluid Digest*), you will be alerted to profitable practices or new research that can benefit your operation.

Information contained in *Fluid Digest* will be compactly written only to whet your curiosity. If you desire details, call the FFF headquarters office in St. Louis and you will receive all

available published data covering your area of concern.

This is your newsletter. If you have comments or suggestions that you think will improve it, let us know. If you employ an agronomic practice that will benefit others — and you're willing to share it — most certainly let us know!