Transition Tool

This Transition Tool is aimed mainly at farmers and agricultural advisors in Europe. It brings together resources to help explore ways to introduce renewable technologies (mainly agrivoltaics and the production of biogas) onto farms.

Why consider integrating food and renewable energy production on your farm?

Integrating food and energy can bring a wide range of benefits to farms;

- Financial benefits through diversifying income streams and providing energy security
- Environmental benefits through reducing greenhouse gas (GHG) emissions and fossil fuel use
- Societal benefits through generating job opportunities for skilled workers in the rural economy.

There are many ways which food and energy production can be integrated on farmland and, depending on the technologies used, integration could benefit crops and farmland soils, and potentially enhance the circularity of farming systems.

There are also benefits to local, regional, national and global communities through production of renewable energy, including reduced reliance on fossil fuels, reduced GHG emissions, and improved energy security while still maintaining food production.

How to use this Transition Tool

Before you start, take a minute to think about why you are considering adopting renewable energy technologies on your farm. How might it benefit your farm? What challenges can you see to introducing it? Have you considered what type of renewable energy generation you might use?

This could help you to get started in answering the questions this transition tool poses to aid your decision-making.

This tool contains three main sections:

1. A series of checklists of factors you will need to consider if introducing renewable energy generation, agrivoltaics or biogas production on farm
2. Case studies of how agrivoltaics or biogas production have been used on farm. These case studies are based on modelling, simulations or examples of how the technology has been used on farms across Europe
3. A partial budgeting tool to help explore the costs and incomes associated with the Agrivoltaics and Biogas technology and the financial impact on your farm.

To get you started:

Before you look at the Transition Tool you might want to:

- Complete the on-line course that discusses integrating energy and food production, see *https://www.futurelearn.com/courses/integrating-food-and-energy-production-on-farmland*
- If you haven't already, use the Value4Farm Audit Tool to evaluate your farm situation and explore whether renewable energy production via agrivoltaics, biogas or both is of interest
- Undertake an energy audit of your farm – where is energy used, what type of energy and when is the highest energy usage
- Build a detailed farm map – look at both topography and crop locations, do you use any precision farming technologies that could support you to do this?
- Ensure your budget / accounts are up-to-date, this could support you when considering where benefits and costs might be incurred
- Have a local area map – to help you consider planning, connections to national energy grids, access points during construction works, and explore how renewable energy technologies could impact on the local landscape
- Does your farmland contain, or is it close to, any conservation areas (see for example *Natura2000,* the *Bern Convention and Emerald Network,* and the *European Nature information System*) that could impact on land use and fertiliser or pollution controls?
- Explore if there are any regulations (e.g. CAP rules) relating to crop production or land use you will have to adhere to

To support you with these:

You might find the following websites useful sources of information and resources around farming and renewable energy generation:

- *CAP at a glance - Agriculture and rural development - European Commission*
- *EU FarmBook*
- *DiverIMPACTS (Diversification through Rotation, Intercropping, Multiple Cropping, Promoted with Actors and value-Chains towards Sustainability)*
- *AKIS (Agricultural Knowledge Innovation Systems) - EU CAP Network*
- *FiBL - Research Institute of Organic Agriculture*
- *HyPErFarm*

You may also want to discuss your initial ideas with a farm advisor or extension agent.

Some terms used in the tool:

Agrivoltaics - the combining of solar panels to generate electricity with agriculture – arable, horticulture or livestock. Agrivoltaic systems are designed and built to enable farming and producing food to occur simultaneously with energy production. These systems differ from conventional solar farms in which electricity is usually the sole output from the land area.

Biogas, Biomethanation, Anaerobic digestion – through the process of anaerobic digestion, organic matter is broken down in an oxygen free environment. In a controlled environment (e.g. an anaerobic digestor) this process can use a range of organic wastes (such as food waste, crop residues and livestock waste) to produce biogas and nutrient rich digestate. The biogas can be used, within a combined heat and power unit (CHP), to produce heat and electricity or further refined to produce biomethane which can be used as an alternative to natural gas. The digestate (which can be solid or liquid) can be used as fertiliser or soil improver.

Feasibility study – explores various aspects of a farm including topography, soils, climate, location, crops, yields, and how these could impact on the feasibility of your farm as a suitable location for renewable energy technologies. An example feasibility study can be found here - *Agrivoltaics-Feasability-Study-Stephen-Briggs.pdf*

Environmental impact assessment – a process that evaluates the potential environmental risks a project could cause. It aims to identify risks and suggests mitigation measures that may be required for larger scale projects or projects in conservation areas.

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