07 Mass balances

Taking a further look at mass balances

Farming is a diverse business. Cows, pigs, chickens, grain, all have different needs. Looking at how mass flows through the production cycle, it should be possible to identify the opportunities for better waste use and management.

The classical mass balance concept (inputs and outputs in relation to products) can be applied to agriculture. However, it is important to recognise that the term agriculture represents a phenomenally diverse group of businesses, some of which have few similarities, and others that are intimately linked. The complete mapping of all resource flows to all sub-sectors of agriculture is outside the scope of this study.

Sections 2 and 3 contain detailed information on the inputs and outputs of the various agricultural sectors. This section collates this information to give a clearer picture of the issues for each farming sector.

The major focus of this report is recycling and energy from waste, it is useful, however, to undertake an overview of the elements of mass flow to get a feel for the relative components of important products, and also the particular nuances pertaining to agricultural products.

This is the purpose of the mass balance as in the Biffaward programme.[63]

Information on mass balance within each agricultural sector can be compared to the actual level of product consumption, and allows the relative impact of each business sector to be assessed.

Figure 33 shows the relative UK consumption of agricultural food products. Figure 34 shows the relative feed/fertiliser inputs for each of the main agricultural sectors covered

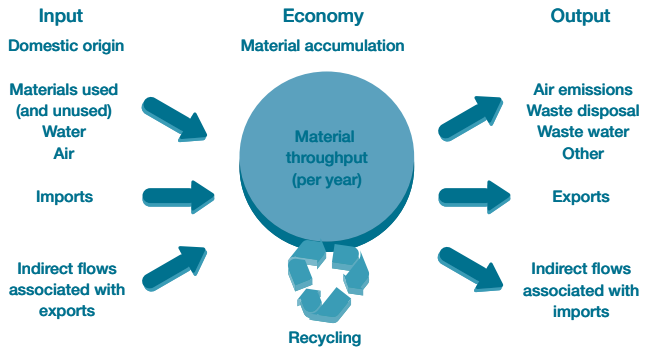


Figure 32: The elements of mass balance.

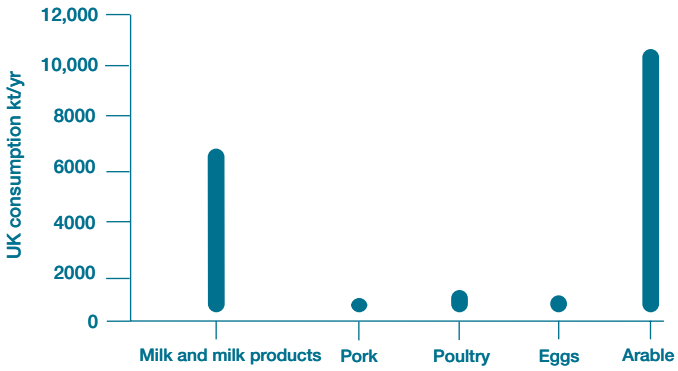


Figure 33: Annual UK consumption by food type.

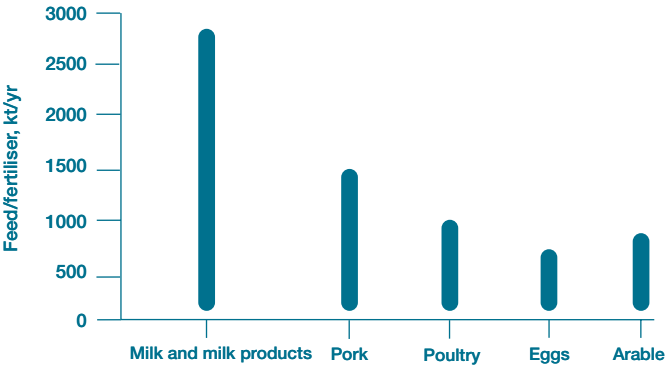


Figure 34: Annual UK inputs by food type.

in this report. Figures 35 and 36 show annual organic and plastic waste production respectively. The mass balance for all food types is summarised in Table 37.

The impact of each sector can be seen by looking at the waste output per kg of product (as shown in Figure 37 and Table 38).

It can be seen that pork production has a high impact in terms of organic waste produced, and egg production results in the highest paper waste production. This identification allows the focus for recycling to be aligned on the most productive wastes in each sector.

Another useful way of visualising the impact of each sector, is to perform specific mass balances for each one, so that the inputs and ouputs involved can be compared to the quantity of end product. Figure 38 shows the individual mass balances for a range of agricultural products.

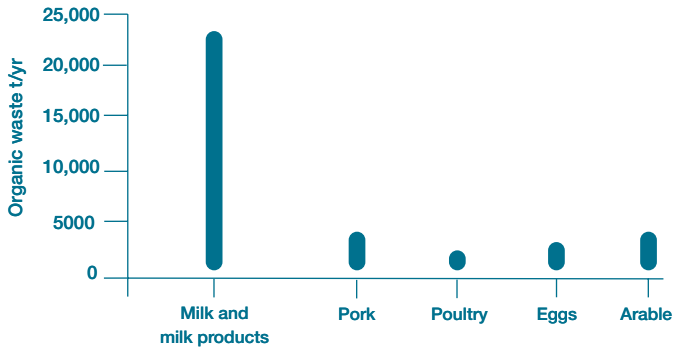


Figure 35: Annual organic waste production by food type.

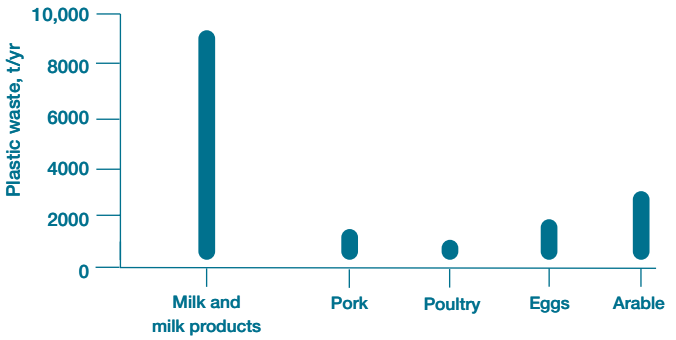


Figure 36: Annual plastic waste production by food type.

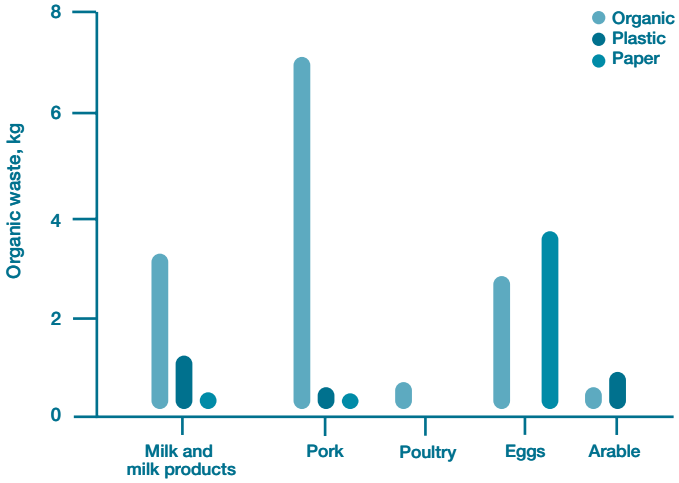


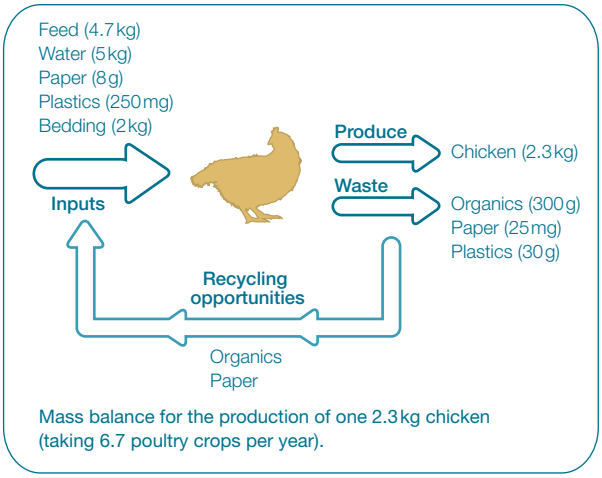
Figure 37: Organic waste production per kg of product.

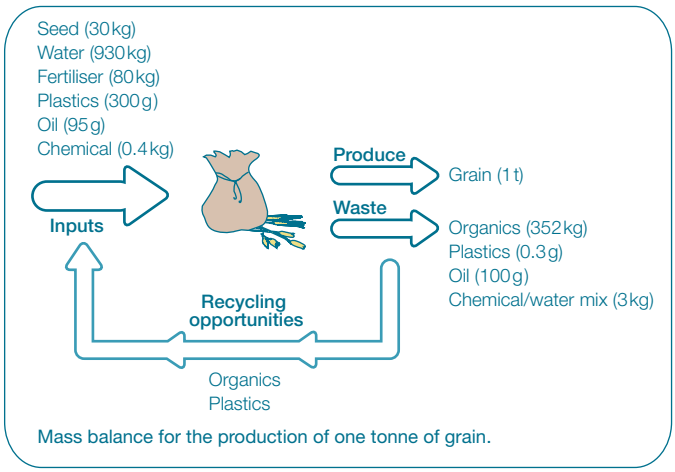
Table 37: Annual UK mass balance by food type.

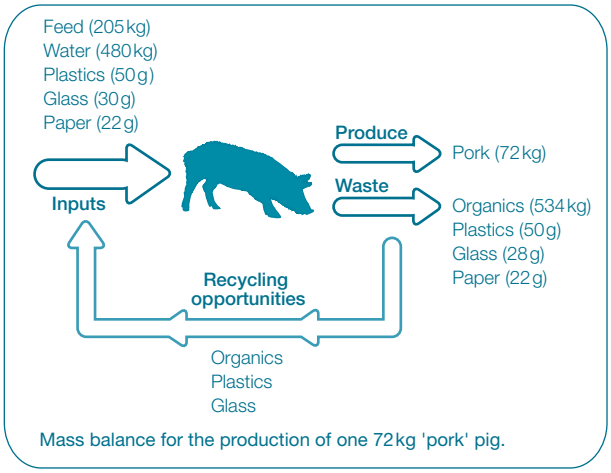
		Inputs				Outputs		
Sector	UK consumption kt/yr	Feed/fertiliser kt/yr	Water kt/yr	Plastic t/yr	Paper t/yr	Organic t/yr	Plastic t/yr	Paper t/yr
Milk and milk products	7014	2806	21,042	11,920		23,146	8420	
Pork	221	619	1459	155	66	1635	155	66
Poultry	758	1516	1516	8	2274	91	10	8
Eggs	268	803	1785	11	13,400	760	714	1027
Arable	10,207	1123		2960		3593	2960	

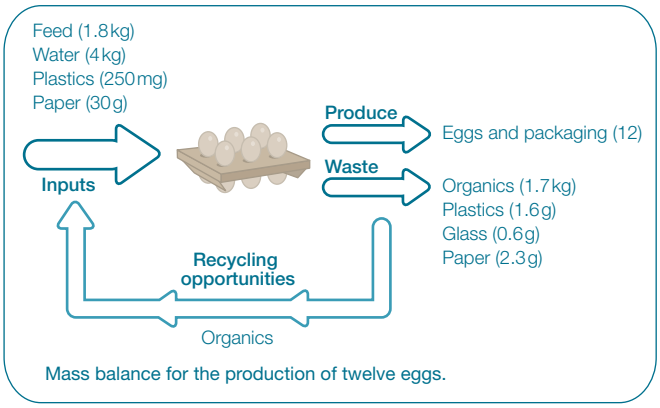
Table 38: Waste produced per kg of product.

	Organics waste, kg	Plastic waste, kg	Paper waste, kg
Milk and milk products	3.3	1.2	0
Pork	7.4	0.7	0.3
Poultry	0.12	0.013	0.01
Eggs	2.8	0.026	3.8
Arable	0.35	0.3	0









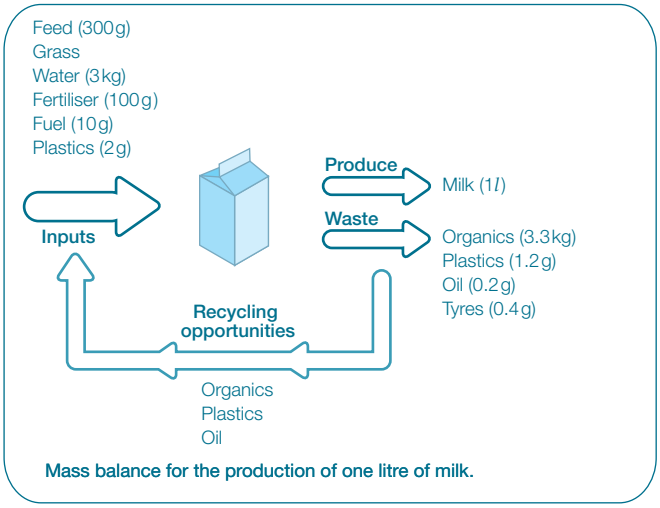


Figure 38: Mass balances for a range of agricultural products.