Calculator Guidance

The goal of this energy audit program is to provide simple means for producers to assess the energy balance of row crop production in Iowa, and so highlight areas where energy conservation measures might be targeted to achieve maximum economic benefit.

When you open the spreadsheet, be sure to click "enable macros".

To fill out, simply click on the boxes within the spreadsheet: in the pale yellow boxes, a small arrow appears on the right side – click on this to activate the drop down menu; red boxes represent user defined values – just click on the box and enter the appropriate number. (The one exception to this is the composite fertilizer – a pop up box instructs user to enter the N, P, or K value of the fertilizer used.)

After completing the form, the data is copied to the Summary sheet – along with the farm and field name – by clicking the "Copy to Summary" button. **Then print the form to capture the specific inputs for each management scenario**. To clear the data input/calculator sheet, click on the "Clear all Inputs" button. Enter in the next field, rotation year, or cropping scenario, fill in the appropriate data, and copy to the summary page.

Print summary page when complete.

Notes on sources and some basic assumptions

1. Primary sources for fertilizer data were:
   Bhat, et al. 1994. Energy in Synthetic Agricultural Inputs: Revisited. Oak Ridge National Laboratory Report ORNL/Sub/90-99732/2. Oak Ridge, TN: Oak Ridge National Laboratory.

   Fertilizer energy content does not include packaging and distribution.

   The following sources were also used:

"Energy Requirements for Various Tillage-Planting Systems." D. Griffith and S Parsons, Purdue University Cooperative Extension Service. **NCR-202-W**.

"Conservation Tillage Systems." P. Jasa, Extension Engineer, University of Nebraska.

"Fuel Required for Field Operations." M. Hanna, Extension Agricultural Engineer, Iowa State University. **File A3-27,** adapted from **Pm-709**, Oct. 2005.

"Estimating Farm Fuel Requirements." H.W. Downs and R.W. Hansen, Colorado State University Cooperative Extension. **No. 5.006**, updated June 2006.

"Farm Machinery Economic Cost Estimates For Late 2005." W. Lazarus, Extension Economist – Farm Management, Univ. of Minnesota and R. Selley, Extension Farm Management Specialist, Univ. of Nebraska.

"Comparison of energy inputs for inorganic fertilizer and manure based corn production." N.B. McLaughlin, A Hiba, G.J. Wall, and D.J. King. Canadian Agricultural Engineering, Vol. 42, No. 1, Jan/Feb/Mar, 2000.

"Environmental and Economic Costs of Soil Erosion and Conservation Benefits." D. Pimentel, et al. Science Magazine, Vol. 267, February 1995.

"Toward cropping systems that enhance productivity and sustainability." R.J. Cook, Proceedings of the National Academy of Sciences, Vol. 103, no. 49, Dec. 5, 2006.

"Energy Use in Agriculture: Background and Issues." R. Schnepf, Resource, Science, and Industry Division, Congressional Research Service, Nov. 19, 2004.

"Curbing the U.S. carbon deficit." R.B. Jackson and W.H. Schlesinger, Proceedings of the National Academy of Sciences, Vol. 101, no. 45, Nov. 9, 2004.

"Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels." J. Hill, E. Nelson, D. Tilman, S. Polasky, and D. Tiffany, Proceedings of the National Academy of Sciences, Vol. 103, no. 30, July 25, 2006.

"The Trade-Off between Field Losses and Drying Costs." Michael Schmitt, Extension Agronomist, University of Minnesota, August 1987.

2. Conversion value used for Gallons Diesel Fuel Equivalent was 147 MJ.

3. Energy consumed in grain drying was derived from ISU Extension Ag Decision Maker worksheet, "Grain Drying Cost Calculator" by William Edwards.

4. Conversions for LP and Kwh to GDFE are 95,500 BTU/gal and 13,900 BTU/kwh respectively.

NOTE: The conversion used for LP is 95,500 BTU/gal. This represents the enthalpy or heat of combustion of LP and not the Primary Energy (which includes enthalpy plus energy consumed in extraction and delivery to the point of use.)
Likewise, the diesel fuel consumed in field operations is reflected only as enthalpy on the summary sheet and does not reflect the energy used in it's extraction, manufacture, and transport.

5. The indirect energy value of manure was assumed to be zero since it is a waste byproduct of livestock production.

A more precise way to account for the energy content of manure could factor in the energy efficiency of the livestock production facility, the amount and type of feed used or imported to the facility, and calculate an energy credit based on the GDFE values for N, P, & K in fertilizer.