

## SLURRY INJECTION INTO GROWING CROPS

By Stephen Vale

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The next few years may see farmers being able to use standard grassland injection machines to inject livestock slurries into growing cereal crops with minimal crop damage.

Injection into grassland is now commonly practised in all areas of the United Kingdom, though the use of such machines on arable land has been restricted until after harvest.

At Silsoe College, Cranfield Institute of Technology, Mike Hann is looking at injecting into winter- and spring-sown cereal crops, as well as crops such as sugar beet, potatoes and maize, which offers a number of advantages.

The first is that it allows the farmer to reduce the amount of artificial fertiliser needed. Secondly, it provides a longer period in which to dispose of slurry; and finally, there is an improved nutrient uptake from a period close to drilling, resulting in reduced leaching.

The problem with the practice that immediately springs to mind is crop damage. The combination of a heavy tractor and slurry tanker produces unwanted ground compaction, leading to reduced yields. One solution would be to operate from tramlines, though this would require spacing to come down to about 4 m (13 ft). Such a machine would still have an enormous power requirement.

Somewhat surprisingly, the injection unit itself creates little crop damage.

"It is possible to inject up until the fifth leaf stage in cereal crops with little crop damage," says Mr. Hann, "as the ground is pressed back into place by the following rollers."

In row crops such as potatoes it may be possible to inject to a later stage of crop growth. As to the spacing between the injection legs, Mr. Hann feels 650 mm (26 in) is the minimum. In potato crops it may be possible to inject between each row. Maize, on the other hand, may have to be injected every other row.

### **Application Rate Problem**

However, although it is feasible to inject into growing crops, few farmers would be happy to see huge machines trundling across their

valuable crops, and there are a few days when ground conditions would allow such operations to take place.

The next problem is that of application rate, and if the farmer is to reduce his usage of artificial fertilisers he needs to know the nutrient content of the slurry. Mr. Hann claims a solution to the latter question could be found before the year 2000 if chemists put their minds to it.

An answer to the amount of slurry applied has already been found by Silsoe College. Called the application rate control system, it works by restricting the outflow pipe on vacuum slurry tankers. A flow-control mechanism controls the amount of restriction, and it is operated by a double-acting hydraulic ram.

The device is pre-programmed, from a control box situated in the tractor cab, to deliver a fixed amount of slurry measured in cubic metres per hectare. The maximum application rate recommended by the Ministry of Agriculture is 503m/ha.

A prototype of the application rate control system, developed in conjunction with slurry equipment manufacturer Fuller, is undergoing trials.

"The system was originally developed for use with sewage work sludge," says Mr. Hann, "though I feel it could be important to agriculture, as the industry suffers the same smell and run-off problems."

The system can be retrofitted to existing tankers, and it is expected to cost in the region of 10 to 20% of the price of the slurry tanker.

### **Next Stage**

It is clear that the technology exists to control the application rate, though what is now required is some method of getting the slurry to the injection unit without using the existing trailed tankers.

"This is the next stage of our research," says Mr. Hann, "and will use an umbilical hose."

The use of a low-ground-pressure vehicle in conjunction with an umbilical hose connected to a storage tanker at the side of a field is not new, but research is required to prevent the hose from dragging across the crop rows.

The obvious solution would be to run the hose in a straight line between the crop rows. Silsoe is also looking at some form of device to lift the hose off the crop close to the injection unit at the end of a run.

Mr. Hann says only minor modification is required to an umbilical hose to allow it to operate in cereal crops.

Researchers are considering using an umbilical hose in other crops such as potatoes and sugar beet, though this is still a few years away.

However, once a solution has been found to the crop damage caused by a heavy dragging hose, the number of days when slurry can be injected will be increased, as there will be a reduction in the number lost to bad weather.

The use of an umbilical hose also means draught force reductions of around 50% can be expected compared with those for the fully-laden tanker injector, where the injection legs have to slice through compacted tanker wheelings.

This draught force reduction means tractor size, and hence weight, can be reduced. Fuel consumption will also be reduced - by between 20 and 30% - but a second tractor will be required to operate the supply pump.

### **Final Obstacle**

Perhaps the main benefit from the farmer's point of view is the fact that Silsoe figures show wheel-rut depths resulting from umbilical injection are 50% less than those produced by conventional tanker systems. Although this figure was obtained in grassland trials, the same reductions are expected in cereal and other crops.

However, even when all the problems have been ironed out, there could be one final obstacle: there is currently no market for such equipment. Consequently, potential manufacturers are hesitant about taking the system through to the production stage.

The future of the concept seems dependent on changes in legislation. It is only a matter of time before British farmers are obliged to inject all farmyard slurries, as pressure from environmentalists increases to reduce ammonia emissions and contamination caused by leaching and run-off.

Only when this happens and chemists find a simple method of analysing the nutrient content of slurry will there be a future for injecting into growing crops.

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