

Innovation News

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SPOTLIGHT...TIRES, TRACKS AND SOIL COMPACTION

Tim Harrigan, MSU Agricultural Engineering Department

Compaction concerns are generating interest in rubber tracks and tire use for farm tractors. Several studies have shown that crop yields decrease with increasing ground contact pressure from tractors and other implements. Both rubber track and wheel tractors can be managed for optimal performance and minimal soil compaction.

Rubber tracks allow low ground pressure--Caterpillar estimates 4½-6 psi for its Challenger tractors--because they spread the load over a large area. Duals or triples do the same thing for wheel tractors. But it's not enough to just add duals or triples. Since 1992, radial tires have been available with design pressures as low as 6 psi. Run these new radial tires at the lowest pressure allowed by the manufacturer for the load carried. The reason is ground contact pressure is estimated as the tire inflation pressure (psi) plus one or two psi to account for tire stiffness. Lowering the pressure increases tire contact area and spreads the load over a larger area. Over-inflating a 20.8R42 to 18 psi rather than 10 psi can decrease ground contact area by 33%, decrease the footprint length by 20%, and increase tire stiffness by 42%. This concentrates the load and increases soil compaction.

Recent research at the Ohio State University measured compaction caused by a JD 8870 at two tire pressures, a Cat Challenger 65 with 24 inch

rubber belt tracks, and a Challenger 75 with 36 inch tracks. Each pulled a 41 ft. field cultivator.

Measures of changes in bulk density, air-filled porosity, air permeability and cone penetration were made to gauge soil compaction. This is how the OSU researchers ranked the tractors, **from least to most compaction**: 1) JD 8870 w/dual 710/70R38 radial tires @ 7 psi front, 6 psi rear, 2) Cat 75 w/35 inch belts (estimated static ground pressure @ 4½-6 psi), 3) Cat 65 w/25 inch belts (estimated static ground pressure @ 4½-6 psi), and 4) JD 8870 w/dual 710/70R38 radial tires @ 24 psi.

The most compaction was caused by the wheel tractor with over-inflated tires, but the same tractor with low pressure tires caused the least compaction. These tests demonstrate the ability of both rubber tracks and low pressure tires to reduce compaction. These tests also indicate that the actual ground pressure with rubber tracks under draft load may be somewhat higher than the ground pressure under no load. Weight transfer toward the rear under load may account for this change.

Tracks or low pressure tires can be added to combines, grain carts, manure spreaders and other equipment. The objective of the Ag Expo '96 (June 25-27) field demonstrations was to illustrate the range of tire and track options available for tractors, combines and other field equipment, and show how decisions regarding such factors as tire selection, tire pressure and ballasting influence machine performance and compaction.

**SUSTAINABLE AG/ECONOMIC
DEVELOPMENT MEETING**
Thursday, August 1, 1996
Cousins Restaurant, Bad Axe
at 6:30 p.m.

TRACKS AND TIRES COMPARED

Tim Harrigan, MSU Agricultural Engineering Department

Canadian researchers conducted side-by-side comparisons of rubber tracked and wheeled vehicles in the early 90's at the Alberta Farm Machinery Research Center (AFMRC). They tested a 270 hp Challenger 65 and a 270 hp 4-WD with eight radial tires. The main goal of the test was to measure *power delivery efficiency*, the ability of the traction system to deliver available engine power to the ground as useful working power. But they also ranked each on pull, optimization, ride, steering and cost:

Pull—a plus for tracks. Only the rubber belts were able to deliver 200 drawbar hp at speeds as low as 3 mph. Both tractors were able to deliver 200 drawbar hp at 5 mph, a typical working speed.

Optimization—a plus for tracks. Optimizing a tire tractor involves changing ballast and tire inflation pressure. Rubber belt tractors operate near optimum over a wider range of speeds than tire tractors with considerably less adjustment.

Power delivery efficiency—a slight plus for tracks. This is a measure of the ability of a traction system to convert available engine power into useful work on the ground. Tests showed little difference between rubber belts and rubber tires *correctly set-up*.

Ride—equal for tires and tracks. There was little difference in average ride quality between the two systems.

Steering—plus for tires. Tires roll through a turn and produce little disturbance.

Cost—plus for tires. Costs vary, but rubber belt tractors generally cost more than equivalent

drawbar horsepower rubber tire tractors.

Soil Compaction—unresolved. Soil compaction was not measured in the AFMRC tests.

KEEPING A VITAL SOIL BUILDER

Carbon—Gone in a Puff with the Plow

Article from CTIC Partners, April/May 1996, Vol. 14 No. 3

Soon after a plow opens the ground, the soil loses a key ingredient and that loss affects the soil's natural productivity as well as the earth's atmosphere.

USDA Agricultural Research Service (ARS) research shows that soil carbon is lost very fast--as carbon dioxide--within minutes after the ground is intensively tilled (plowed). Carbon is a key component of organic matter which helps make soil productive.

After 19 days, total losses of carbon from plowed wheat fields were up to five times higher than for unplowed fields. In fact, the loss of carbon from the soil equalled the amount that had been added by the crop residue left on the field the previous season.

What it means

For the first time, scientists know with certainty the reason that tillage reduces the soil's organic matter. It's the loss of carbon (as carbon dioxide - CO₂) from the soil during tillage that lowers levels of organic matter. According to ARS researchers Don Reicosky and Mike Lindstrom, carbon makes up about half of the soil's organic matter.

Where does the carbon dioxide go? Into the earth's atmosphere where it can contribute to the potential for global warming.

While fossil fuels are the main producer of carbon dioxide, estimates are that the widespread adoption of conservation tillage--no-till, mulch-till, strip-till, or ridge-till--could offset as much as 16% of worldwide fossil fuel emissions.

What next?

ARS scientists are currently trying to put a dollar value on the loss of carbon. They want to find out if losses are costly enough to warrant development of sensors. The sensors would help farmers decide where to till more and where to till less in a field. In the meantime, as the ARS scientists put it, "These findings point to the value of no-till and other conservation tillage systems."-JM

Type of Tillage Equipment	Percent of Crop Residue Remaining	CO ₂ Loss After Tillage
JD 2800 Moldboard	6.5 to 9%	Highest Loss
Paraplow 410 B	75.5 to 83.5%	Higher Loss
White 445	30-35%	Average
DMI 530	29-43%	31% of the
Glencoe 7400	31-36%	CO ₂ loss of
JD 510 Ripper	24-34%	the moldboard

Last fall, ARS researchers in Minnesota also compared carbon dioxide (CO₂) losses in the first five hours following use of tillage equipment listed above. While leaving ample crop residue, the Paraplow caused nearly as much carbon dioxide loss as the moldboard plow in the first five hours. After a rainfall, the Paraplow soil lost less carbon dioxide than the moldboarded soil.

IF SUMMER TOURS - CANADA Summer Activities

Jim House, Acting Chair, Tours Committee, IFAO

July 17, 1996. Come out to Ridgetown College to see what's new in narrow row and alternative crops with Gord Schiefele, and wheat varieties with Arned Smid. Tour area farms including Doug Smith's, then on to north Middlesex to see pre-tillage of wheat stubble followed by corn. The day will end with a barbecue supper and social time.

September 4, 1996. An Open House will be held at the farm of Jim and Lorraine House featuring presentations by Ray Rawson, veteran no-tiller and his agronomist, Don Shrieser; narrow strips of corn, beans and wheat; Bt and IR corn; and Ray Rawson will demonstrate his coulter caddy on wheat stubble.

September 5, 1996. Field Day at Beltane Farms,

Londesboro. The program includes Ray Rawson, veteran no-tiller and Don Shrieser, agronomist; University of Guelph Variable Rate N Trials; Ag Leader Yield Monitor; Ashtek Guidance Systems; Topographical Field Mapping; DGPS Receivers (Coast Guard and Satellite); Crop Management/Mapping Software.

September 10-12, 1996. At the Outdoor Farm Show, in cooperation with Monsanto, the IFAO will plant plots of *crazy strips* with twin row corn and drilled beans, all planted with the same planter at the same time.

For more details on any of these events, contact Jim at (519) 769-2777 or the SIB at (519) 767-5020.

HAVE YOU CHECKED YOUR TIRE PRESSURE LATELY?

Jack Rigby, Blenheim, IFAO

Most farmers using dual wheels have too much pressure in their tires thereby reducing the advantage of having duals. When you install duals without reducing the pressure on your inner tires, you shorten the footprint which reduces traction and increases compaction. We run 10 lbs. of air or less in each rear tire when we install our duals. This gives us approximately the same footprint as 24 lbs. of air when running a single tire.

ON MAKING THE SWITCH TO NO-TILL...

Bruce Shillinglaw, Londesborough, IFAO

For wet springs in the early adoption stage of no-till, some type of shallow pre-tillage may be necessary to speed up soil drying. Listed in order of preference, they are: coulters on the planter with markers to give controlled traffic; coulter cart used with seed drill; aerway; cultivator; disc; and sometimes a rotary hoe. Another option is to increase planting speed to 6 mph to get more aggressive action from the coulters.

In established no-till fields, we can plant earlier and under wetter conditions than our "conventional wisdom" would allow.

ANHYDROUS AMMONIA ON 20" ROWS...

Jim House, Port Stanley, IFAO

Mount your anhydrous knives as close to the tractor as possible to improve tracking. Use 1" wavy coulters to reduce snow plowing of soil onto corn and follow with a 12" piece of logging chain to help sealing.

NOTES FROM ALL OVER

Article from IFAO, Issue 4, June 1996

Weed Seeds Last A Long Time. Researchers at Nebraska buried weed seeds 8" deep in a clay loam soil and dug them up every year for 17 years. After five years, barnyard grass and green foxtail still had 35% germination and lambs quarters 17%. Redroot pigweed only had 1% survival. Velvetleaf, mullein and curly dock all had high survival rates (40%+ after five years and 25% after 17 years).

(Source: Weed Science, Vol. 44, Jan-Mar 1996, pp. 74-86)

Pesticide-Eating Bacteria Discovered.

Researchers have found a microbe in municipal sewage sludge that degrades pesticides, leaving harmless carbon dioxide. *Klebsiella terrigena* degrades three major herbicides--atrazine, cyanazine and simazine. For more information, contact Cathleen Hapeman, USDA Agricultural Research Services at (310) 504-6461.

(Source: CTIC Conservation Impact, November, 1995)

ASK-AN-EXPERT The Dirt on Worms!

Dr. Alan Tomlin, Agriculture & Agri-Food Canada

How damaging is worm picking? Not very damaging so far as we can tell. Only dew worm adults are picked which means the juveniles remain to repopulate the field. Some Ontario fields have

been picked continuously for more than 40 years with no obvious problems.

Should I let earthworm pickers onto my farm to harvest dew worms? You can, and it can be quite profitable for you if you rent out the picking rights. If you are concerned about sustaining the earthworm populations in your field, you could specify the number of nights that can be used by pickers, limit the number of pickers, or have pickers on your land every other year to conserve the worms.

How much should I charge earthworm pickers to harvest earthworms from my farm? That depends on how good your soils are for worms, but a good one-acre field could easily provide 300,000 worms annually which would ultimately retail in the US for \$0.20 Canadian each (that's \$60,000). I would think that the source farmer should try and obtain about \$500 for that.

What is the effect of conservation or no-till on earthworm populations and other soil organisms? They generally increase under conservation or no-till...usually dramatically.

COMPOST INCREASED CROP YIELDS

Article from Innovations, University of Guelph

Soybean yields were increased where composted food and yard waster was applied in a one-year trial. Sands and yields were improved due to reduced crusting, reduced weed pressure, and possibly improved moisture retention. Corn yields were unaffected by spring applied compost, but were higher with fall applied compost. Compost was applied at rates of 0, 100, 150 and 300 metric tonnes per hectare (0, 1, 1.5 and 3 inches on the soil surface). This one-year study, conducted with Green Plan funding, was aimed at finding the appropriate rates, tillage and nitrogen management in conservation tillage, considering both agronomic and environmental aspects of the applications. This experiment is part of a larger project entering its third and final year.

LATE BREAKING INNOVATIVE FARMERS NEWS

PLOT UPDATE:

The plots have been planted, cultivated, sidedressed and post sprayed. For the most part, the plots look fairly good for the year. Stop by at your convenience to look them over.

IF SITES TWILIGHT TOURS SCHEDULED:

Evening tours of the IF sites will be held on the following dates:

Shaw Site (Wadsworth Rd.) Tuesday, July 16, at 7:30 p.m.

IF Corn, Dry Bean and Sugar Beets

Fertilizer Comparison

Dry Bean Herbicide Comparison (ten treatments with five tillage systems)

Affect of Row Width on White Mold in Soybeans (7.5-, 22- and 30-inch)

Cross Slot Planted Corn vs Double Disc Opener

MSU Wheat Variety Trials

22-inch Soybeans

Voelker Site (Caseville Rd.) Monday, July 22, at 7:30 p.m.

IF Corn, Sugar Beets and Dry Beans

Comparison of Bt Corn Borer Resistent Varieties and Non-Resistent Varieties

Plan to attend one or both of these tours!!! Complete plot maps and information will be available at the tours.

NARROW ROW EQUIPMENT UPDATE:

The 22-inch zone till cart and planter were used to plant the following fields:

1. 16 acres corn, Wil-le Farms, one mile east of Filion.
2. 40 acres of soybeans, Randy Weber, Verona and Leppek Roads, Parisville Township.
3. 16 acres of corn, Ross Voelker Farm, corner of Notter and Geiger Roads.
4. 50 acres dry beans, Shaw Farms, corner M-53 and Sebewaing Roads.

While we didn't reach our goal for planted acres, we did get the equipment out for trial.

COMMENT: I have heard about the comment that the equipment is too small to try. The concept was to obtain the equipment and try it. First of all, we couldn't afford 12 or 16 row equipment; and second, a field trial could be 20 to 40 acres -- it doesn't have to be 500 acres. I realize this spring has been a struggle for everyone and doing a field trial is time consuming. But, we need to keep our original motives in perspective.

IMPORTANT DATES:

August 22 - Innovative Farmers Plot Tour for Farmers

September 19 - Water Quality Public Policy Tour (here's your chance to express your views to public officials, legislative aides, environmental representatives) What are the issues and concerns that need to be addressed? You have a forum through the Innovative Farmers. Do you want to use it?

THREE-DAY TOUR TO ONTARIO

Last year we hosted a group from the Innovative Farmers of Ontario. We are currently setting up a tour to Ontario for September 10-12. I realize this is risky for that time of year, but we are late with everything else.

We will be visiting a machinery show and several IF members to look at their efforts in strip cropping, narrow row zone-till, alternative crops and several other production practices. The cost of the bus will be covered. You will only need to pay for food and lodging. More details will be coming soon.

SUSTAINABLE AG/ECONOMIC DEVELOPMENT MEETING:

John Gardner, North Dakota State University Extension, will be the featured speaker for the August 1 meeting at Cousins. The meal is at 6:30 p.m. and John will be presenting information on how North Dakota farmers are adding value to their products. Please call our office to make reservations as soon as possible.

I will be visiting John the week prior to our meeting, so I hope to have additional information.

SOIL DOCTOR UPDATE:

Six plots were established to test the Soil Doctor. Replicated strips were hand soil nitrate-N tested prior to applying N with the Soil Doctor. We will be taking chlorophyll readings and leaf analysis, as well as yield checks to determine the cost effectiveness of the Soil Doctor.

A complete list of the locations will be included in the IF plot booklet.