

“They are what they eat”

***The Influence of Geochemistry
on Animal Health
in Northern Ireland***

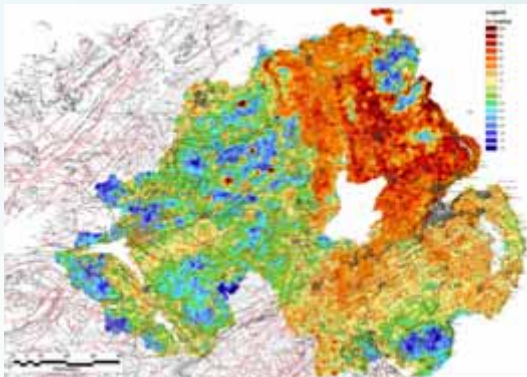
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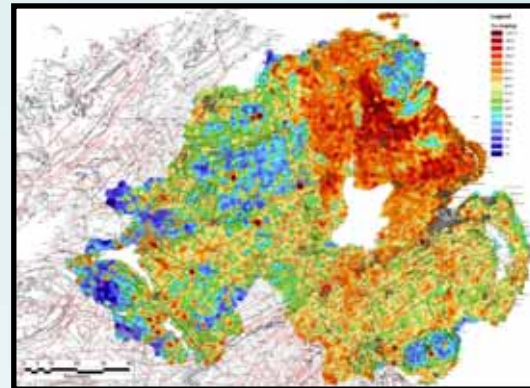
Outline

The importance of trace elements in animal health and what we can learn from the **TELLUS** soil survey data.

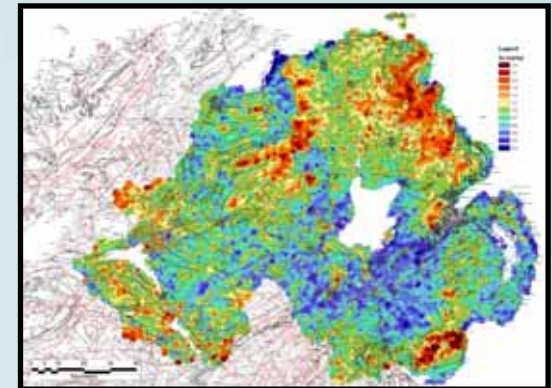
Cobalt, Co



Copper, Cu



Selenium, Se



Trace elements in animal health

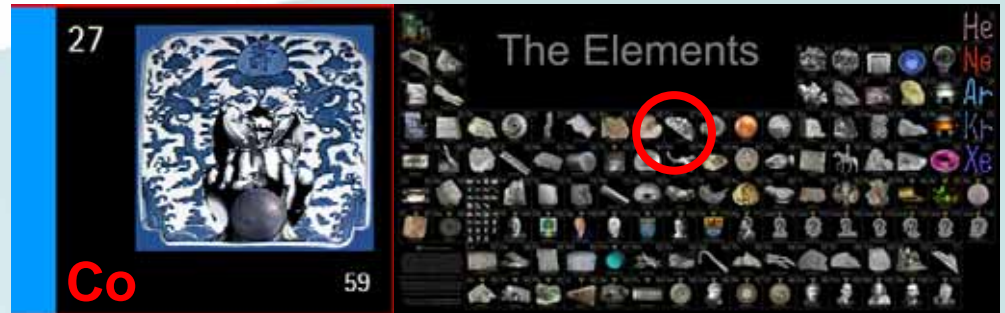
- Components of enzymes
- Co-factors in biochemical reactions
- Insufficient or excess amounts may lead to poor health, decreased production, clinical disease or even death
- Trace elements interact with each other in complex biochemical reactions

Trace elements in animal health cont.

- The levels of minerals and trace elements in the soil determine the levels present in the pasture and crops grown in that area.
- Grazing animals are dependent on pasture or supplementation for their mineral and trace element requirements.



Cobalt, Co



- Ruminants cannot use Vitamin B12 available in their diet
- Micro-organisms in the rumen require **Cobalt** to produce Vitamin B12
- Vitamin B12 is used to metabolise propionic acid
- Propionic acid is used by ruminants as an energy source
- Without Vitamin B12 (and therefore **Cobalt**) ruminants will effectively *starve!*



Normal and Cobalt deficient sheep

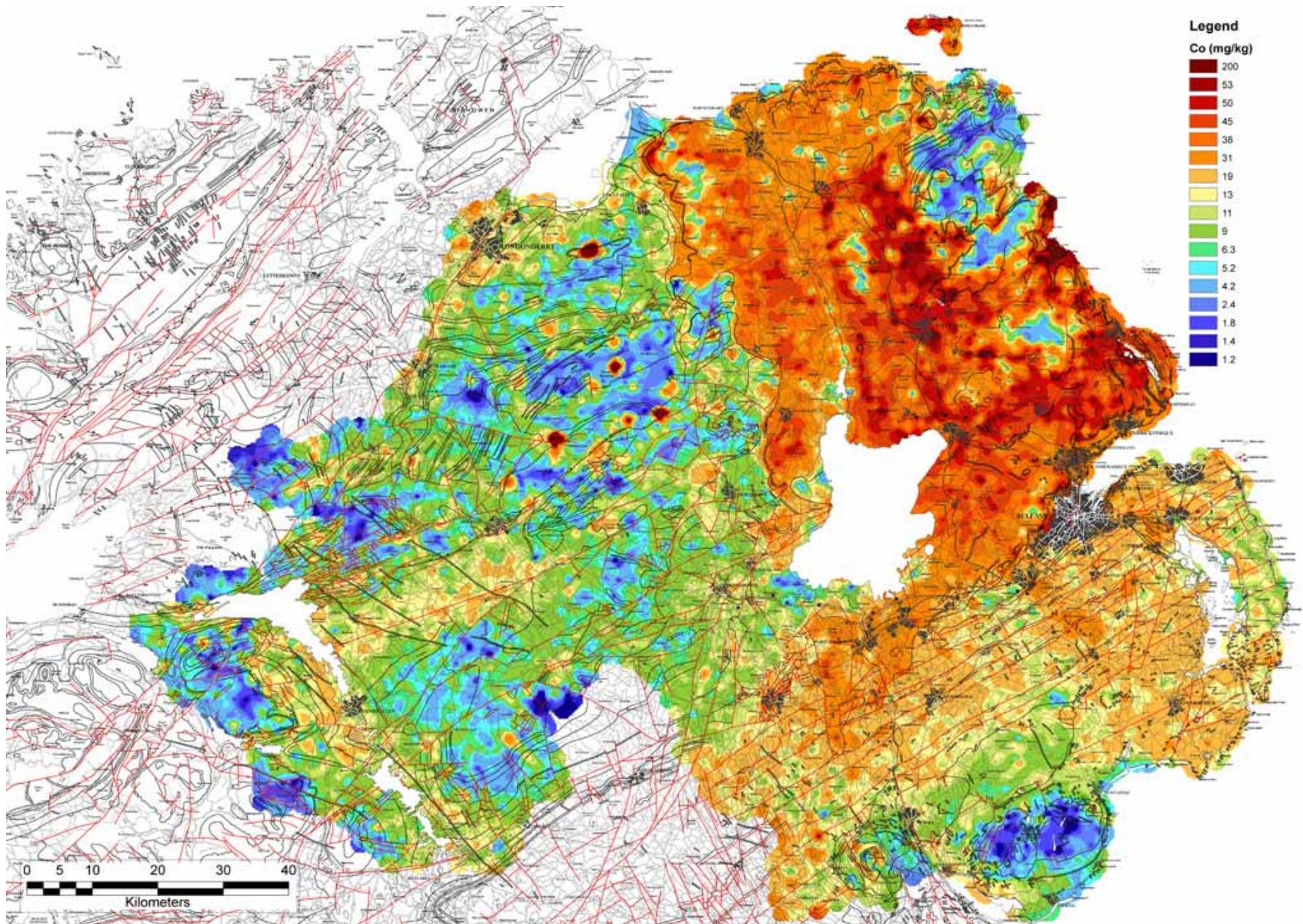


Cobalt deficiency

Observed most frequently in areas of

- Granite catchments i.e. Mourne area in Northern Ireland
- High rainfall (i.e. in uplands and to the west)
- High pH, especially areas heavily limed

TELLUS Survey Map of Soil Cobalt, Co



Copper, Cu



- **Copper** is used in the formation of nerves, bone and haemoglobin and affects keratin synthesis.
- Both **Copper deficiency** and **Copper toxicity** occur in animals
- Breed differences in susceptibility occur e.g. in sheep :
 - Texels are more susceptible to **Copper toxicity** than Scottish Blackface
 - Scottish Blackface sheep are more prone to **Copper deficiency** than Texels



Scottish Blackface



Texel

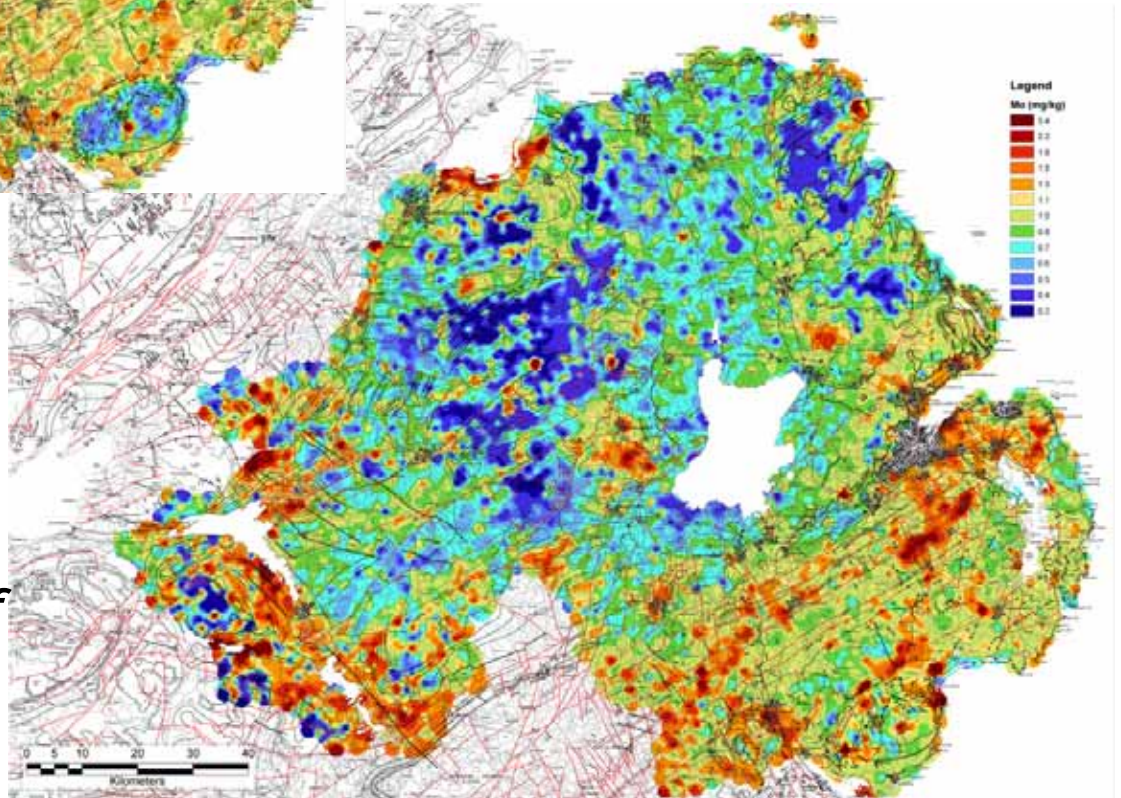
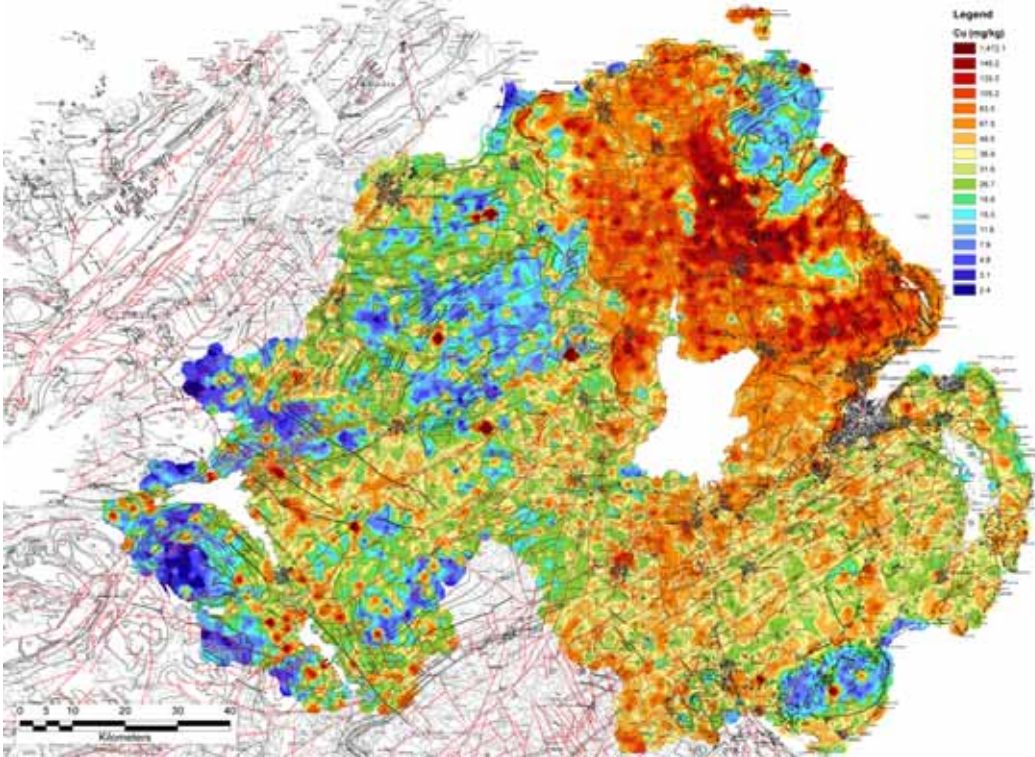
Copper toxicity

- Two forms: acute and chronic (Chronic is the most common)
- Excess **copper** is stored in the liver until a “tipping point” is reached
- Large amounts of **copper** are released suddenly into the circulation
- This causes peroxidation of fats and intravascular haemolysis (breakdown of red blood cells within the circulation)
- Clinical signs include jaundice and death. Occasionally gastroenteritis, diarrhoea, abdominal pain, anorexia, dehydration and shock are seen

Copper toxicity (contd)

- Copper toxicity is more likely if intake of **Molybdenum**, **Iron** and/or **Sulphur** is low
- Conversely high levels of **Molybdenum** can result in **Copper** deficiency

**TELLUS Survey Map of
Soil Copper, Cu**



**TELLUS Survey Map of
Soil Molybdenum, Mo**

Copper deficiency

Copper deficiency comes in several forms:

- Poor coat quality, “steely wool”
- Stillbirth
- Anaemia
- Swayback

Copper deficiency 'Spectacles'





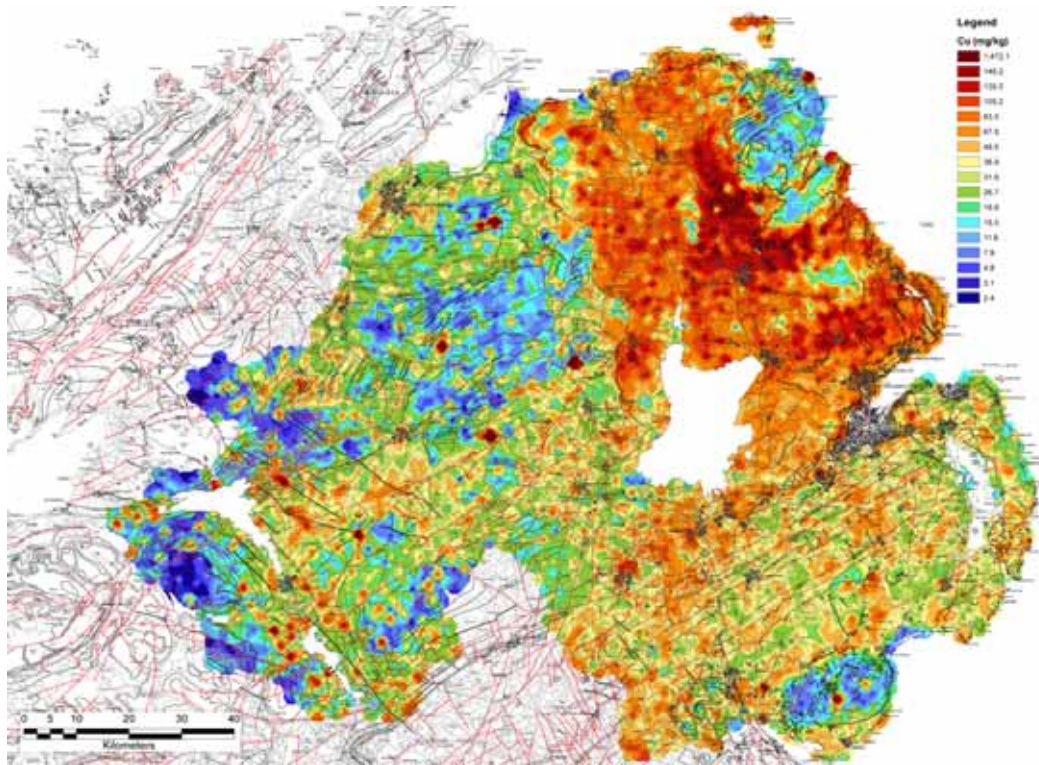
Calf with Copper deficiency



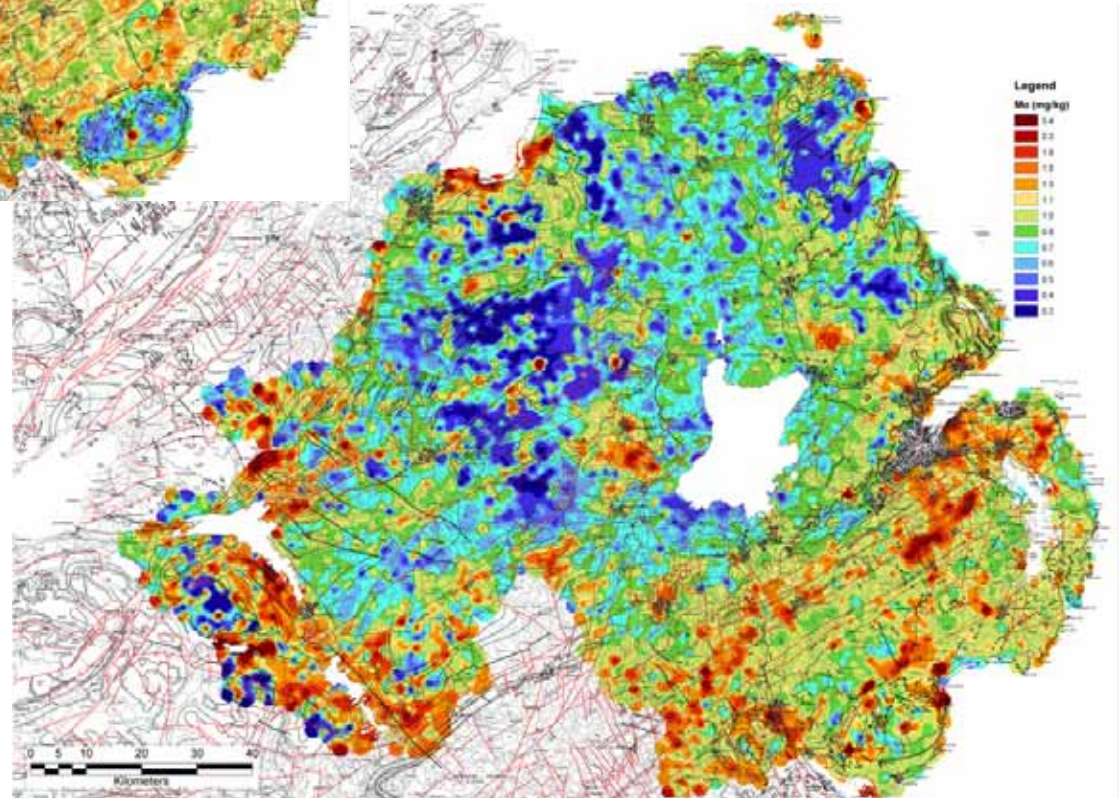
Normal calf

Copper deficiency – swayback

- Swayback is a condition of unweaned lambs
- Shows as an in-coordination of the hind limbs
- Animals are bright and alert, feed and may appear normal if lying down
- Occurs when dams have low **copper** levels in mid-pregnancy
- Areas likely to display **Copper deficiency** can be identified from the TELLUS soil maps



**TELLUS Survey Map of
Soil Copper, Cu**



**TELLUS Survey Map of
Soil Molybdenum, Mo**

Selenium, Se



- Selenium is used by the body as an antioxidant
- Other nutrients (especially Vitamin E) are linked to Se and can partially replace Se in the diet
- Selenium toxicity and Selenium deficiency occur
- Selenium deficiency is most common animal deficiency in Northern Ireland

Selenium

- **Selenium** is incorporated into an enzyme which functions as an antioxidant of fats
- Vitamin E and **Selenium** are partially mutually replaceable
- More likely to see clinical **Se deficiency** if Vitamin E also low
- Skeletal muscles and the heart are most commonly affected
- Muscles are pale (white muscle disease) and may have **Ca** deposits. Both sides of the body are affected

Selenium deficiency



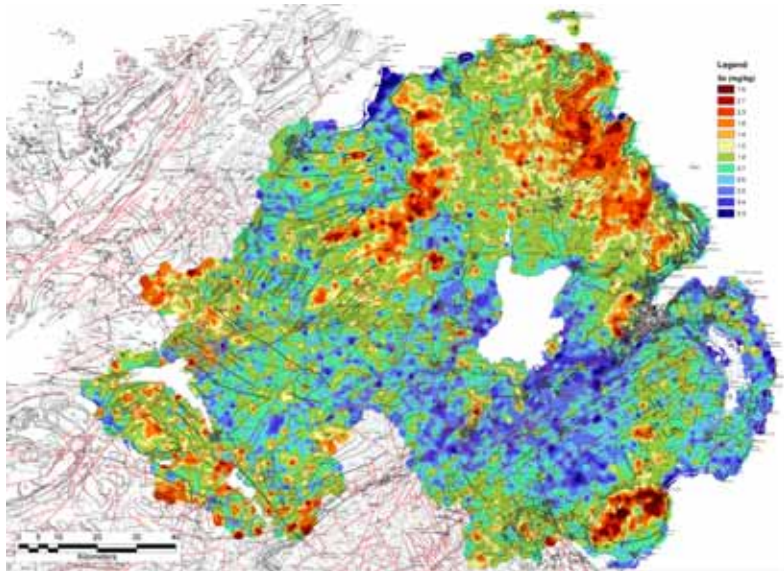
Selenium deficient sheep

White muscle disease

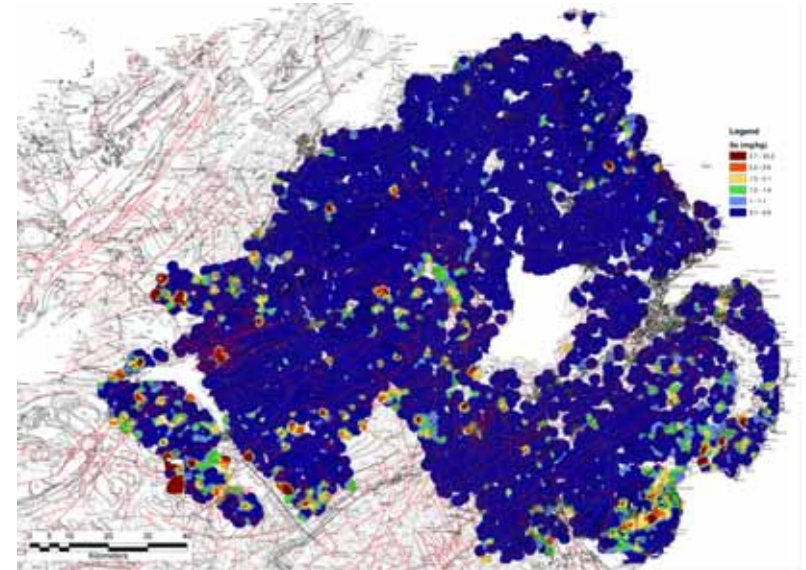


TELLUS Survey Maps and Hill Farm Map (C Munoz)

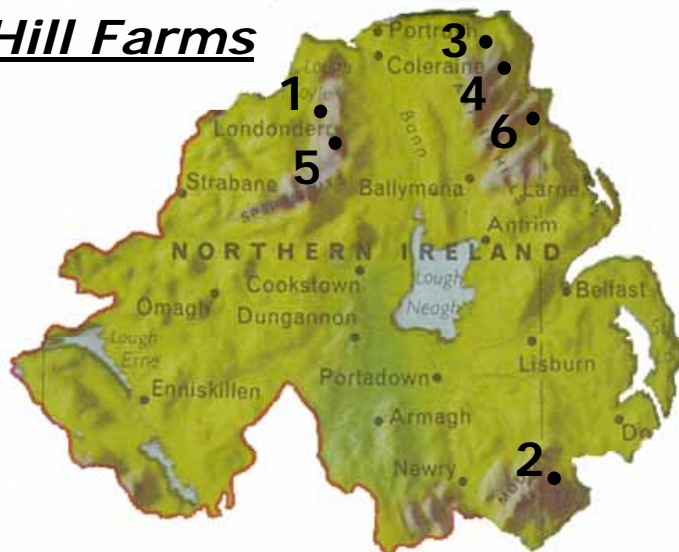
1. Soil Selenium, Se



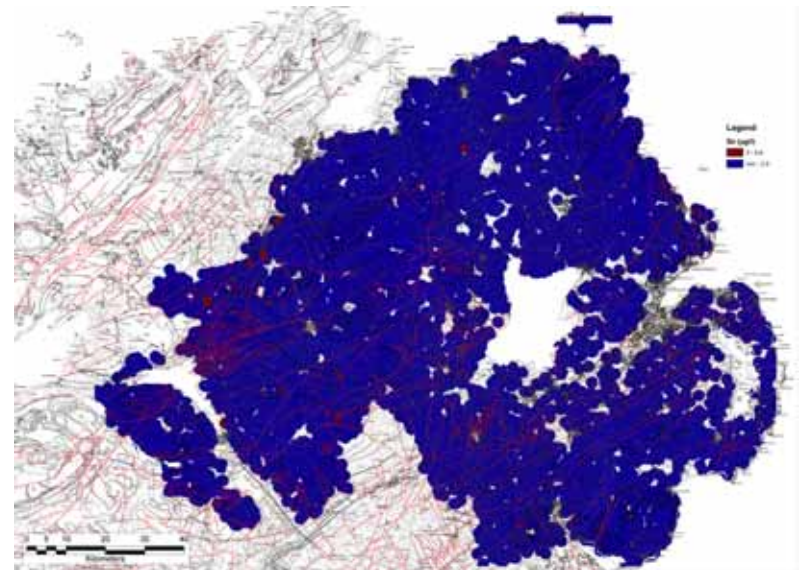
2. Sediment Selenium, Se



Six Hill Farms



3. Water Selenium, Se



Acknowledgements

- TELLUS team

and from AFBI :

- C Jordan
- F Malone
- C Munoz
- C Mason

- AFBI staff in VSD and Hillsborough