



Engine and PTO speed

The basics

The key to getting the best from a tractor engine is operating it at the 'sweet spot' which gives the correct power and torque but at the lowest speed. If engine speed is too high, the mechanical losses and wear increases and efficiency decreases.

In practice

The most important key indicator for efficiently overcoming driving and tractive resistances is to use high torque in a low speed range.

Gears match power, engine speed and driving speed to give the most efficient operating condition. It's important that gear ratios are easy to engage and that they are precise. A power-shift transmission or continuously adjustable transmission enables a driver to change engine speed without being forced to interrupt the power flow or stopping. For example, when working on areas with uneven soils or slopes, they are able to adapt the speed of the engine directly to the specific conditions. Time and fuel can therefore be saved.

The general rule is to operate the engine at lowest speed for the power requirement. However, the engine should not be overloaded. To check whether the engine is overloaded, work the tractor for a short period at the desired speed and throttle setting, before rapidly opening the throttle. If the engine readily picks up speed, it is not overloaded, and the original throttle setting is suitable. On the other hand, if the engine does not respond quickly, shift the gear down or increase the engine speed. Follow the procedure again, to check the suitability of the new settings.

ENGINE SPEED AND GEAR SELECTION

Efficient20 is a European project which was commissioned to help farmers contribute to an overall fuel reduction of 20% by the year 2020 through becoming more efficient.

One aspect identified through the project is that some farmers tend to operate at engine speeds around 1,800 to 2,200 rpm when in fact it might be suitable to drop the speed to between 1,600 and 2,000 rpm.

Following information received during and after training, the farmers were able to achieve the following average fuel savings (l/ha):

Operation	Fuel saving
Cultivator	7%
Disc Harrow	12.5%
Fertilizer spreading	25.9%
Plough	6.4%
Roller	16.9%
Drilling	15.8%
Transport	17.6%

It's clear that worthy savings are achievable just by selecting the correct gear and engine speed.



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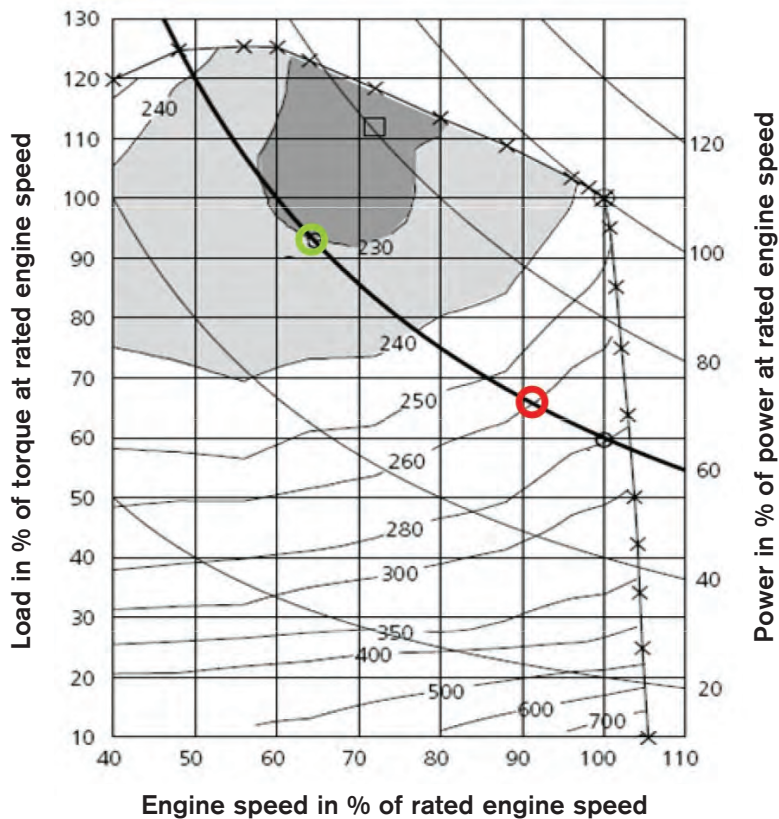


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Shaded area of chart represents the 'sweet spot'.
 Diagram reproduced courtesy of Efficient20: Strategies for saving fuel with tractors.

Potential savings

Driving with the same power in a lower speed range can definitely save fuel. For example, looking at the diagram on the left, driving with 60% rated power and 92% of the rated engine speed results in a specific fuel consumption of 260g/kWh (red spot). If the driver can reduce engine speed to 64% of rating – by selecting the right gear or by managing the continuously adjustable transmission – the specific fuel consumption decreases to 230g/kWh (green spot), reducing fuel use by 12%. The lower engine speed is well balanced by the increasing amount of torque.

For more information on 'Engine and PTO speed' please contact:

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