

On farm nutrient management

Laurence Smith

Energy and Emissions Programme Manager

The Organic Research Centre, Elm Farm

laurence.s@organicresearchcentre.com



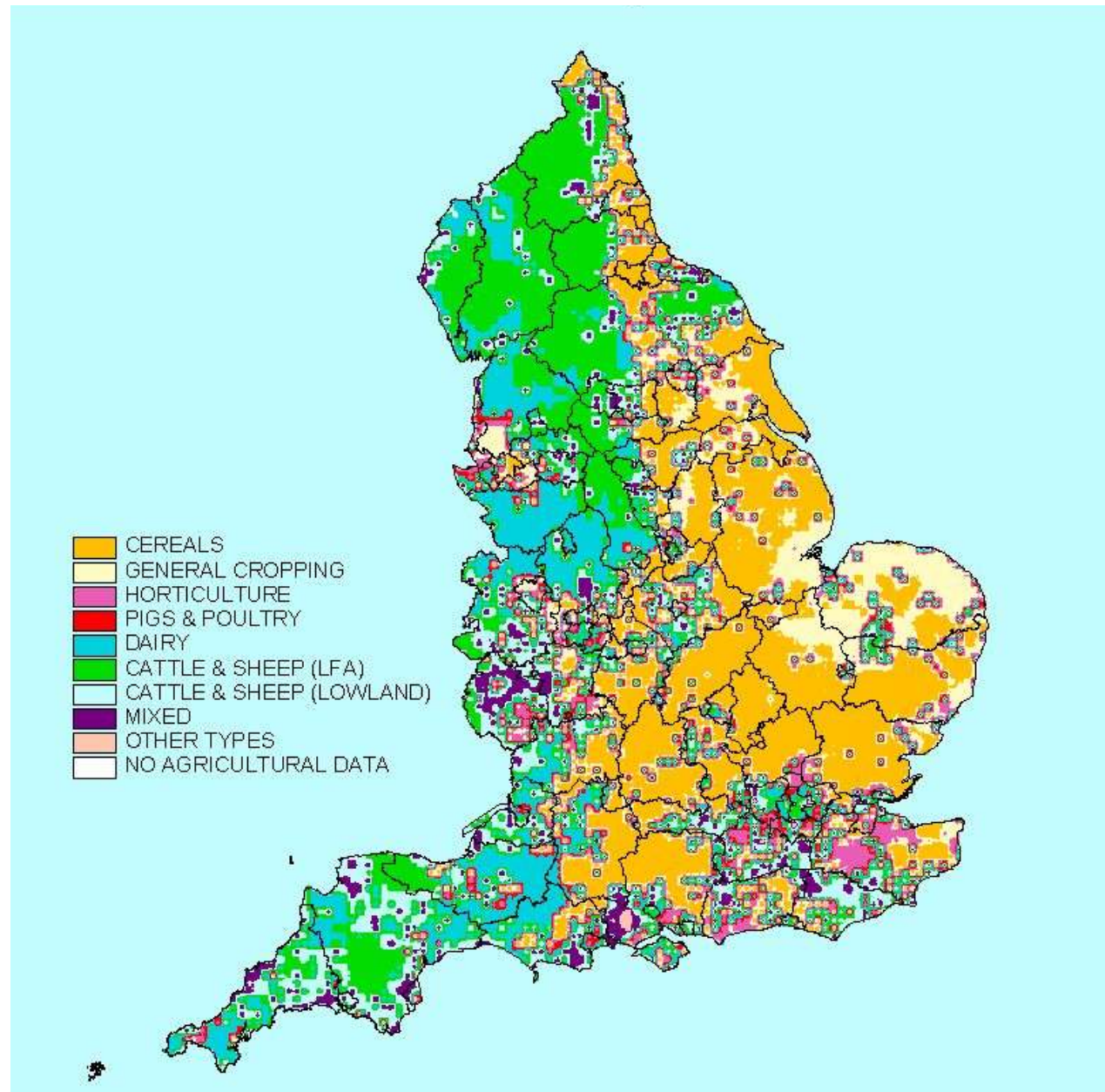
Outline of talk

- 1. Challenges**
- 2. Nutrient cycling**
- 3. Maximising efficiency**
- 4. How to move forward**

Transition farms: the challenges

- **Rising input costs**
- **Increasing population and demand for cheap food**
- **Less land area available**
- **Climate change**

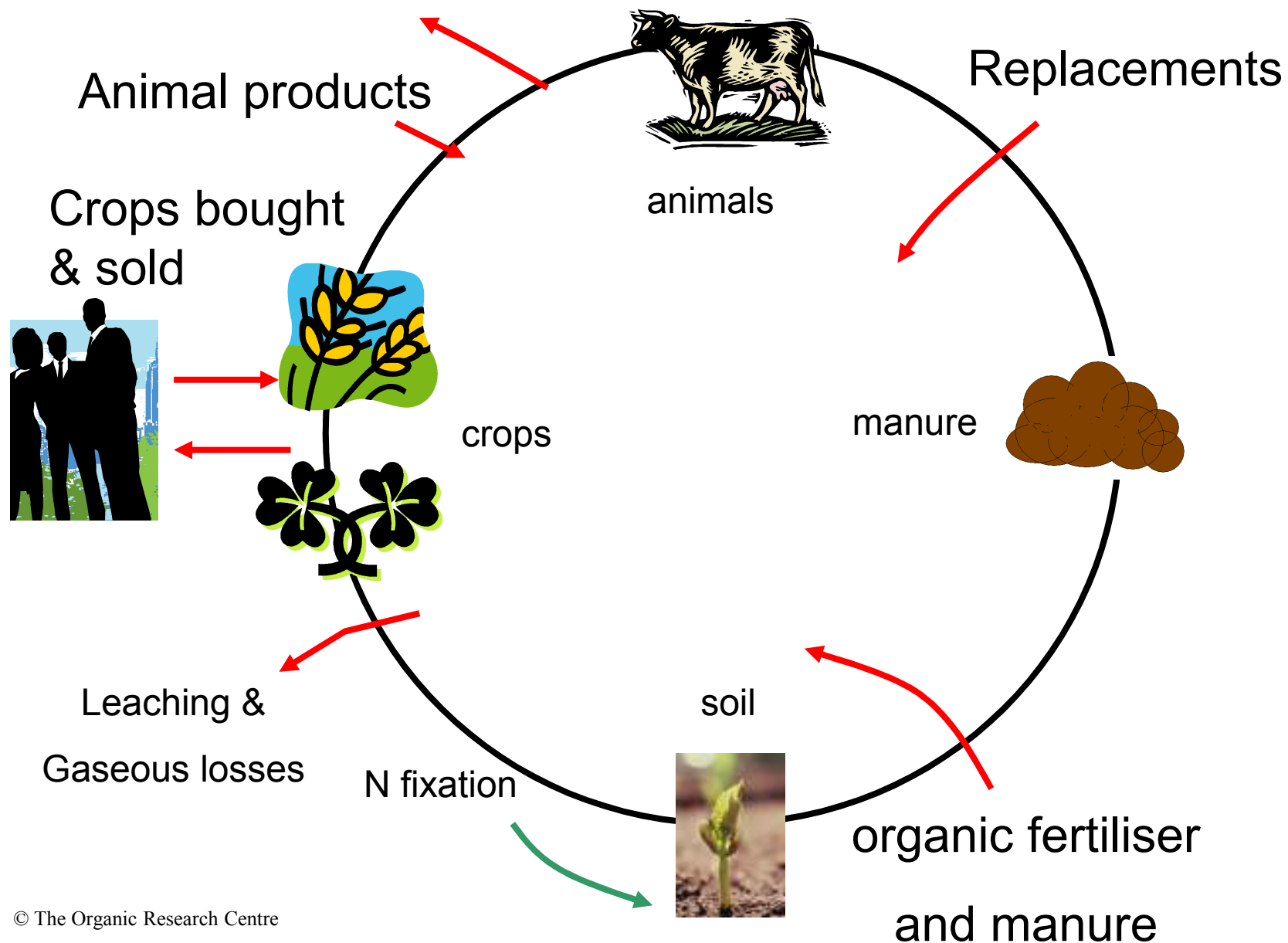
Present: Agricultural Census. Dominant farm type by 5km grid squares



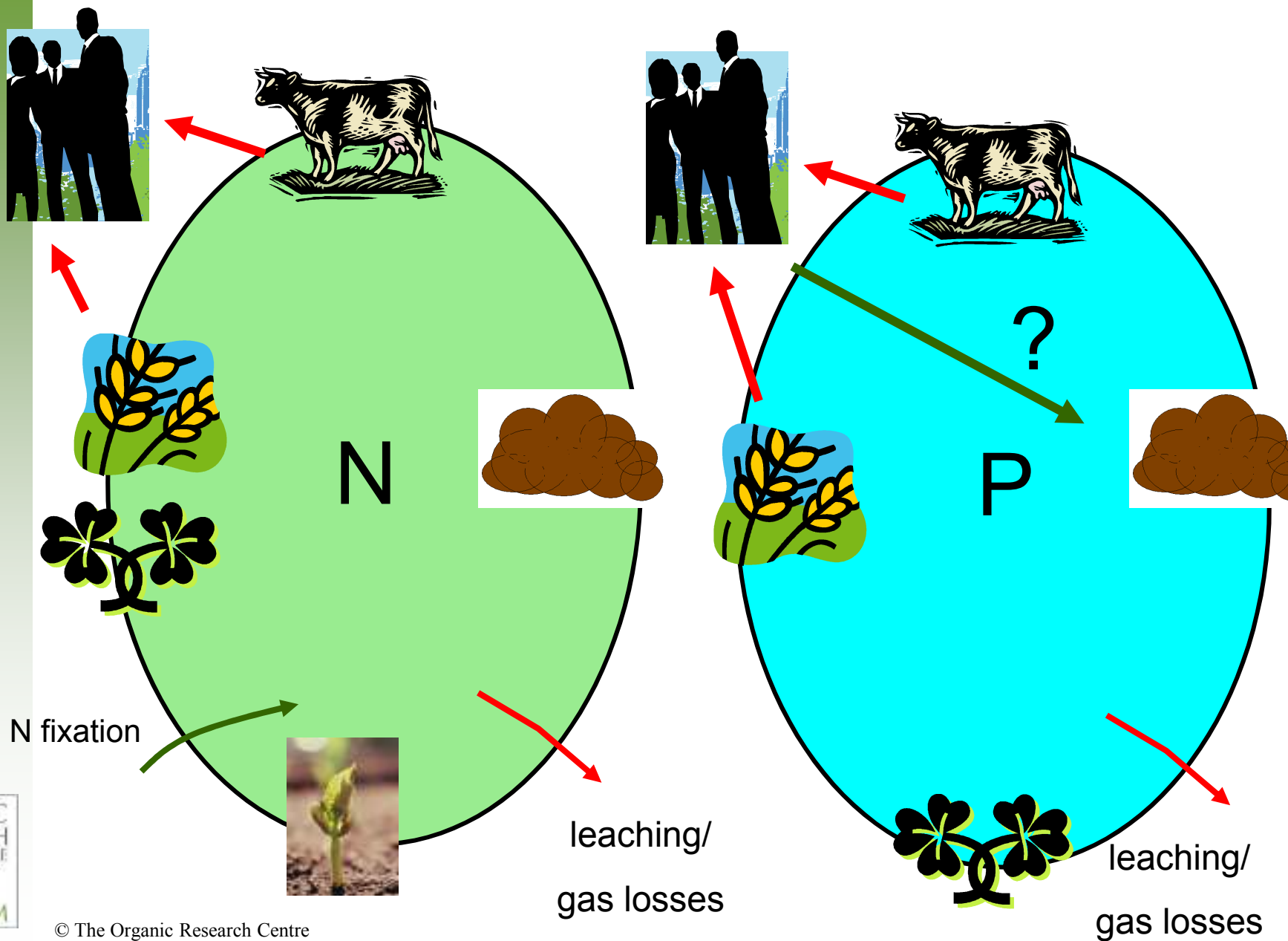
- Importation of feed is now commonplace
- However the transport of livestock wastes in the opposite direction is uncommon



The future: a balanced nutrient cycle

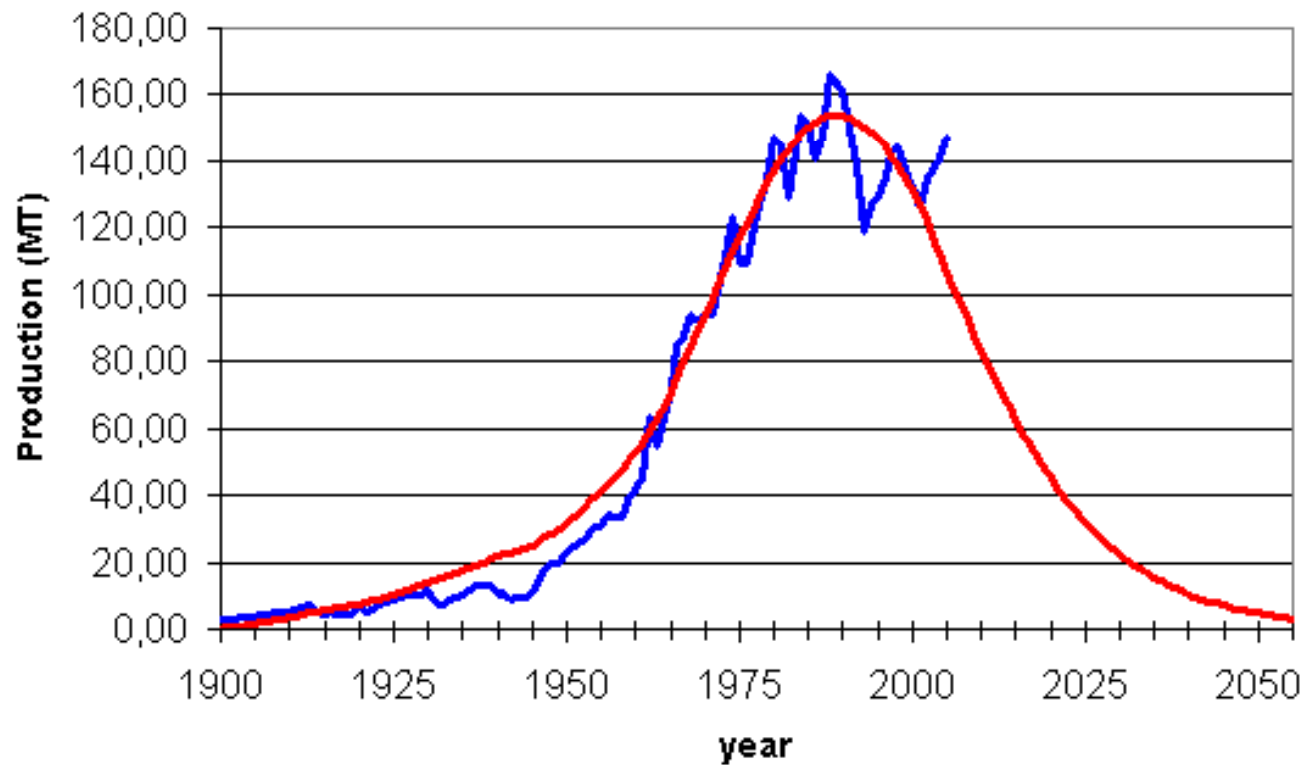


Nitrogen and Phosphorus cycles



This gap in the nutrient cycle has been addressed through the mining of rock Phosphate

World rock Phosphate production



However....

Even if we include human waste within the nutrient cycle, this will not be enough.

We still need to reduce losses within the system

This will be achieved by increasing awareness in the following areas:

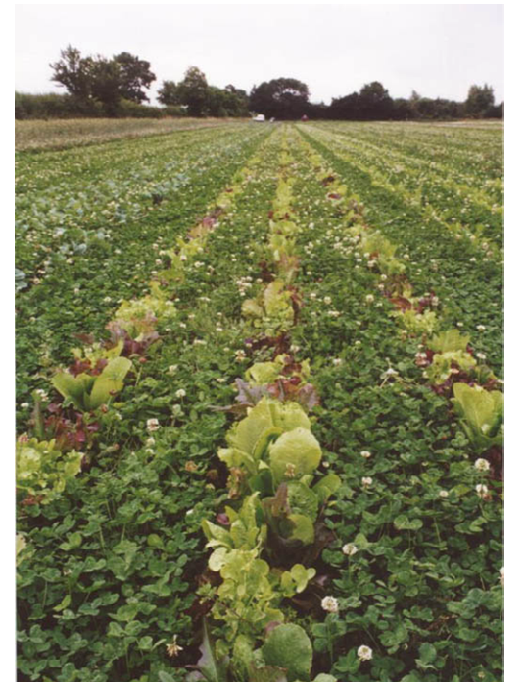
- **Crop rotation**
- **Green manures and undersowing**
- **Correct manure management**
- **Alternative sources of N**

Crop rotation

- **Vital to achieve balance of high nutrient uptake and fertility building crops**
- **Can help to raise nutrients in the soil profile**
- **Improves aeration of the soil**
- **Can help reduce losses, especially where crops overlap**

Green manure, intercropping and undersowing

- Intercropping provides continual source of N
- Green manures help keep soil covered
- Can also increase nutrient availability
- May help to keep down weeds



Use of mulches

- Keep soil covered reducing leaching and N losses
- Mulches can also increase Phosphate uptake



Management of manures and slurries

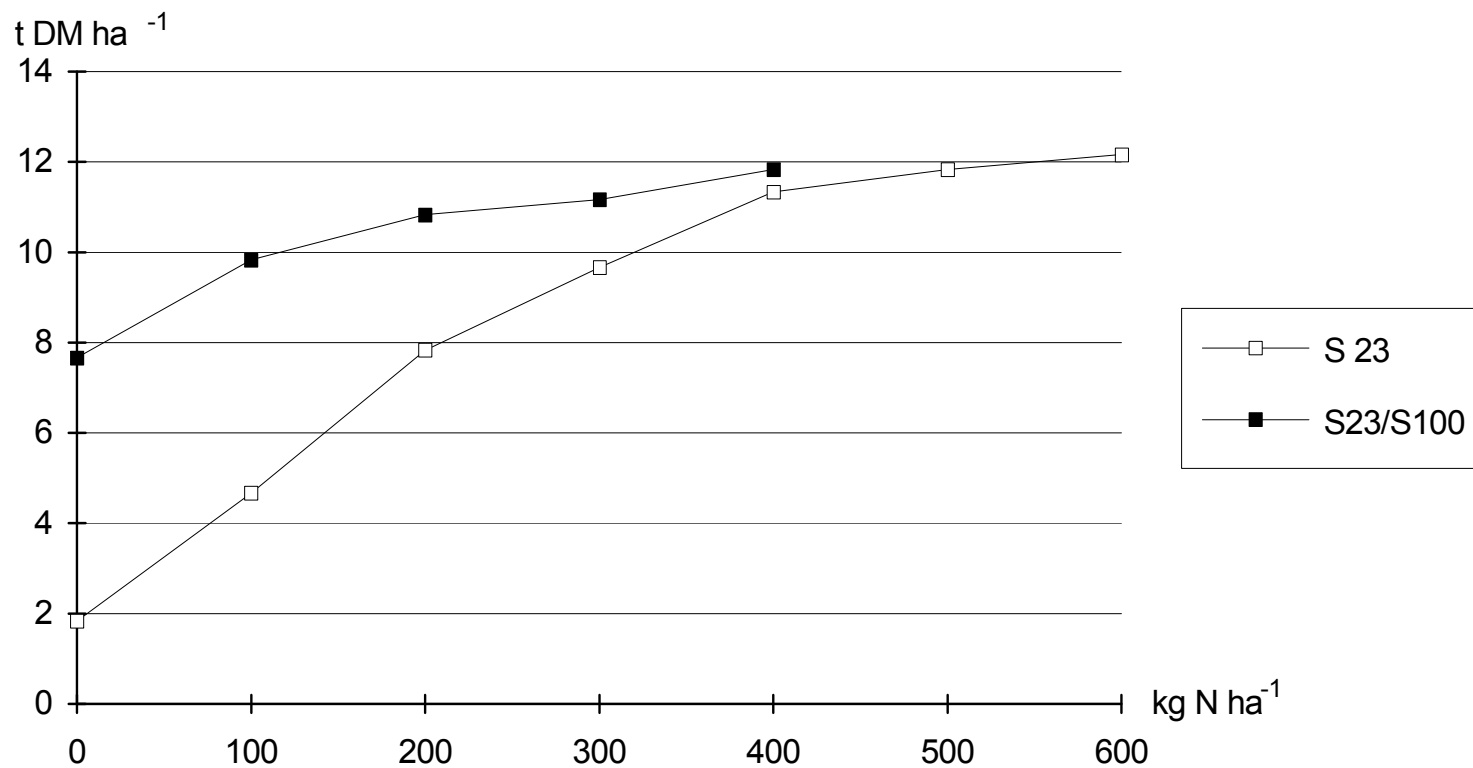
- Will need to move up the agenda, being seen as a resource instead of a waste
- Covering heaps to reduce leaching
- Storage systems to reduce N loss – 4-6% under cover compared with 10-14% unprotected
- Band spreading or shallow injection most efficient in terms of reducing N losses (Misselbrook *et al.* 2002)

Optimising nutrient use

- **Need to make the best use of what we have**
- **Nutrient budgeting can help optimise inputs**
- **Regular soil sampling of P and K levels essential**
- **Well timed cultivations to minimise losses**

Alternative sources of Nitrogen

Nitrogen fertiliser production response curves for perennial ryegrass only (S23) and perennial ryegrass/white clover mix (S23/S100)



Source: Thomas *et al.* (1991)

Areas currently in development

- Contribution of Mycorrhizae Fungal mycelia which penetrate the plant roots enabling nutrient transfer
- Innoculations of N fixing bacteria
- Reduced tillage



Balanced systems

- Crop production can yield up to ten times more food per hectare than animal rearing
- We need to develop land use appropriate to land type and available resources

Resource category	ENTERPRISE			
	Arable	Beef	Potatoes	Sheep
Land (ha)	96	56	10	52
Energy used (GJ)	490	137	293	125
Energy produced (GJ)	1837	235	207	91
Emissions (tonnes CO ² e)	34	146	26	122
ENERGY RATIO (in:out)	1 : 3.7	1 : 1.7	1 : 0.7	1 : 0.7

Ways forward...

- **Forage based diets for ruminants**
- **Start saving own seeds and develop varieties specific to the farm**
- **Mixed farming at a distance**
- **Balanced systems that maximise efficiency of resource use**

Conclusion

- **It shouldn't take a similar crisis in nutrients as Global warming to drive us to action.**
- **Need to act now to implement real change before it is too late**
- **The responsibility lies not only with farmers but society as whole to make this shift**
- **In order to do this we need to take individual responsibility to recycle our so called 'waste'**