

# Energy efficiency

## Integrated Farm Management

Efficient energy use can reduce a farm's carbon footprint. An IFM approach could include:

- Auditing energy consumption to identify patterns and areas for improvement.
- Planning and managing farm operations to optimize fuel efficiency.
- Installing renewable energy sources like solar panels or anaerobic digesters.

### Examples of sustainable energy sources

**Biomass** - converts organic materials into energy, reducing landfill waste.

**Hydrogen fuel cells** - generate electricity from hydrogen and oxygen without emitting greenhouse gases.

**Geothermal energy** - is heat that comes from deep inside the Earth. We can use this heat to make electricity or to warm buildings.

Renewable energy sources, like sunlight, wind, and water, are great because they don't run out like fossil fuels do. They don't pollute the air like coal or oil and using them creates jobs and helps our planet. But sometimes, they bring challenges. They don't always work when we need them, like when the wind isn't blowing, or the sun isn't shining. Also, setting up renewable energy systems can cost a lot at first, and they might take up a lot of space. So, while they're great for the environment, they have some challenges.

Understanding the benefits and limitations of each renewable energy source is crucial, so that we can decide which is the best energy source for us.

### **Solar power**

| Advantages                                                                                                                                                                                       | Disadvantages                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sun power is endless and clean, producing no pollution. It is easy to maintain and has low operating costs. It is possible for sheep to graze underneath some panels. Panels also provide shade. | Energy production changes according to weather conditions, particularly in places Wales where sunlight varies significantly between seasons. Not all fields of solar panels can also be used for food production. |

## Wind power

| Advantages                                                                                | Disadvantages                                                                                                                                         |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Can be built on land and sea, bringing economic benefits to the area as jobs are created. | Construction of wind turbines creates carbon. There is a debate regarding their visual impact. During calm weather periods energy production may dip, |

## Hydroelectric power

| Advantages                                                                                                                            | Disadvantages                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Uses flowing water, which is a constantly replenished resource. Reliable and long-lasting, with some systems helping to store energy. | The construction of dams and barrages may seriously affect local environments through flooding. It could also affect habitats, such as where <i>wading birds</i> feed or <i>fish</i> spawn. |

## Biomass

| Advantages                                                                                                              | Disadvantages                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Relies on organic waste materials, which is readily available in every household. Reduces pollution and landfill waste. | Releases low levels of greenhouse gases such as methane. May compete with wildlife for land or food production. |

## Hydrogen fuel cells

| Advantages                                                                                                                                                                                | Disadvantages                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| They use fuel more efficiently than traditional engines, getting more energy from the same amount of fuel. They produce zero emissions, only water vapour and heat, causing no pollution. | Production of the cells may initially rely on fossil fuels. Hydrogen fuel cell technology is currently expensive to produce. Maintaining and storing the cells safely can be problematic. |

## Geothermal energy

| Advantages                                                                        | Disadvantages                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Since the heat comes from within the Earth, it's always available for use.</p> | <p>Geothermal power plants need hot rocks or water near the Earth's surface, and these are not found in every location. Alternative sources of heat can be found underground, but a large area is required.</p> |

