

TIMELY INFORMATION

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Fuel Conservation Strategies for the Farm

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Recent increases in fuel prices have generated another cost concern for farmers. As with most farm inputs, fuel is one of several input costs that have continued to increase over the years. However, fuel prices have taken a dramatic jump in price over a short period. While input costs continue to rise, commodity prices tend to be stable prompting farmers to reduce costs where possible to maintain profit margins. Therefore, fuel usage is one area that farmers can focus on in order to preserve their economic return.

This Timely Information Sheet outlines several management strategies or ideas that farmers might consider for conserving fuel on farm. The ideas presented are only suggestions which could potentially lead to the reduction in fuel use, but more importantly on-farm savings. The important strategy is to try and plan field and other activities in an attempt to minimize the number of trips and time associated with them. The list of considerations is broken into three sections. The first section provides considerations for all equipment and vehicles while the second focuses on tractors and other large equipment. The third and final section provides considerations for other on-farm vehicles, primarily light and heavy duty trucks.

All Equipment and Vehicles

- *Minimize idling times.* For modern electronically controlled diesel engines, ten minutes is usually sufficient to warm up and cool down on tractors and other equipment. Excessive idling during break periods can lead to unwarranted fuel use.
- *Reduce excess weight on equipment.* Keep trucks cleaned out. Lighter loads require less energy to move.
- *Inflate tires to appropriate pressure.* Inflation pressure is an important variable for traction efficiency, tire life, and ride comfort—especially for radial tires. Check your tractor owner's manual and/or the tire distributor for suggestions on inflation pressure. Keep tires properly inflated on trucks and other vehicles. Improperly inflated tires can reduce gas mileage and tire life expectancy.

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- *Perform routine maintenance.* Keeping vehicles, tractors, and equipment in tiptop condition keeps them operating at peak efficiency. Routinely replace fuel, oil, and air filters and use the proper grade of motor oil. Consult your owner's manual for the proper timing and list of maintenance operations.
- *Communicate with cellular phones and radios* rather than driving to converse with someone.

Tractors and Large Equipment

- *Perform multiple field operations within the same pass.* Consider modifying equipment so that you can perform multiple operations in one pass. Examples would include strip tilling and planting all in the same pass using one tractor. Some manufacturers sell tractors with hitches located on the front and back providing implement attachment points at both ends of the tractor.
- *Avoid compacting soil by staying out of wet fields.* Extra tillage and extra power (and thus more fuel) are needed to break-up compacted soil.
- *Improve soil structure, reduce soil erosion, and increase organic matter content while conserving on fuel usage by practicing conservation tillage.* Tillage uses more fuel per acre than almost any other field operation, especially subsoiling. Under conservation tillage or no-till management, farmers minimize the tillage performed and the number of trips across a field. Evaluate your total cropping system to determine the appropriate level and frequency of tillage.



Figure 1. Example of strip tillage prior to planting.

- *Use site-specific tillage.* In this approach, only areas requiring tillage due to compaction receive tillage. Additionally, the depth of tillage can be varied according to the depth of detected compacted layers. This type of strategy has the potential to minimize tillage power requirements. Equipment manufacturers are starting to provide variable depth control for tillage implements.

- *Attempt to match the tractor horsepower to the equipment or loads.* Properly matching machinery can minimize excessive power usage resulting in unnecessary fuel usage. Instances such as pulling a light load with a high-horsepower tractor should be avoided.
- *Gear up and throttle down when using a high-horsepower tractor to pull light loads.* You can usually save quite a bit of fuel by running an under-loaded tractor in a higher gear but at a lower engine speed. Make sure, though, that you don't overload the engine; if the engine speed doesn't change quickly when you change the throttle setting, you should probably shift down a gear.
- *Maximize tractive efficiency by properly ballasting tractors for the operation at hand.* Tractive efficiency is a measure of the effectiveness of the tractor to put its available power to the ground and is affected by weight distribution and tire slip. Maximum tractive efficiency is typically attained with drive tire slip between 8 and 15%. Add the appropriate amount of ballast, or weight, to properly distribute the draft load to all drive tires therefore helping control drive wheel slippage. Slip can be estimated by comparing the distance traveled for a certain number of wheel revolutions while under load to the distance traveled when the tractor is under no-load conditions. Many tractor manufacturers are providing performance monitors which provide real-time slip estimations. These can be used to visually assess slip during operations. High levels of slip cause excessive tire wear and poor fuel efficiency which indicates an under-ballast condition requiring additional ballast or the use of a larger tractor. Conversely, low slip levels indicate that the tractor is likely carrying too much ballast causing higher fuel usage while placing extra load on the axles and drive train. Ideally, weights should be added or removed to match the load when tractors are used for different field operations and conditions.



Figure 2. Example performance monitor from a John Deere tractor with the ability to display wheel slip.

- *Layout fields to minimize turning time at headlands and point rows,* if you can do so without causing excessive soil erosion. Using GPS to map field boundaries can help optimize a field layout for various operations to help minimize infield time.
- *Minimize the amount of time spent driving tractors and other field equipment on the road.* Attempt to keep tractors and other equipment in the field. Use faster and more fuel-efficient vehicles to service equipment in the field and to haul harvested crops to storage.

- *Consider using differential global positioning system (DGPS) based guidance systems.* These systems, whether a simple light bar or a real-time kinematic (RTK) autoguidance system, can help reduce overlap during field operations. The use of guidance systems over foam markers or dead reckoning has been shown to increase field efficiency thus reduced fuel usage. These guidance systems also permit working at night and can reduce operator fatigue.



Figure 3. Illustration of guidance system use within a conservation tillage (no-till with cover-crop) management scheme.

- *Consider using variable-rate application (VRA) strategies, primarily for fertilizer, lime, herbicide and insecticides.* These have the potential to reduce fuel use. This type of management approach could indicate where areas of a field do not require particular inputs thereby not requiring coverage during application.

Other Farm Vehicles

- *Use ATVs or motorcycles to run errands and perform light tasks around the farm.* They can be much more economical than driving heavy-duty pickups.
- *Use more fuel-efficient vehicles for making trips to field or to town when you are not hauling heavy loads.* Although heavy-duty pickups and trucks play an important role on farms, they are often used for trips that do not require their power and hauling capacity.
- *Attempt to run a heavy-duty diesel truck at an RPM 40% below the peak torque.* Diesel powered truck research has indicated that this is the point that maximum fuel economy is achieved.

- *Consider diesel engines over gasoline engines when planning to purchase a new large, heavy-duty truck.* Diesel engines produce more torque at the same engine speed as gas and can therefore be more efficient when hauling heavy loads. For general usage, however, consider what the truck will be doing most of the time and remember that fuel is only one component of ownership cost.
- *Attempt to combine errands into one trip rather than making multiple trips.*
- *Accelerate gradually and drive smoothly rather than being an aggressive driver.* The EPA has reported a 20% advantage in fuel economy for drivers displaying these driving characteristics.
- *Make trips during less congested times during the day to reduce heavy traffic periods and delays.*