Land, Bioenergy & Waste: Farming Yield & Efficiency

This lever controls the sub-levers listed in the table, and ambition levels are for the end year shown on the right hand side. Units of 'Index' are relative to 2015.

Livestock numbers

Livestock are responsible for a large proportion of total agricultural emissions via enteric processes and manure management. Reducing the number of livestock could directly reduce emissions and free up grazing land for other purposes. Changes to diet may lead to less meat eating, switching from red to white meat and meat substitutes, leading to reductions in numbers of some livestock such as cattle and sheep.

Yields

Yield is the output per unit land area (here expressed as an index relative to 2015 yields). UK bioenergy production is dependent on the yield of bioenergy per hectare of land. Yields can be improved by growing crops with higher energy densities or higher dry mass per hectare such as *Miscanthus* and willow.

Improving the yields of livestock grazing land and food crops means less land is needed to maintain the same livestock population and level of food production thus freeing up more land for woodland or bioenergy crops.

Emissions intensity

Farming emissions come from livestock (enteric fermentation and manure), arable land and soil (peatland is not included in the GHG inventory). Farming practices can be employed in order to reduce the emissions arising from these sources. Biofuels provide a way of decarbonising machinery used in agriculture.

Key Interaction

Since there is currently little un-used land in the UK, in order to derive benefit from increasing the ambition level of the Forestry or Biofuels levers, it is necessary to free up land using the Farming Yield and Efficiency lever.

Level 1

There is no change in livestock numbers, yields or agricultural emissions compared with 2015, other than for bioenergy yield.

Level 2

Ambition is 1/3rd of Level 4.

Level 3

Ambition is 2/3rds of Level 4.

Level 4

The numbers of cattle and sheep is reduced by 50% (CCC speculative scenario). Best practices for agricultural efficiency are adopted widely across the sector, such as better nutrient and feed planning, and improved manure management. Plant and livestock breeding improve the efficiency of production through conventional breeding, and in the longer term through gene editing and genetic modification (GM). Advanced fertiliser formulations which incorporate innovations such as nitrification inhibitors become widely adopted in the longer term.

Default Timing Start year: 2020, End year: 2050

Sub-Lever	Units	2015	Level 1	Level 2	Level 3	Level 4
Number of Livestock						
Poultry	Million	167.6	167.6	184.8	202.1	219.3
Cattle	Million	9.9	9.9	8.3	6.7	5.1
Pigs, Sheep & Other	Million	38.1	38.1	33.7	29.4	25.0
Yield Relative to 2015						
Bioenergy yield per unit land	Index	1.00	1.25	1.37	1.48	1.72
Food crop yield per unit land	Index	1.00	1.00	1.12	1.25	1.38
Livestock yield per unit land	Index	1.00	1.00	1.1	1.2	1.3
Agricultural Emissions Intensity Relative to 2015						
Livestock Enteric Fermentation	Index	1.00	1.00	0.93	0.85	0.78
Livestock Manure Management	Index	1.00	1.00	0.95	0.90	0.85
Arable land for food crops	Index	1.00	1.00	0.94	0.88	0.81
Soil Management	Index	1.00	1.00	0.96	0.91	0.87
Agricultural Biofuel Substitution	Share	2%	2%	25%	50%	100%

Agricultural Emissions Intensity Relative to 2015

Legend: Livestock Enteric Fermentation; Livestock Manure Management; Arable land for food crops; Soil Management