

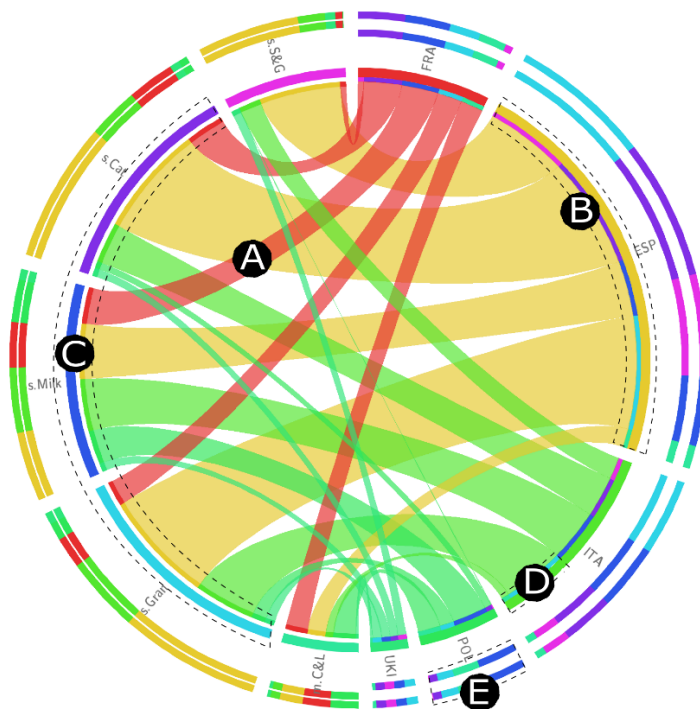
## Supplementary Materials

### *Chord Diagrams*

The paper makes extensive use of chord diagrams (see the example below). The particular form of chord diagram is that provided by the CIRCOS software. These visualisations were developed initially for genomic datasets but have also been found to have potential value for aiding interpretation of other large or information rich datasets.

The chord diagram has a high information to ink ratio. It can demonstrate relationships between elements—across scales or between typologies—and so can be used to link countries and farm types, to show the mix of activities, and resources used or created, or how funds are used. Chord diagrams are good for seeing the “big picture”, for example, highlighting the relative importance of extent variables, but are not necessarily best for showing fine details. In most cases, in this deliverable only the largest 25% of relationships are shown (top quartile) as these often encompass approximately 90% or more of the flows/funds. The chord diagram is also good for highlighting accumulated effects from multiple sources.

Since chord diagrams are not a commonly encountered visualisation, it is worthwhile indicating how the visual language works to aid the reader in the interpreting the figures within the paper. Figure S1 shows the relationship between EU member states and farm types in terms of the extent of the use of green water and blue water embodied in their imported animal feed.



**Figure S1.** Chord (CIRCOS) diagram example.

In the paper, all chord diagrams show countries on the right-hand side of the diagram (i.e., reading clockwise from 12 o'clock) with the farm types on the left-hand side (from 6 o'clock clockwise). A standard country-ordering was maintained across all diagrams to ease

interpretation, as per Figure S2. The order used combines size, proximity, and biophysical similarity. Clearly other orderings are possible, but this one was used for consistency and compatibility with the chord format. Countries are identified on the chord diagram by their three-letter identifier. Similarly, across all diagrams that show farm types, a fixed order is used, starting with more intensive and moving to less intensive, and from crop-based to livestock-based. Farm types use acronyms from Table S1.

The nature of relationships is encoded in the width and the colouring of the chords (A) linking the entities. The size of the segments around the perimeter of the core represents the extent of the variable encoded, showing relative importance: in this case, Spain (B) is the country with the largest use of green water and blue water embodied in feed imports, whilst specialist granivores, milk and cattle are the largest farm types each with near equal size using this embodied water (C). The chords are coloured using each country's colours, so that it is possible—after having defined the relevant extent variable for the analysis—or each farm type to see the relative share for each country (the mix) and also, conversely, to interpret which farm types are the most significant for a particular country: for example, specialist granivores are significant for Italy (D). The outer segments e.g., for Poland (E) summarise the components present (farm types for countries and countries for farm types). These are ordered from largest to smallest providing another visualisation of relative importance.

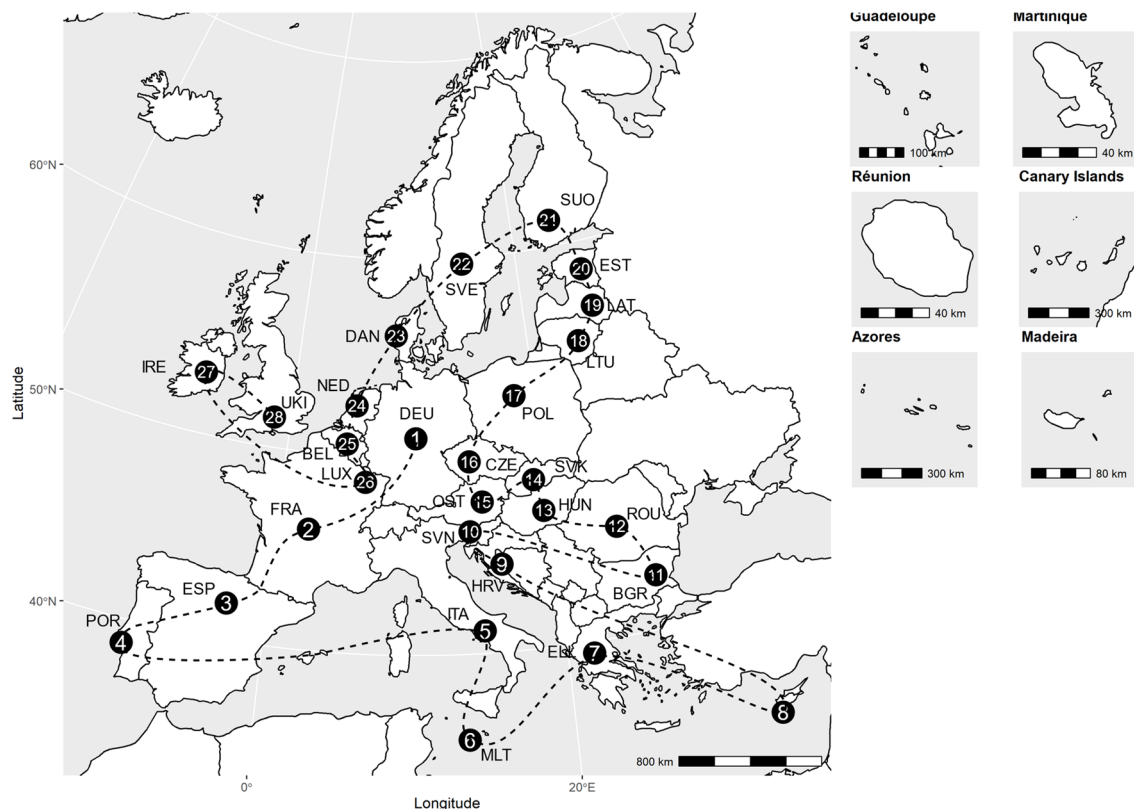


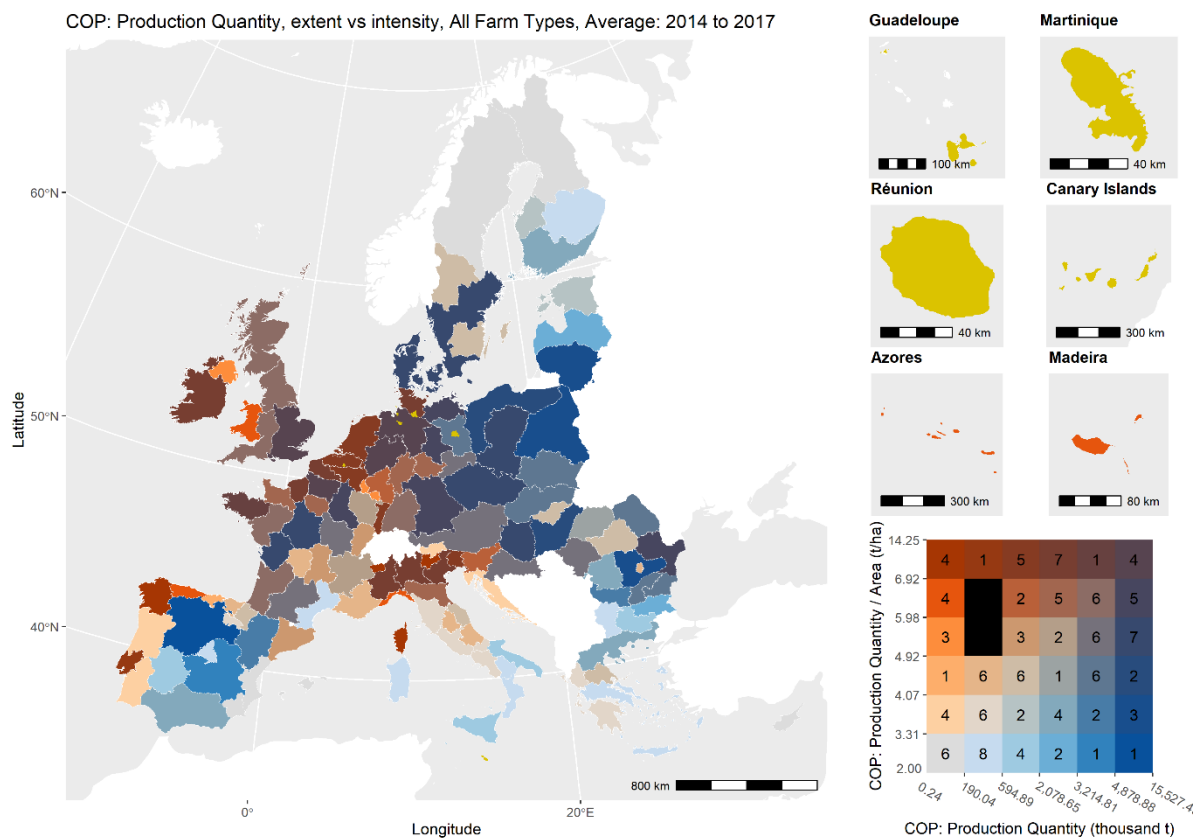
Figure S2. Ordering of countries in the chord diagrams.

**Table S1.** Farm type acronyms used in the chord figures

No.	Farm Type	Abrv.	No.	Farm Type	Abrv.	No.	Farm Type	Abrv.
1	Mixed crops	m.Crp	6	Specialist cereals, oilseeds and protein	s.COP	11	Specialist orchards—fruits	s.Or&F
2	Mixed crops and livestock	m.C&L	7	Specialist granivores	s.Gran	12	Specialist other field crops	sof.C
3	Mixed livestock	m.Lst	8	Specialist horticulture	s.Hort	13	Specialist sheep and goats	s.S&G
4	Permanent crops combined	Perm	9	Specialist milk	s.Milk	14	Specialist wine	s.Wn
5	Specialist cattle	s.Cat	10	Specialist olives	s.Olv			

### *Relationship Maps*

The maps in the paper are mostly of the form as shown in Figure S3. This shows the spatial pattern of a relationship between two variables. This can be in the form of two extent variables forming a relationship (a flow fund ratio), for example, tonnes of grain vs. hectares of land used to produce grain. This implicitly creates a rate map (in this example t/ha) whilst maintaining the two variable values defining that rate therefore allowing distinction of high/high locations and low/low locations, which on a standard rate choropleth would occur in the same class.



**Figure S3.** Relationship map example.

An alternative form of these maps is an extent vs. intensity map. In this case, the overall production of a given flow (the supply of the flow)

can be related to a series of benchmarks (the productivity per unit of fund or the requirement of inputs per unit of fund). For example, the produced quantity of a given crop (extent) can be related to the yields of that specific crop or to the level of fertilisation, irrigation, pesticide application per hectare of that crop. In this way one can handle simultaneously qualitative aspects and quantitative aspects of the production process. For extent vs. intensity maps the extent variable is on the x axis of the legend (the size of the supplied flow), and the intensity variable (the benchmark determining the chosen flow/fund ratio) is shown on the y axis. These allow the display of both the share of the overall supply of the supplied flow from that region via the extent variable as well as the pressure of use via intensity, for example tonnes of cereal, oilseeds and protein crops (COP) versus COP production per hectare in Figure S3.

The maps contain several important components. The main map display is of the mainland European territory of the EU that is covered by the available data. The boxes on the right contain the outermost territories that the data available can cover, these include the islands of Guadeloupe, Martinique and Saint Martin (shown in the same inset as Guadeloupe) in the French Caribbean, the island of Reunion in the Indian Ocean, the Spanish territory of the Canary Islands in the Atlantic Ocean and the Portuguese territories of the Azores and Madeira in the Atlantic Ocean. The legend sits below these insets, and contains up to 36 different colours, with each being a combination of the two variables being displayed on the map. The left and bottom edges show the class boundaries for the mapping, with the classes on each axis containing 1/6 of the values for that variable, so in Figure S3 as an example, 1/6 of all the regions shown have a COP yield rate of between 2.00 and 3.31 t/ha, and 1/6 have between 240 and 190,040 tonnes total output for the region. The number within the square indicates the number of regions that are within that class. A black box indicates no regions exist on that map with that combination of values. The yellow colour, shown below for the French and Spanish outermost regions and the city states in Germany indicates no data is available for these variables, usually because there is insufficient data in the FADN survey to report on that variable. It can also be as a result of combining data from other incompatible datasets, for example combining NUTS regions with FADN regions.