



Agriculture and Natural Resources
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NOTE to editor: This is one in a series of articles produced by University of Wisconsin-Extension agents and specialists to address farming through difficult times. More articles can be found on the Extension Responds website at:
www.uwex.edu/ces/ag/farmingindifficulttimes.html

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Managing through Difficult Times: Spring tillage and planting energy savings tune up

Madison, Wis. - As you prepare for the cropping season, there are many no-cost or low cost things that can be done to reduce cropping costs. Nine topics are considered below.

1) Can you make a profit?

Before you hook-up the tillage tool or order seed, you should determine your cost of production and whether you will likely make a profit on the crops you plan on growing. Can you purchase the crops for less than it costs you to grow them? Do you have a market for your crop? Can you buy a contract to lock in a profitable price and reduce risk? A Crop Analyzer Budget Spreadsheet <http://www.uwex.edu/ces/cty/waushara/ag/index.html> is available from University of Wisconsin-Extension that can provide guidance in determining production costs. Contact your local UW-Extension agent if you need assistance.

2) Can you get more production from the land you have?

Can you spread your energy use over more than one crop? It takes a certain amount of energy to prepare a seed bed and plant a crop but if you can get two crops from a field or increased production of one crop, you've increased the utilization of the energy inputs.

Are you establishing alfalfa this year? Do you need hay crop silage? Consider planting a cover crop of oats and field peas with the alfalfa to act as a cover crop. The oats and peas are fast growing, high yielding, high quality, and high protein forage mix. This mix is usually harvested in early June and can yield about 1.7 dry tons/acre with crude protein of 15 to 18percent. Using oats alone as a nurse crop will provide about the same yield (1.6 dry t/a) but with 4 to 5 percent lower protein content.

Are you planting corn for silage? Consider planting in 15 inch to 20 inch rows. Research indicates the potential for 5 to 6 percent yield increase using narrow rows for silage corn. There is little advantage in using narrow rows for corn grain production. The cost of fertilizer and weed control remain the same but the cost is spread over greater yield. This may require different equipment than you currently have but you might find a custom operator to plant and harvest the crop at a competitive cost so you can try ultra narrow row corn.

3) Reduce trips over the field.

The approximate fuel required for planting corn using a conventional tillage system (moldboard plow) is 3.5 gallons per acre, chisel plow system is 2.4 gallons per acre and the no-till system uses 1.4 gallons per acre. Combining operations or using a piece of equipment that accomplishes two or more tasks in one pass saves energy. For example, a one-pass soil finisher can replace a pass with a chisel plow and field cultivator. Another option is to add a leveler attachment to a chisel plow to eliminate disking or field cultivation. Each pass over the field that is eliminated can save an average of \$7 to \$10 per acre in fuel, depreciation and labor.

4) Use no-till or strip tillage systems to reduce energy and labor costs.

The energy savings for using no-till versus conventional tillage is about 50 to 60 percent or 150 to 200 gallons of diesel fuel per hundred acres of corn, soybeans or wheat depending on the amount of secondary tillage used. Based on 10 years of no-till crops trials at the UW Agricultural Research Station at Arlington, yields for continuous corn were 8 percent lower with reduced tillage while they were 5 percent lower for a corn-soybean rotation, however costs are less. On continuous-corn, no-till costs an additional 8 cents per bushel compared to conventional tillage while using strip tillage resulted in a 2 cents per bushel cost savings. No-till had the best savings when using a corn-soybean rotation returning 3 cents per bushel for corn and 26 cents per bushel on soybeans. Strip tillage provided the highest savings for the total crop rotation with 12 cents per bushel return on corn and 18 cents per bushel on soybeans.

5) Repair and maintain your equipment before you get to the field.

Poorly lubricated bearings, dull blades and cutting edges, and loose drive belts require more energy and power to complete a given task. Break downs and slow productivity delay field work which can result in lower yields.

Tillage tools

Replace worn tillage surfaces (plow shears, chisel points, disk blades), check disks for worn bearings and missing scrapers, check and tighten nuts and bolts and check resets for proper operation. Don't forget to lubricate per manufacturer's recommendations.

Plows – don't plow deeper than necessary, it wastes fuel; 6 to 9 inches of depth is sufficient for most crops and soil types. Research in central New York showed no benefit from tillage depths beyond 9 inches. Make adjustments so the plow runs level front to back and side to side. Use coulters for fields with sod and heavy crop residues to help cut the slice in front of the bottom. Lubricate and assure resets are working properly.

Disks – Check for worn bearings – lubricate daily or more often if the manufacturer recommends. Replace worn or broken blades and scrapers. Set the depth as shallow as possible to accomplish the desired seedbed.

Spring-tooth harrows and field cultivators – Replace worn shovels or sweeps. Level front to back and side to side so tillage depth is even. Check resets and lubricate as needed.

Planters

Now is the time to get the planter ready for spring planting! Check that disk openers turn freely and scrapers are adjusted properly, tire inflation (important for planter calibration), packer wheel down pressure, seed dispersal mechanism works properly, monitor for proper operation and clean seed drop tubes. On air planters, check seals, trueness of seed drum or disks, and air pressure. Grease and lubricate per manufacturer's recommendations. A planter that isn't working correctly wastes energy, fertilizer and seed due to reduced yields.

Check the fertilizer rate – it is too valuable to over or under apply. Fertilizer rates can be easily checked by disconnecting the drop tube from the disk opener and attaching a bag to the tube to collect metered fertilizer. Test Procedure: Fill the fertilizer hoppers or tanks, and make a short run to get the fertilizer flowing. Next measure off 150 feet and attach bags to the drop tubes. Then make a 150 foot test run with planter at typical planting speed. Weigh the fertilizer collected for each row to within a tenth of a pound. If using liquid fertilizer, it can be measure by fluid ounces and then converted to weight (10.67 pounds per gallon (128 oz.)). Weights should be within 5 percent of the average for all rows. Use the following formula to determine the application rate in pounds per acre:

$$\text{Fertilizer}(\text{lbs} / \text{acre}) = 3485 \times \text{sample weight}(\text{lbs per } 150 \text{ foot row}) / \text{row width}(\text{inches})$$

The same procedure and formula can be used for pesticide rate calibration of your planter, except the pesticide collected needs to be measured in ounces or grams. The formula results in the same units as used for your sample weight; ounces/acre or grams/acre depending on which you choose.

Seed Spacing

Adjust the planter as needed for the seed size and desired population and fill the seed hoppers. On a hard surface lower the planter just enough to engage the metering unit drive mechanisms and make a test of at least 100 feet at planting speed. For air or vacuum metering systems, you'll need to tie a small mesh bag over the end of the seed tube or boot to collect the seeds if running tests on a hard surface. Another option is to tie or prop up the planter closing wheel and run your tests in the field. This method can be used on an air planter without needing to catch the seeds. After you are done counting seeds, you can cover the seeds with a rake instead of having to pick up several hundred seeds. Using a tape ruler, measure off 100 feet, and then count the seeds in each 100 foot row. As you count, look for uniform spacing between seeds, skips and double drops. Research indicates that as the seed spacing variability increases because of skips and doubles, the yields will decrease by 2.5 to 3.4 bushels per inch increase in the standard deviation. Skips and doubles in seed placement are caused by planter malfunctions. After plants germinate there will be additional gaps due to poor germination and survival of plants. Seed population can be calculated as follows:

Seed population / acre = 5227 × seed count (one row per 100 feet) / row width (inches)

6) Correctly ballasting tractors

Tractors ballasted too lightly waste energy due to excess wheel slip and those weighted too heavily waste energy by excess rolling resistance. The weight required on your tractor depends on many factors, including soil type, moisture, compaction and type of operation (i.e. tillage or PTO work). Tractors doing mainly light draft and PTO work should be weighted at about 125 lbs./PTO hp while those doing heavy tillage should be ballasted to 180 lbs./PTO hp. Adding duals or triple tires adds weight but can also change wheel slippage due to more tire-soil contact area so wheel slippage should be checked with the intended load after changing the number of tires. The University of Missouri Extension bulletin, Tractor Tire and Ballast Management <http://extension.missouri.edu/explorepdf/agguides/agengin/g01235.pdf> should be consulted to fully understand how to properly distribute the ballast on your tractor.

7) Match tractor size to the implement

Excessive horsepower uses more fuel than if the tractor horsepower is no more than 25% higher than the power requirement for the implement. The draft requirements (force to pull implement) have been determined for many types of tillage and planters. Based on the draft, the PTO power requirement can be calculated with the following formula.

$$PTO\ hp = width\ (feet) \times speed\ (mph) \times draft\ (lb / ft) \times soil\ factor / 375$$

Draft values and soil factors are published in an Iowa State publication entitled Matching Tractor Power and Implement Size www.extension.iastate.edu/agdm/crops/pdf/a3-26.pdf

Example: A 20 foot tandem disk (draft – 200 lb./ft.) pulled at 5 mph with a 2 wheel drive tractor on tilled soil (soil factor – 1.75) will need the following minimum PTO hp tractor:

$$20\ feet \times 5\ mph \times 200\ lb / ft \times 1.75 / 375 = 93\ PTO\ hp$$

If you have a choice of a 125 hp or 200 hp tractor, the 125 hp tractor would get the job done and use less fuel to pull the disk.

8) Tractor maintenance:

Check fuel injectors – dirty injectors don't atomize the fuel well resulting in incomplete combustion, loss of power and increased fuel use. Black smoke coming from the exhaust can be an indication of dirty injectors.

Replace air and fuel filters – dirty air filters reduce air flow which leads to excess fuel to air mixture resulting in incomplete combustion and black smoke coming from the exhaust. One gallon of fuel requires about 10,000 gal of air, so it's vital to have clean air filters! Dirty fuel filters can cause an engine to not start or stop dead in its tracks.

Proper tire inflation reduces rolling resistance, tire wear, wheel slippage and saves fuel and time. Radial tires require lower pressures than bias ply tires. Ask your tire dealer for a tire

inflation pressure table. Replacing tires? Consider radial tires – 5 -7 percent less wheel slip. Goodyear's Farm Tire Handbook <http://www.goodyear.ca/tires/farm/handbook.html> is a guide for inflation pressures by tire load.

9) No cost actions

Don't let tractors idle for longer than 10 minutes. Significant fuel savings can be realized by reducing idling times. However, be sure to let engines with turbochargers idle for at least 5 minutes after heavy use or turbo bearing damage could occur. Example: Turn off the tractor while the mixer wagon is being filled.

Shift-up and throttle-back – Operating tractors in higher gear ranges at lower engine speeds is about the easiest way to reduce fuel consumption when doing light duty work like spraying.

Dual or triple tires increases rolling resistance and can increase fuel use so removing the extra tires when finished with tillage saves fuel.

Purchase the right fuel for the season – Winter blend diesel has about a 3 – 5 percent lower energy content so if you use winter blend for field work you will use more than if using summer blend.

Is your above ground fuel tank shaded? Fuel tanks in the sun can lose 2 to 3 percent of fuel per month during the summer while shading will reduce evaporation losses to less than 1 percent. A pressure cap can reduce losses to 1 percent for a white tank in the sun and 0.4 percent in the shade.

Replace worn, weather checked or compromised hydraulic hoses. Failed hoses are messy, waste time and are preventable.

Running an errand or performing light duty tasks? Using an all-terrain vehicle (ATV) or a small vehicle will save fuel. Combining trips whenever possible also saves time, fuel and money.

To access more information and/or tools to help analyze your situation, link to the Extension Responds web page at: www.uwex.edu/ces/ag/farmingindifficulttimes.html

For assistance in making these tough decisions, contact your UW-Extension county agent, your Farm Business and Production Management Instructor in the Technical College or the DATCP Farm Center at 1-800-942-2474.

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File: farming in difficult times, energy