ENERGY EFFICIENCY ON FARMS

Panel 1 - Innovative solutions to improve energy efficiency on farms

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Background

- Delivery of food to EU citizen accounts for **17%** of the EU's gross energy consumption (JRC 2015)
- Agriculture accounts for **33%**
Energy inputs open-field agriculture EU-27

- Indirect energy (Fertilizer) biggest contribution to EU energy use in agriculture.
- Diesel use 31%
- Other: irrigation, drying, cooling

Paris et al. (2022)
Total energy inputs for selected open-field crops EU-27

Paris et al. (2022)
Energy use in EU Dairy Production

- **Feed** most important driver for energy use
- Performance (milk yield per cow) most important driver for energy efficiency

Golaszewski et al. (2012)
Key aspects of energy efficiency

1) animal products

- Energy efficiency of crops 6 to 12 times higher compared to animal products.

**Bar Graph:**
- Energy efficiency (MJ out/MJ in)
- Crops (Cereals, pulses)
- Pork
- Dairy milk
- Beef

Benoit & Mottet (2023)
Key aspects of energy efficiency

2) Nitrogen

- N-Input necessary to feed the world population
- Main driver of energy input
- Is green ammonia the solution?

N Fertilizer production world-wide

Source: own calculations, according to Dawson & Hilton 2011, IFA 2020
Innovative Solutions
Precision Farming

- Adjusted fertilizer rates according to soil conditions
- Adoption by farmers: low
- Profitability: low
- Calculated fertilizer rates do not take into account prices
Innovative Solutions
Adjustment of N fertilizer level

- High fertilizer prices justify **reduced fertilizer** levels
- Especially with increased uncertainty of weather conditions

Crop yield (Mg/ha) vs kg N/ha for Canola 2018, Brandenburg, N price 1-3€/kg N
Digital tools and technologies

- Robots can reduce fuel use (lighter machines, use of solar power)
- Limited to rather light works
Biogas from manure as fuel

- Energy „losses“ from animal husbandry systems can be used as fuel for tractors

Photo: A. Meyer-Aurich, ATB
Agri-photovoltaik

Use of agri-photovoltaik, especially when there are win-win situations

Photo: C. Kammann, HS Geisenheim. Project VitiVoltaic with funds from EFRE (APV-Weinbau4Real), EFRE-REACT, Hessisches Ministerium für Umwelt, Klimaschutz, Landwirtschaft und Verbraucherschutz (VitiVoltaic4Future)
Crop storage: Cooling - Drying

- Dimensioning of fans and apple boxes can save 10-20% of storage energy use

Scaar, 2017
Conclusions

- Innovations improve energy efficiency
- Innovations should be aligned with regulation, especially
  - in fertilizer management
  - spatial allocation of livestock industries

Thank you

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References

- Scaar, H. Working material. ATB