



DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Joint Committee on Energy, Senate and House Committee on Agriculture, Forestry and Economic Development, on Arkansas Agricultural Energy Use

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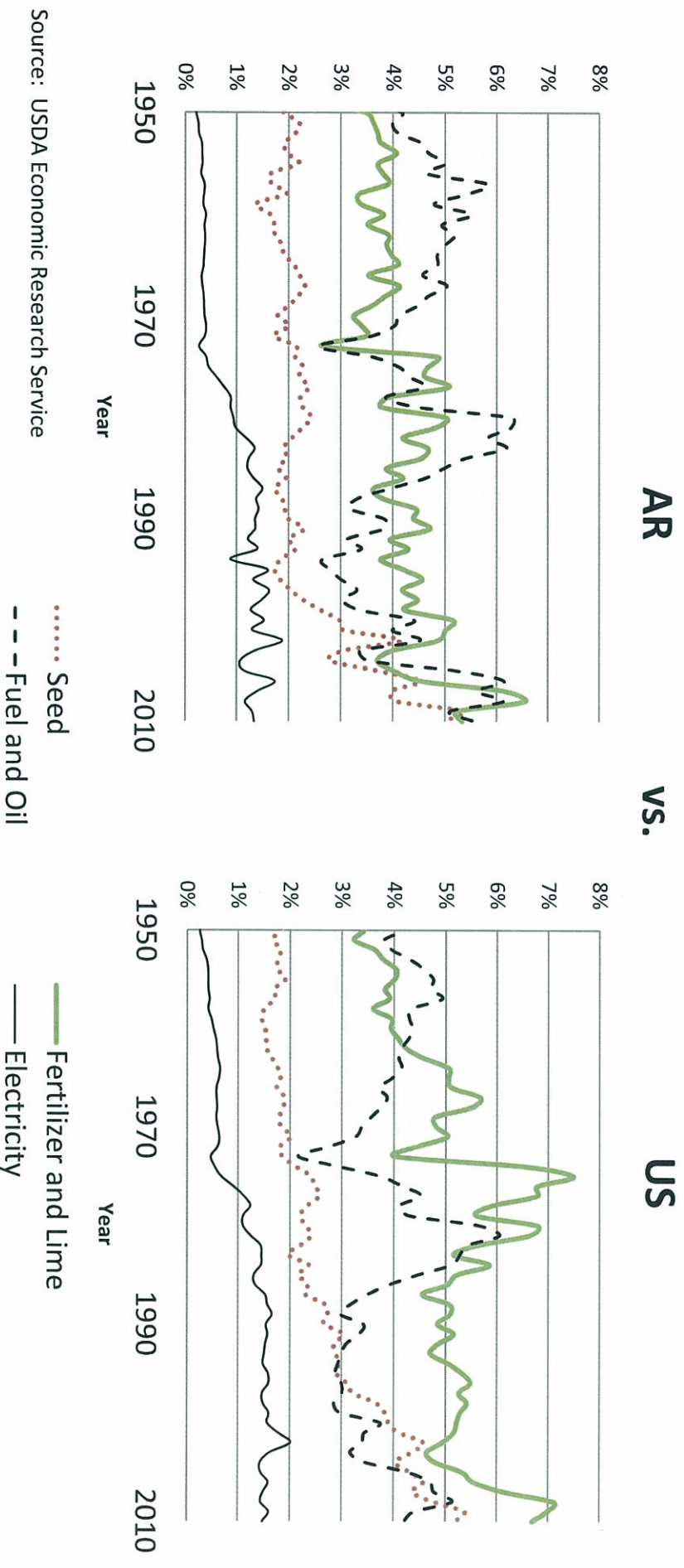
Dr. Terry Siebenmorgen, Dr. Christopher Henry,

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Outline

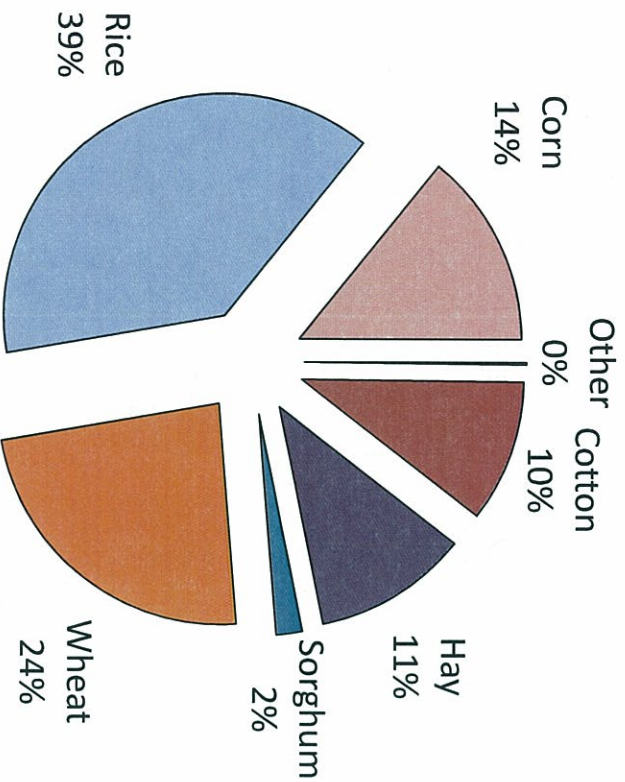
- Relative importance of fuel & oil, fertilizer & lime, seed and electricity (AR vs. US)
- Breakdown of nitrogen fertilizer use by crop by county across the state (modeling land use choice and GHGs)
- Breakdown of electricity, fuel & oil, fertilizer & energy use for 2006 – 2010 from USDA ARMS data by farm type
- Price comparison across fuel types
- Division work that relates to energy

Relative Importance of Seed, Fuel and Fertilizer Expenditures as Percent of Total Cash Farm Receipts (1949 – 2010, US vs. AR)



- Electricity and seed gaining in importance
- Fertilizer and lime play a greater role in US than AR... likely because of corn and wheat
- Fuel and oil play a larger role in AR than US... likely because of irrigation
- Similar story with using farm cash expenses rather than farm receipts (excl. gov't payments)

Breakdown of N Fertilizer Applied by Crop Excluding Pasture in AR

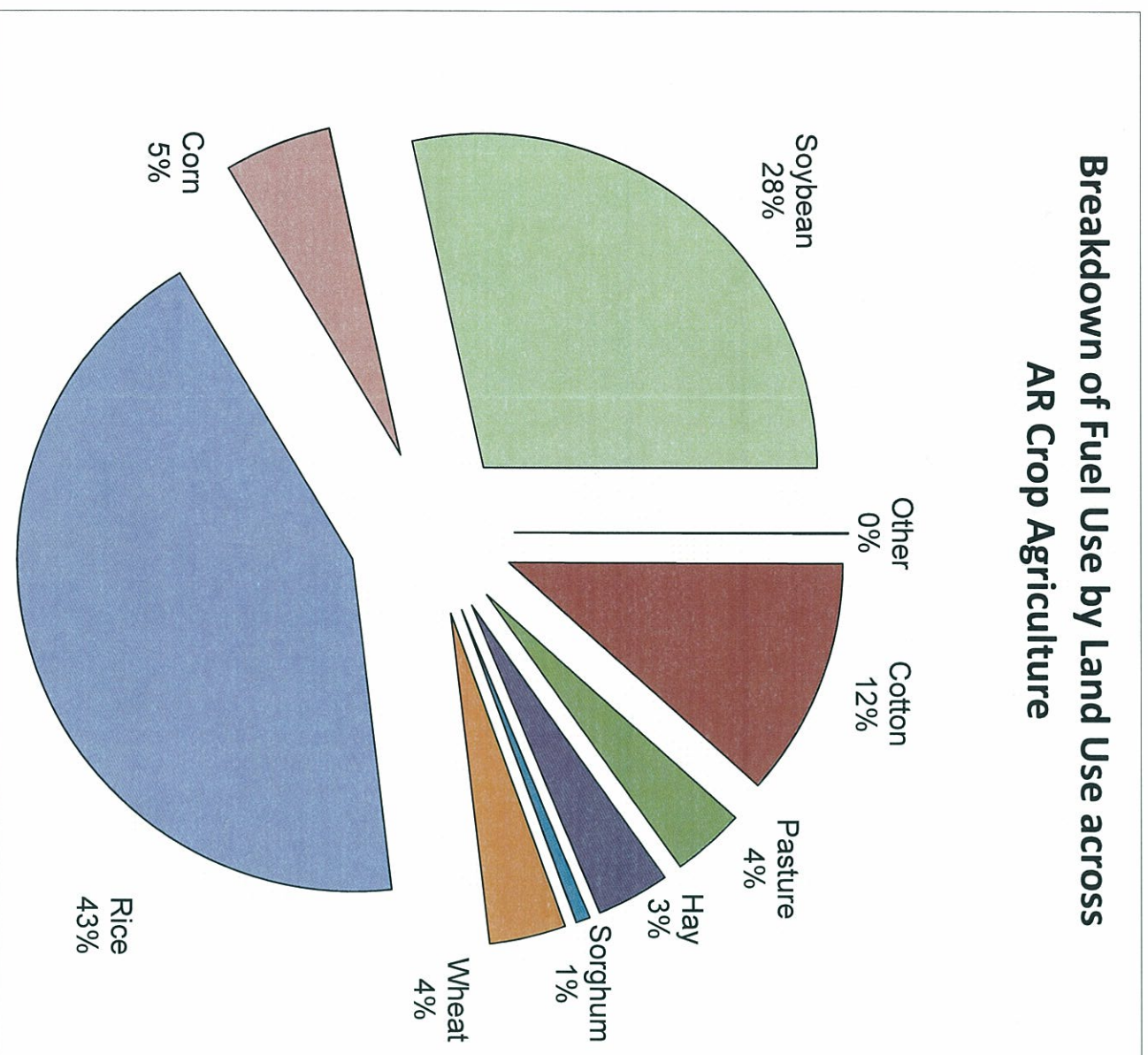


Total N use to the farm gate using 2008 information is 666 Million lbs of actual N excluding pastures. Pasture would add approx. 75 MM lbs of N but may be supplied by litter.

- Energy equivalent in gallons of diesel is calculated by multiplying 1 lb of actual N by 0.125 gal of diesel
- 666 MM lbs of N = 83.25 MM gal of diesel or approx. 51% of estimated diesel fuel consumption to farm gate
- Irrigation fuel use, assuming all irrigation is applied by diesel powered pumps, state wide makes up 54% of fuel use to farm gate. This varies by county from 6 to 64%.
- Excludes drying, ginning, transport fuel use and electricity

Est. crop acreage in millions by crop using 5-yr avg. prices and input costs: Rice -- 1.52, Cotton -- 0.73, Beans -- 2.7, Corn -- 0.4, Wheat -- 1.0, Sorghum -- 0.1, Hay -- 1.4, Pasture 3.85

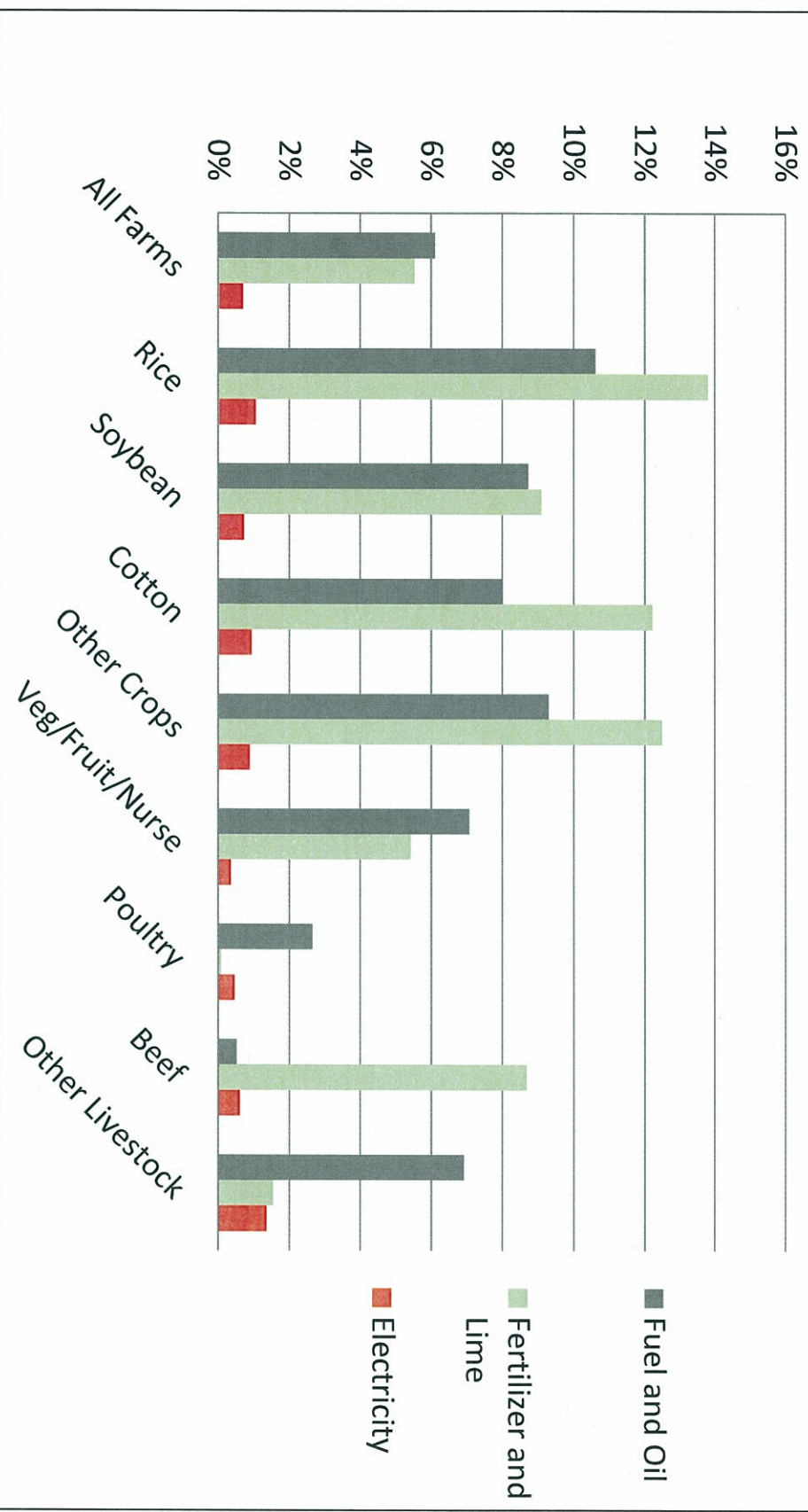
Breakdown of Fuel Use by Land Use across AR Crop Agriculture



- Based off same land use allocation using 5 yr average prices and cost and all irrigation modeled using diesel fuel
- Pasture fuel includes establishment & maintenance of forage only... no livestock activities
- Excludes drying, ginning, transport fuel use & electricity

Source: Popp and Nalley, Crop Ag Model (5 yr avg.)

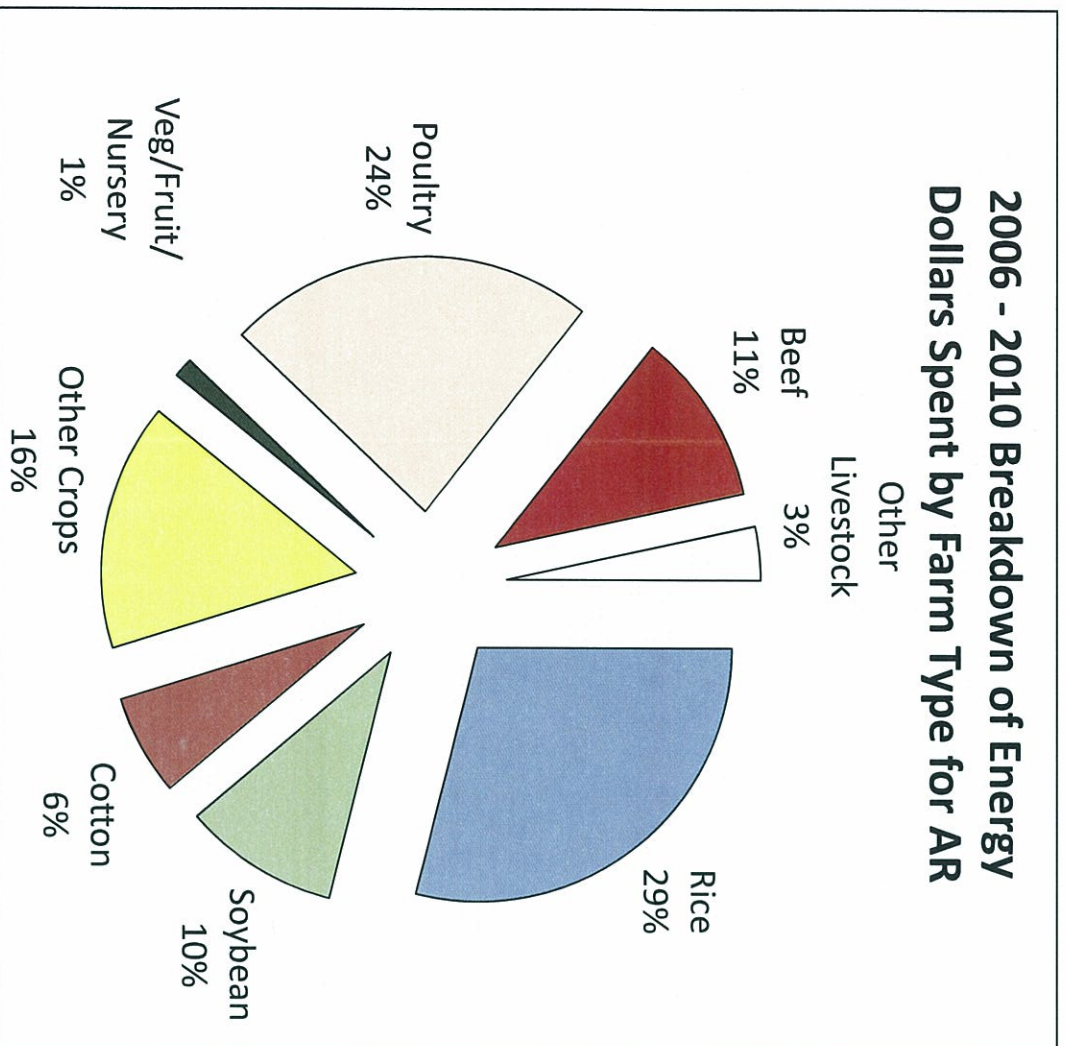
Breakdown of Energy Expenditures by Farm Type as % of Farm Sales, 2006 - 2010 Average, Arkansas



Source: USDA Agricultural Resource Management Survey data

- Crop operations rely more heavily on energy & energy related products
- Livestock operations vary significantly in expenditure breakdown

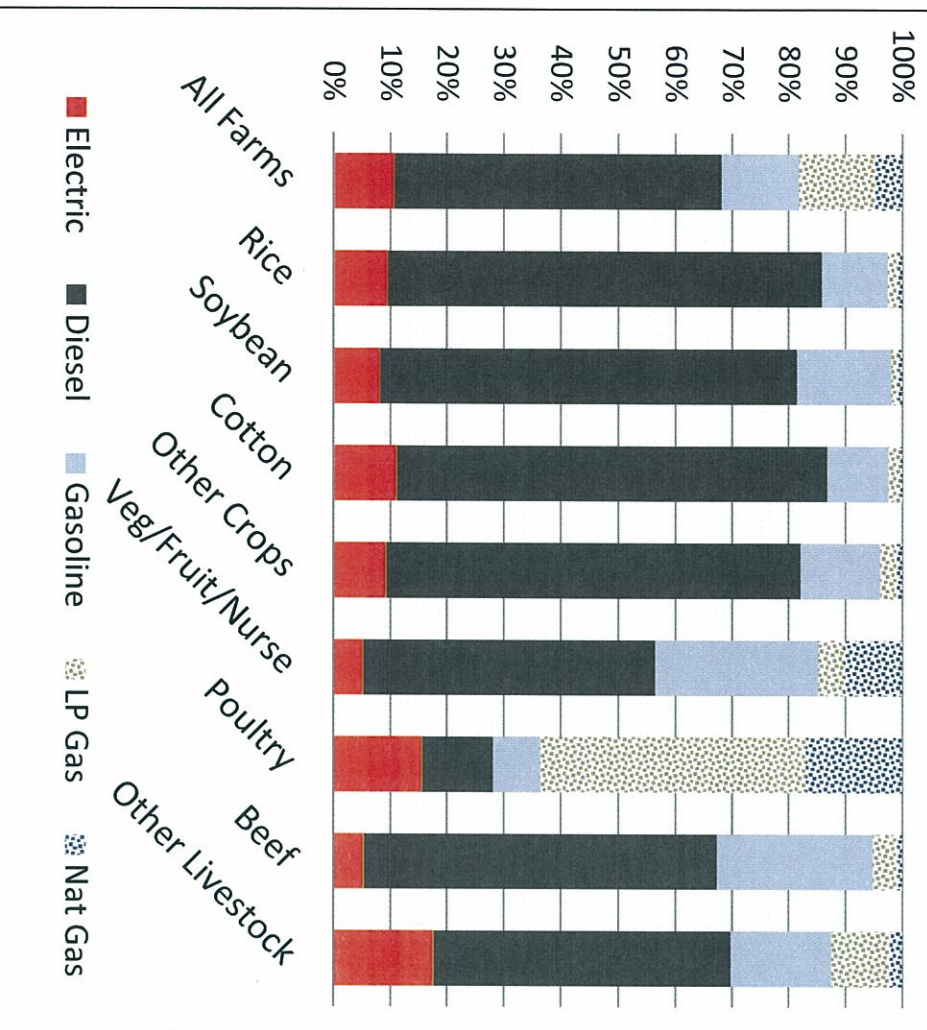
2006 - 2010 Breakdown of Energy Dollars Spent by Farm Type for AR



Source: USDA Agricultural Resource Management Survey data

Statewide and to the farm gate, again, crops use more energy than livestock.

Source of Energy by Farm Type as % of Total Electricity, Fuel and Oil, 2006 - 2010 Average, Arkansas

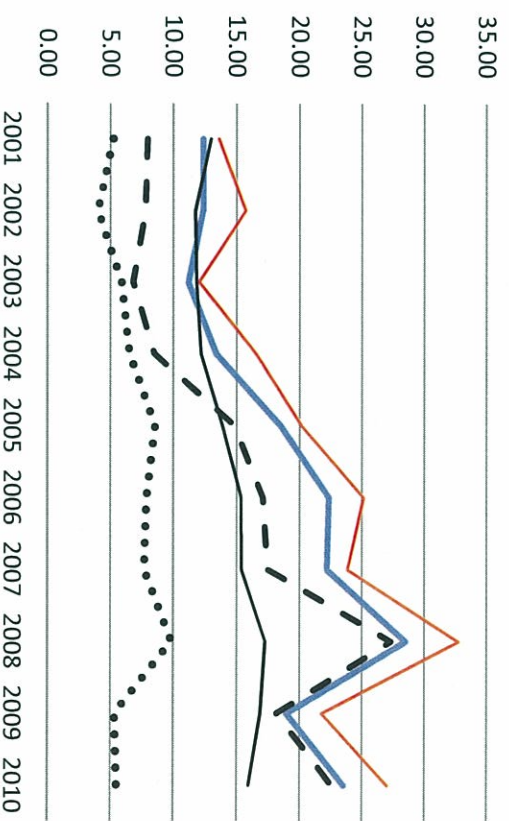
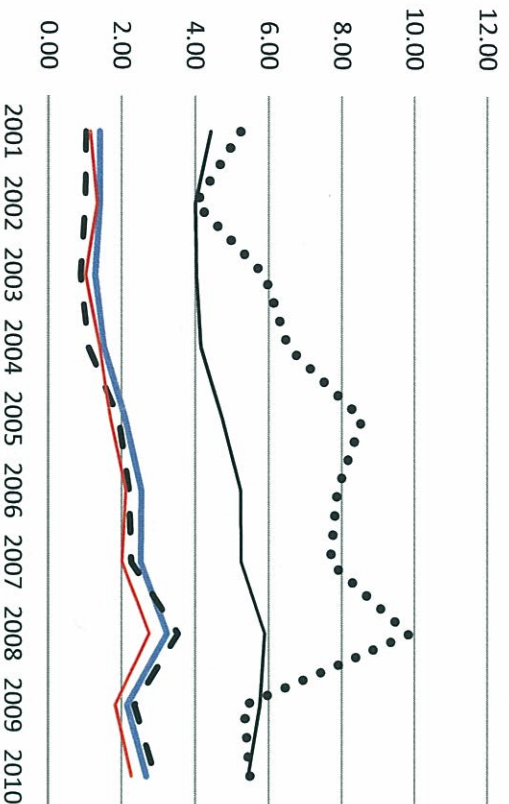


Per farm type and total electricity and fuel & oil use, the most important energy source for poultry is LP gas and Nat Gas.

Crop farms rely most heavily on diesel fuel.

Other Livestock (Dairy and Hogs) and Poultry rely most heavily on electricity.

Nominal AR Energy Prices in Conventional & \$ per MM BTU



- While natural gas is relatively cheap infrastructure is capital intensive
- LP gas, natural gas and electricity prices vary significantly across location

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- Evaluate resource use efficiency (Rice, Cotton, Cattle, Soybean, Other Crops – identifying and measuring input use efficiency)
 - Total energy use per acre or per head is important but energy use per bushel or per lb of gain often justifies greater total energy use
- Energy audits (Poultry house lighting and heating efficiency)
 - LED lighting programs have saved 17.9 MWh annually or \$1.5 MM
 - Variance in heating needs across houses suggest potential for energy savings
- Irrigation pump efficiency (fuel vs. electric and pumping strategies)
 - Fuel vs. electric
 - Late season efficiency – intermittent vs. continuous pumping
- Alternative renewable fuels
 - Switchgrass, Miscanthus
 - Energy production and nutrient recycling
- Grain drying and milling
 - on farm drying can be more efficient in terms of BTU/lb of water removed and is being designed with milling effects in mind

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- Biofuels evaluations and education
 - Biodiesel myths vs. facts
 - Blending bio-oil with fuel
- Corn genetics
 - Lower enzyme cost
- N,P, K uptake work of biomass crops
 - Drought tolerance and harvest timing effects on nutrient uptake and yield
- Soil nitrogen testing innovations and modified recommendations +primarily for rice
- Forestry
 - residue potential as alternative renewable fuel
 - intercropping SRW crops with switchgrass
 - small scale harvesting, storage and logistics