Conservation Tillage

Fertility Practices and Equipment for No-till and Ridge-till

Phosphorus and Potassium

As with any tillage system, a fertility program should start with a good soil test. Not only will the test tell how many pounds of nutrients are needed, it also will indicate how to apply them.

Plants will respond to nutrient levels in no-till and ridge-till much the same as they do under conventional tillage. Large yield increases will result from fertilizer applications if soil nutrient levels are low. As more nutrients are added, production increases become less for each additional unit of fertilizer. Base fertilizer rates on soil tests and reasonable yield goals.

Since P and K are quite immobile, they tend to stay where applied. If surface broadcast, nutrient stratification near the soil surface will result after a few years. The less tillage. the greater the stratification, The question is, will the stratification affect crop yields?

Research in Iowa, Minnesota, and other states shows that if initial P and K soil test levels are below medium (P = 15 ppm, K = 85 ppm). deep placement may increase yields. Conversely. if soil test levels are medium or higher, benefit from deep placement is unlikely. Deep-banded fertilizer becomes more effective than surface applications as tillage intensity decreases when residual soil test levels are low.

Application Equipment for P and K

Conventional equipment can be used for broadcast applications. Dry P and K can be applied below the surface by gravity from planter fertilizer boxes. or by pneumatics from a trailer behind a planter or tool bar. Liquid usually is applied using squeeze pumps with a tube to each row.

Equipment for placing fertilizer below the soil surface usually is of two types: disk openers with either single or double disks, or coulters with knives following them. Farmers are familiar with double disk openers because many planters use them to open the seed slot. To apply fertilizer below the soil surface, simply mount a double disk opener to the side (usually 2 inches) of the seed unit and run deeper (2 inches or more). As the disks open the slot, a tube drops liquid or dry fertilizer into it. Full rate applications can be made with this placement. A disadvantage of disk openers is that they can be hard to hold in the ground, and may tend to ride over heavy residue.

Another type of deep placement device is the coulter and knife. This unit uses a single (usually smooth) coulter followed closely by a forward swept knife. They can be either mounted on the planter to apply starter or used alone on a tool bar. The knife is hollow or has a tube attached that serves as the fertilizer tube. The forward sweep of the knife helps hold the coulter down. The deeper the placement, the more advantage the coulter and knife system has over disk openers. Both systems can be used with either liquid or dry fertilizer.

Liquid “pop-up” starter can be applied by simply dribbling fertilizer just behind the seed tubes. The fertilizer dribbles into the seed slot ahead of the cover disks and presswheels. The amount of fertilizer applied directly on the seed must be limited because of salt effects on germination and emergence. As a general rule, keep the total amount of nitrogen plus potash below 10 pounds per acre.

Nitrogen

Corn response to nitrogen fertilization is similar for all tillage systems. If nitrogen is limiting, it responds dramatically to the first few units of N. Yield increases lessen with additional increments of fertilizer. Set N rates according to realistic yield goals. Take appropriate credits for previous legumes and/or manure applications.

Nitrogen fertilizer decisions with reduced tillage must deal with how and when to apply nitrogen. as well as how much to apply. The easiest N application method, especially for no-till, is a surface broadcast liquid “weed and feed” application. It is fast, easy, and generally gives excellent weed control. The same concept can be used with herbicide impregnated on dry fertilizer materials. A primary disadvantage of unincorporated “weed and feed” applications is that nitrogen from a urea source can be

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lost if precipitation does not occur soon after application. Data from several states show lower yields with surface application compared to knifed-in. Therefore, it is recommended that nitrogen applications be incorporated either by knifing in or by cultivation.

Application Equipment for N

Anhydrous ammonia normally is the least expensive nitrogen source. A coulter ahead of each knife is needed to apply anhydrous through corn residue or unchopped bean stubble. Coulters will not be needed if bean residue was chopped by the combine. Since the soil surface under heavy residue may be more moist than exposed soil surfaces, field operations may have to be delayed slightly to prevent plugging and to make the soil work better. Closing disks are not necessary, although they are popular in some areas. They are used more in northern Iowa where soils tend to stay cool and moist longer.

Anhydrous, although cheap and effective, is hazardous to handle. Always use it with proper safety equipment and precautions.

Dry nitrogen can be used in no-till or ridge-till subject to the same constraints and potential losses as with conventional tillage. Moisture will move it down into the root zone if precipitation occurs. Application equipment for deep placement is the same as described for P and K placement.

Dribble banding, either liquid or dry, is another popular fertilization method. If done at cultivation, the cultivator can cover the fertilizer and reduce the risk of loss. Equipment requirements for dribbling are basically a ground driven squeeze pump and a series of tubes. One tube is run to each row, usually just ahead of the cultivator sweeps. As the fertilizer dribbles down, the sweeps cover it with soil.

The spoke wheel injector is a recently developed tool that holds promise for liquid applications. The spoke wheel injector can be pulled with a variety of equipment including planters and cultivators, or it can be mounted on a tool bar. The injector places fertilizer into the soil without disturbing the crop residue.

Other equipment with promise for more accurate application are electronic monitors and controllers for sprayers and anhydrous applicators. Monitors show application rates at all times. Controllers provide the ability to change rates "on the go" for different soils or fertility levels.

Summary

In summary, the fertilization decisions to be made for reduced tillage are how much to apply and how to apply it. The decisions should be based on good soil tests, reasonable yield goals, and personal preferences for equipment and procedures. Equipment is available for about any application system wanted.

For more information on conservation tillage systems, see the following publications:

AE-3049 *Conservation Tillage-Planning*.
AE-3050 *Conservation Tillage-Effects on Soil Erosion*
AE-3051 *Conservation Tillage-Effects on Water Quality*
AE-3052 *Conservation Tillage-No-till Systems*
AE-3053 *Conservation Tillage-Ridge-till Systems*
AE~3054 *Conservation Tillage-Fertility Practices and Equipment for No-till and Ridge-till*
AE-3055 *Conservation Tillage-Cultivators for No-till and Ridge-till*
AE-3056 *Conservation Tillage-Planters for No-till*
AE-3057 *Conservation Tillage-Planters for Ridge-till*

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