Future Fuels in UK Agriculture - Report Summary

Introduction

UK agriculture faces increasing pressure across the supply chain to decarbonise and replace fossil fuels, notably, subsidised red diesel. This transition is impeded by a lack of coherent policy support and the high cost of alternative technologies.

A 2024 study, commissioned by Northern Gas Networks, conducted by Cenex and RASE, explored the technical and economic potential for gas fuels in farming applications. The replacement of fossil fuels is crucial for meeting national sustainability targets and strengthening rural energy security.

The farming sector's reliance on heavy machinery and long operating hours means it is often excluded from national policy measures supporting fuel transition in other sectors, necessitating a tailored approach and clear guidance. **Link to Future Fuels in Agriculture report - https://farmofthefuture.co.uk/latest-reports/**

Alternative Fuels for Farm Vehicles

The ability to deploy clean fuel alternatives is currently limited by cost, suitability for demanding operations (like high torque and off-road capability), and inadequate infrastructure.

Alternative Fuel	Suitability & Benefits	Constraints & Challenges
Biofuels & Biomethane (BioCNG)	Adoption ready for internal combustion (IC) engines. BioCNG offers significant Greenhouse Gas (GHG) emission reductions (over 80% reduction in CO2 per kWh vs. diesel). Can be produced on-farm with anaerobic digestion (AD) of bio-resources like slurry.	Less than 5% of UK cow slurry goes to anaerobic treatment. Widespread adoption requires investment in off-grid supply and refuelling infrastructure.
Electric Powertrains (BEV)	Suited to smaller applications, robotic systems, or controlled environments (e.g., protected horticulture).	Limited by battery weight, energy density, and poor rural power grid constraints. Not generally suitable for high-horsepower tractors and long operating hours.
Hydrogen (IC Engines & Fuel Cells)	Green hydrogen has potential for on-farm use. Hydrogen IC engines (e.g. JCB) can match diesel efficiency and produce minimal NOx emissions, with a lower re-engineering cost than BEV/Fuel Cells.	Rural deployment is currently constrained. Infrastructure and supply chains need development. Investment in off-grid green hydrogen production from on-farm electrolysis is required.
Hybrid Systems	Use energy from solar, wind, and biofuels to create flexible, low emission solutions.	Viable option but avoid negative environmental trade-offs.

Decarbonising Rural Heat

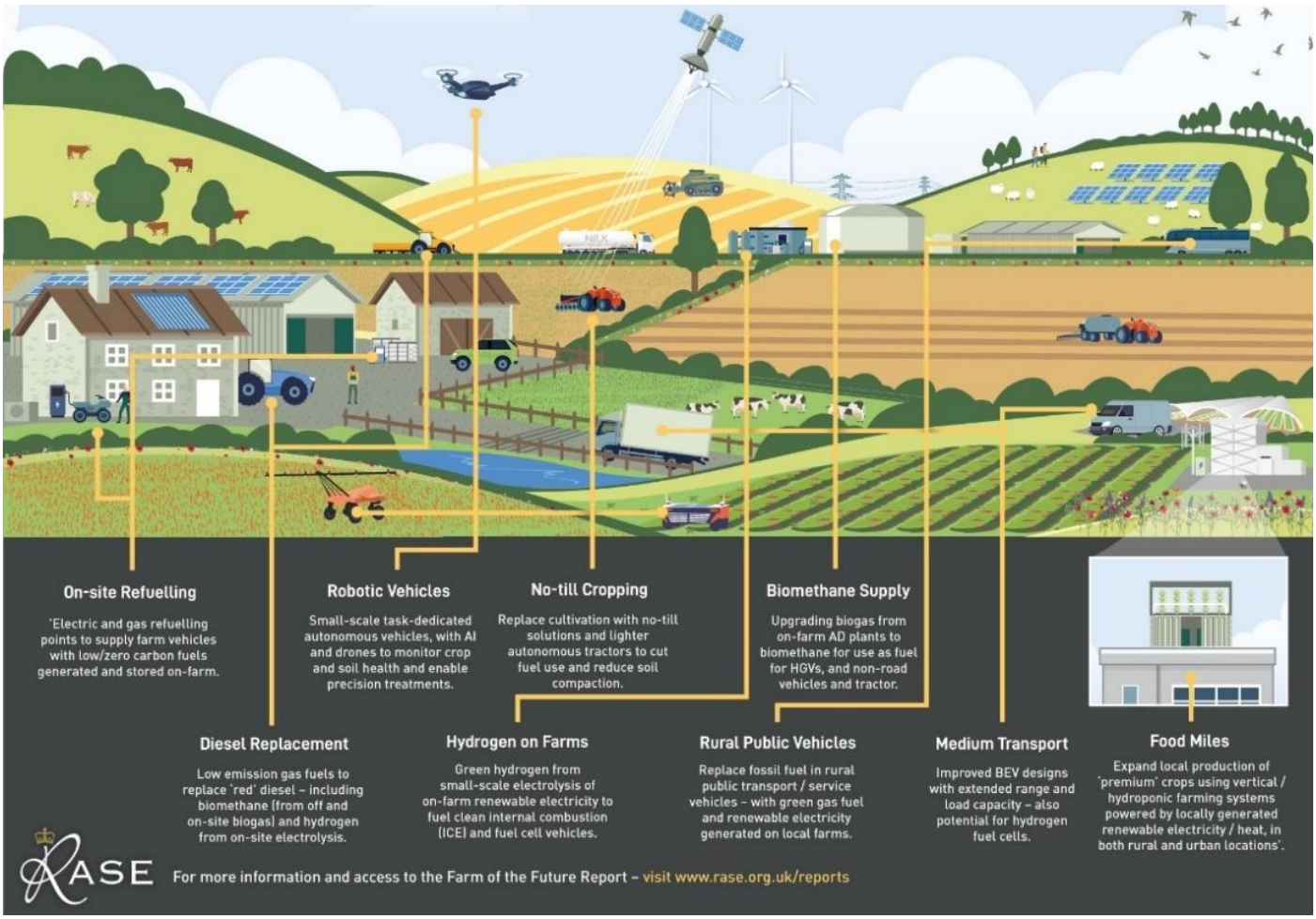
Options for decarbonising on-farm heat in housing, processing, horticulture, and crop drying include:

- **Biomass boilers:** Sustainable if locally sourced, though with some air quality concerns.
- **Heat pumps:** Efficient but require high upfront investment and use power in winter.
- **CHP systems (biogas/biomethane):** Efficient for co-generating both heat and electricity.
- **Off-grid hydrogen:** Could contribute to rural energy resilience with smaller, modular systems.

Future Fuels in UK Agriculture - Report Summary

Strategic Path and Policy Recommendations

In the medium term, replacement of fossil fuels will require the continued use of Internal Combustion (IC) engines on clean fuels. BEVs are not yet viable for heavier vehicles. A range of systems, including biofuels, gas IC engines (BioCNG and hydrogen) and electrification (where possible), will be needed. This requires a strategic approach that accounts for farm diversity, size, and rural economic constraints.



Key Strategic Needs:

- **Policy Roadmap:** clear plan for red diesel phase-out and support for clean fuel alternatives.
- **Infrastructure:** for rural gas supply / refuelling, including virtual pipelines and off-grid storage.
- **Data:** better energy use, emissions & fuel efficiency data required to guide policy framework.

Policy Recommendations:

1. **Subsidy Reform and Farm Support:** Introduce low-interest loans, grants, and tax breaks to support farmers in transitioning away from diesel by investing in on-farm generation.
2. **Decentralises Energy Hubs:** on-farm clean energy hubs, integrating rural production into UK energy planning. Requires dedicated support for off-grid BioCNG and hydrogen production.
3. **Innovation and Demonstration:** Increased R&D funding for rural low-carbon powertrains and establish demonstration sites for IC options, BEVs, and fuel cells.
4. **Regulatory Flexibility:** Greater policy recognition for small, modular biogas plants and covered slurry lagoons to capture methane as a fuel source - currently discouraged by slurry regulations.
5. **Avoid Inflationary Policy:** The transition must avoid forcing low-margin businesses to adopt novel, highly inflationary technology that could undermine food security.
6. **Better Data and Training:** Add energy use tracking and benchmarking to the annual farm survey and fund training and provide rural advice on alternative energy options.