Chemicals (1 of 3)

FUNGICIDES

A fungicide is a chemical that is applied to kill fungi. When fungicides are applied they are used to treat the whole crop. A range of different crops are treated with fungicides, for example winter barley.

Fungicides are generally applied as a preventative measure than as a treatment method. They are the most widely used pesticide in Scottish agriculture.

HERBICIDES

A herbicide is a pesticide used to control unwanted plants eg. weeds and is also called a weed killer.

In agriculture as well as being used for general weed control, herbicides can be used to target specific weeds that are a particular problem – for example, meadow grass, couch grass and volunteer cereals (the wrong cereal in the crop).

INSECTICIDES

An insecticide is a pesticide used to control insects. In agriculture there are a range of pests that can significantly reduce the yield of crops.

The use of insecticides is increasingly being targeted towards specific insects, to ensure helpful insect populations are maintained. For example, the following insects are targeted when using insecticides on oilseed rape – aphids, cabbage stem flea beetles, pollen beetles and flea beetles.

In wheat, aphids, leatherjackets and leaf miners are some of the different insects targeted.


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Chemicals (2 of 3)

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GROWTH REGULATORS

A growth regulator is a chemical used to regulate the growth of the plant, for example to prevent the crop from growing too tall or to suppress the growth of sprouts by potatoes in store. If plants grow too tall they are prone to falling over when wet. This is called lodging.

ANTIBIOTICS

Antibiotics are drugs used to kill harmful bacteria and to cure infections. Animals do get ill and just like humans can be prescribed drugs from the vet. The withdrawal period for medicine residue must be respected before the animal enters the food chain.

FERTILISERS

Fertilisers are chemicals or natural substances that are added to the soil to increase its fertility (nutrient level). Natural fertilisers include manure and slurry (animal faeces). The most common fertilisers contain N, P and K – Nitrogen, Phosphorus and Potassium (potash). Different fertilisers have various chemical compositions and there are different fertilisers for different crops.

BENEFITS

Agricultural chemicals increase the volume of food farmers can produce. They achieve this by reducing competition and/or providing extra nutrition for the plant/animal.

Harvest index = dry mass of harvest component/total shoot dry mass

The harvest index quantifies the yield of crop versus the amount of biomass. Fertilisers and breeding both contribute to higher harvest index.

POTENTIAL ISSUES

There are a number of issues associated with using chemicals:

- Beneficial insects can be affected by pesticides and the effects can be concentrated the further up the food chain. The natural balance is also affected.
- Chemicals can move, for example through leaching out of the soil into other environments.



Chemicals (3 of 3)

RHET QMS

SOLUTIONS/ALTERNATIVES

A number of solutions are being implemented to reduce/remove the issues associated with using chemicals in agriculture

Organic farming – In organic farming, artificial chemical fertilisers are prohibited – instead organic farmers develop a healthy, fertile soil by growing and rotating a mixture of crops, adding organic matter such as compost or manure and using clover to fix nitrogen from the atmosphere.

Pesticides are severely restricted; instead organic farmers develop nutrient-rich soil to grow strong, healthy crops and encourage wildlife to help control pests and disease.

Animal welfare is at the heart of the system and a truly free-range life for farm animals is guaranteed.

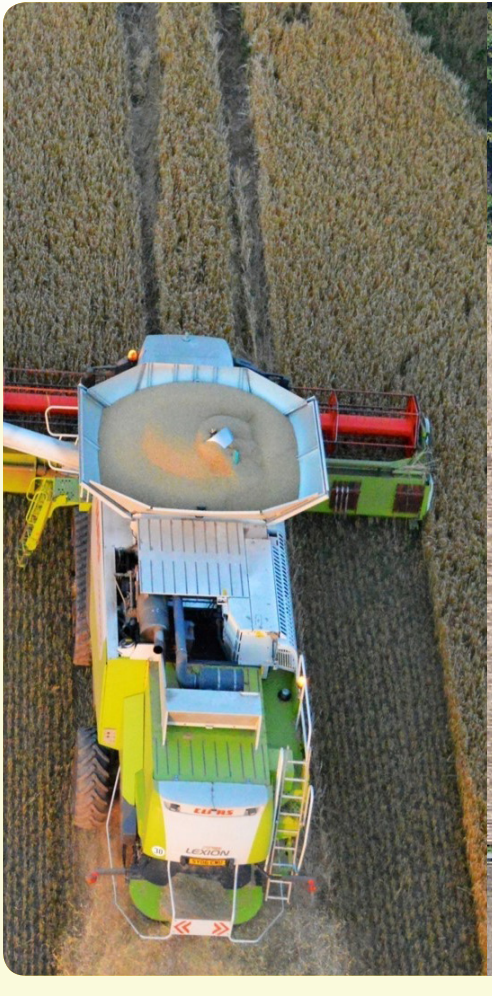
Where a diversity of crops and animals are raised on the farm (mixed farming) they can be rotated around the farm over several seasons. Mixed farming systems are not as common as they used to be and often include fallow (no growing) periods. This mixed farming approach helps break cycles of pests and disease and builds fertility in the soil.

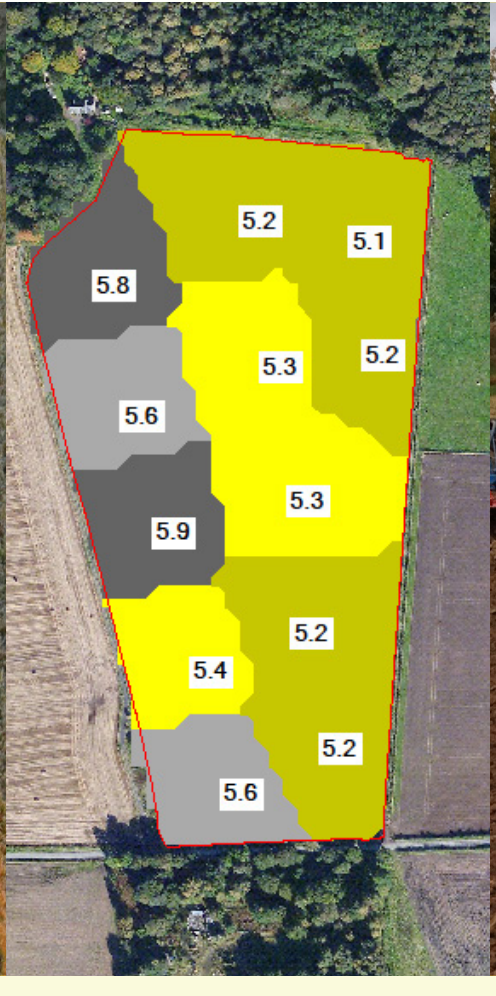
The routine use of drugs, antibiotics and wormers is banned; instead the farmer will use preventative methods, like moving animals to fresh pasture and keeping smaller herd and flock sizes.

Ecological Focus Areas (EFAs) – farmers create areas on the farm, for example beetle banks, skylark plots and wildlife strips to provide habitat for beneficial species. These species help keep the problem species in check, for example ladybirds in beetle banks eat aphids which then reduces the need for insecticides.

Targeted application – increasingly farmers are using technology to target chemical usage. One example involves mapping fields to find out how the soil varies. When the level of nutrient in the soil is known this enables to farmer to reduce the volume of fertiliser spread. This reduces run off from the field and means that more of the fertiliser is used by the plants.

Green manures – these are crops which are ploughed into the soil once they have finished growing. This helps improve the health of the soil and reduces the need for applying fertilisers.

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Case Study Science & Farming (1 of 2)

RHET QMS

TECHNOLOGY USAGE

The famer uses geographical positioning systems (GPS), soil mapping, store monitoring, yield mapping and variable rate inputs. The aim of using the technology is to increase output and reduce costs.

WHAT IS MAPPED ON THE FARM?

The farmer maps field boundaries, the soil, nutrients, pH and drainage.

- Field Boundaries and Ecological Focus Areas are mapped using handheld GPS
- Soil Maps are mapped by a contractor who does a detailed electrical conductivity survey
- Nutrient & pH maps are mapped by a contractor who takes cores from a number of places across a field and analyses the soil

MAPPING AND NITROGEN

When the crop is growing satellite images are used to measure the light reflected from the crop canopy. The colour determines how much extra nitrogen the leaves require. The farmer can then target different coloured areas with different amounts of fertiliser. This saves money and helps reduce wastage.

AUTO GUIDE SYSTEMS

Auto Guide systems are satellite linked GPS which detect exactly where the tractor is in the field at any point in time. An A-B line shown on a screen in the cab is used as a guide for the driver to steer and travel across the field in a straight line. More advanced systems can steer the tractor along the A-B line automatically.

The driver firstly drives around the boundary of a field to set the parameters for the start and finish of the parallel A-B lines. The working width of the machinery being used is also programmed in. The system then calculates how far apart to place the A-B lines starting at one side of the field, which is all shown on the screen. With an additional electronic connection to the sprayer or spreader, the system can be made to switch the machine on or off at the end of the parallel A-B line where it meets the boundary line. The advantage of using the system is accuracy and no wastage.


80.6
74.1
79.0
87.0
75.4
93.5
100.3
81.0
85.8
112.8
184.1

Case Study Science & Farming (2 of 2)

RHET QMS

1m² FARMING

Agriculture happens on a large commercially viable scale. To make this more relevant we have brought this down to m^2 level.

Input m^2	Oilseed Rape	Winter wheat	Winter oats	Malting barley
Seed	80 seeds	300 seeds	275 seeds	275 seeds
Pesticide/spray	0.5ml	1.5ml	1ml	1ml
PK fertiliser	30g	30g	30g	30g
Nitrogen fertiliser	72g	58g	37g	37g
Harvest	400g	1kg	750g	750g
What this gives	180ml	1 large loaf	450g porridge	11 pints of beer or 1 bottle of whiskey