NUTRIENT RECOVERY AND REUSE (NRR) IN AGRICULTURE

The RISE Foundation

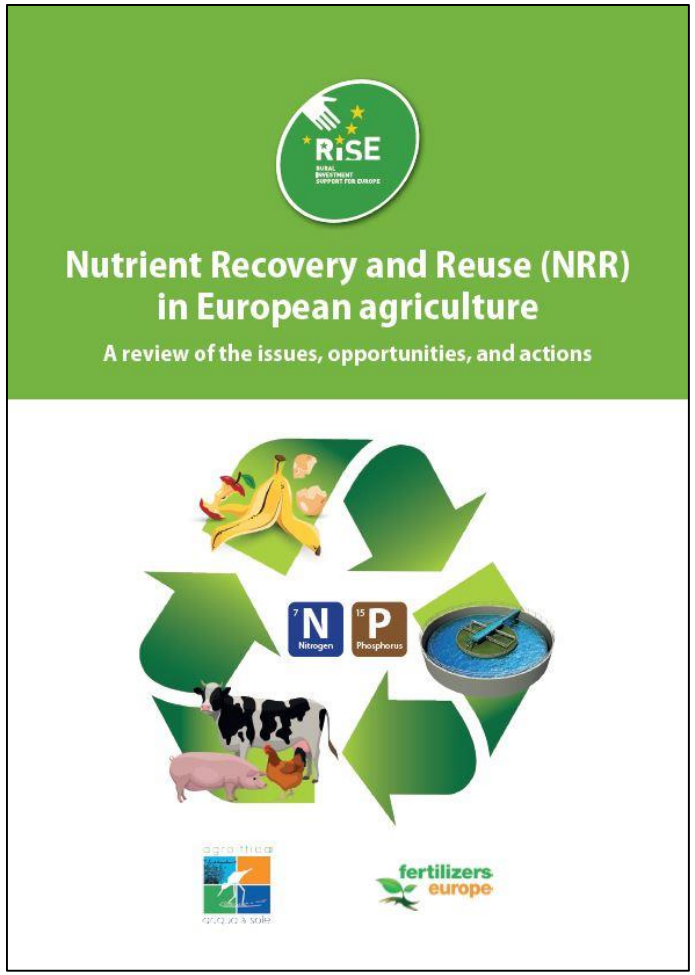
RESOURCE EFFICIENCY ENRD THEMATIC GROUP
Brussels, December 14th 2016

Elisabet Nadeu
RISE Foundation

Nutrient Recovery and Reuse Study (NRR)

To improve understanding of the issues and interactions involved in two nutrient flows in EU food production, Nitrogen - N, and Phosphorus – P and to try and answer the following questions:

1. What is the potential scale for enhanced recovery and reuse of N and P in the EU
2. What are the challenges in doing it?
3. What actions are required to stimulate a wider adoption of nutrient recovery and reuse in Europe?



Why nutrient recovery and reuse?

1. Resource finiteness, and thus rising prices, is not the key challenge this century.
2. Security/reliability of EU supply of P and natural gas may be
3. The more important challenges are waste and the growing leakage of nutrients into the environment.
4. These environmental impacts of current nutrient flows are a more urgent threat to food sustainability/security than finite resources.

Nutrient Recovery and Reuse can:

1. Contribute to all four of these aspects
2. Stimulate innovation and contribute to jobs and growth.

Main nutrient challenges

We identified high leakage in 4 sectors/stages:

- Fertilising crops with manure and mineral fertilisers
- Feeding livestock and managing their waste
- Processing food and feeding humans
- Managing human waste

And four signs of the impact of our current nutrient use on the environment:

- Eutrophication of waters (N & P)
- Pollution of air – nitrogen oxides, particulates, ammonia
- Greenhouse gases – nitrous oxide and methane
- Damage to terrestrial and aquatic/marine biodiversity

1. What is the potential scale for enhanced recovery and reuse of N and P in the EU?

These quantities represent 18-46% of mineral N and 43% of mineral based P applied to EU crops.

TABLE 5. Gross estimation of recycled (recovered/collected + reused) amounts of N and P (Mt) for the three selected waste streams

	TOTAL N in stream	Recycled N	TOTAL P in stream	Recycled P
Raw manure	7-9	7.1	1.8?	1.75
Food chain waste				
Household waste	0.5-0.7	0.16	0.11	0.03
Slaughterhouse waste	?	?	0.28	0.02
Sewage	2.3-3.1	0.5	0.32	0.10
Totals of these streams	> 10-13	>7.8	2.5	1.9
Current recycling (%)		**60-80%**		**76%**
Not recycled (Mt)		**2-5**		**0.6**
For comparison, mineral fertiliser use in crop production (Mt)		**10.9**		**1.4**
Not recycled nutrient as percent of mineral fertiliser		**18-46%**		**43%**

(Sources: see Table 4 for total nutrients in streams. Recycled amounts from Leip et al 2014, Milieu et al 2010, Saveyn and Eder 2014 and van Dijk et al 2016)

2. What are the challenges of doing it?

In comparison to manufactured mineral fertilizers:

- **Large volumes** of often highly dilute, heterogeneous material
- Continuous daily flows, multiple sources, spatially dispersed; while the use of fertilisers is highly seasonal
- Multiple **decentralised**, relatively small production units for recovery (cf fertiliser manufacturing)
- **Safety** concerns: presence of: heavy metals, pathogens, pharmaceuticals, smell; in products destined to be added to soil.
- No presumption that the products of NRR are perfect **substitutes** for mineral fertilisers: price, consistency, nutrient content and availability
- Workable **business models** not yet widely known.

3. What actions are required to stimulate a wider adoption of nutrient recovery and reuse in Europe? (1)

Some justifications for collective action:

- The sheer technical, logistical, attitudinal challenge
- Thus infant industry argument for assistance; R&D, info, encouragement: private and public sector involvement here
- The environmental market failure – externality – argument for encouraging NRR

- The technologies exist, the sector *is* developing, but **will not take-off spontaneously**

- There is strong advocacy in the EU (and regulatory coherence is needed!):
  - Sign up to the Sustainable Development Goals
  - The action plans for the Bioeconomy and Circular Economy
  - The new fertiliser regulation

NRR will not spontaneously, swiftly and significantly increase in a scale without further collective actions

3. What actions are required to stimulate a wider adoption of nutrient recovery and reuse in Europe? (2)

1. Information, research and development

2. Market stimulants - carrots
   - Obligations,
   - Voluntary targets
   - Investment and start-up grants
   - Direct subsidies
   - Fiscal reliefs

3. Penalties and restrictions - sticks
   - Nutrient surplus or fertiliser taxes
   - Landfill and incineration prohibitions/gate fees

Thanks for listening!

Download the FULL report at
http://www.risefoundation.eu/publications