Why focusing on sustainable nitrogen management in agrifood systems?

Aimable Uwizeye, PhD
Livestock Policy Officer
CHANGES IN AGRIFOOD SYSTEMS

Population growth
Increasing incomes
Urbanization

Supply of animal/crop products

Growth of agrifood sector

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COMPLEX AND LONG SUPPLY CHAINS

Small-scale farms

Disconnection between feed production and animal production

Large-scale and geographically concentrated farms

Large use of synthetic fertilizer to produce feed
HUGE DEPENDANCE ON AMMONIA FERTILIZER

Ammonia production, in Tg N

- 1961
- 1963
- 1965
- 1967
- 1969
- 1971
- 1973
- 1975
- 1977
- 1979
- 1981
- 1983
- 1985
- 1987
- 1989
- 1991
- 1993
- 1995
- 1997
- 1999
- 2001
- 2003
- 2005
- 2007
- 2009
- 2011
- 2013
- 2015
- 2017
- 2019
HUGE DEPENDANCE ON AMMONIA FERTILIZER

N\textsubscript{2} in air

Fertilizer manufacture

Biological N fixation

Mineral Phosphates

Crop/pasture production

Animal production

Processing of food products

Consumption
SIGNIFICANT CONTRIBUTION OF LIVESTOCK TO ENVIRONMENTAL IMPACTS

- Losses of N and P to watercourses
- Climate change
- Air pollution (PM2.5)
- Acidification

N\textsubscript{2} in air

Fertilizer manufacture

Biological N fixation

Mineral Phosphates

Emissions of N to air

\(\text{N}_2\text{O}, \text{NH}_3, \text{NO}_x\)

Crop/pasture production

Manure

Livestock farming

Animal products

Consumption

\(\text{NO}_3^-\), Organic N

Soil Pollution
Eutrophication
Acidification
GLOBAL NITROGEN USE EFFICIENCY ASSESSMENT
GLOBAL CONTRIBUTION OF THE LIVESTOCK SECTOR TO NITROGEN EMISSIONS

65 Tg N EMISSIONS

Uwizeye et al 2020
AREAS OF CONCENTRATION OF N EMISSIONS - POLLUTION
Embedded N emissions = 1.5 Tg N
(2.3% of total N emissions)
Commodities: Cereals (Barley, Wheat, Maize): 53%,
Soybean: 38%
POTENTIAL OF INNOVATIVE CIRCULAR PIG SYSTEMS TO REDUCE N LOSSES

Pigs are omnivores

Traditionally, pigs are fed with food wastes

Practice abandoned in industrial production for animal health and food safety risks and transport costs

1.3 billion tonnes of food wastes each year

It is possible to use food wastes as animal feed safely
### POTENTIAL OF INNOVATIVE CIRCULAR PIG SYSTEMS TO REDUCE N LOSSES

<table>
<thead>
<tr>
<th>Regions</th>
<th>Change</th>
<th>Life-cycle-NUE$_N$</th>
<th>N losses in feed production stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Asia</td>
<td>+30%</td>
<td></td>
<td>-53%</td>
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<tr>
<td>North America</td>
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<tr>
<td>Western Europe</td>
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<td></td>
<td>-33%</td>
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<tr>
<td>East and South East Asia</td>
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<td>Eastern Europe</td>
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<td>Latin America</td>
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<td>Russian Federation</td>
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<td>Sub-Saharan Africa</td>
<td>+7%</td>
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<tr>
<td>Near East and N. Africa</td>
<td>+17%</td>
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<td>-49%</td>
</tr>
</tbody>
</table>

Feeding food waste to pigs

Substitution of grains and soybean by feed from food wastes for industrial pork supply chains
JAPANESE CIRCULAR BIO-ECONOMY

- Food waste recycling law
- Health Promotion law
- Feed safety
- Fermented feed
- Traceability
- Access to veterinary services
- Cooperative structure
- 50% lower feed cost
- Market premium - Ecofeed
DEVELOPMENT OF THE GUIDELINES TO ASSESS THE NITROGEN FLOWS AND LOSSES

FAO LEAP guidelines on Nutrient Flows and associated environmental impacts in livestock supply chains
Bioeconomy | Climate change | Nitrogen pollution | Nitrogen use efficiency

• Can N₂O emissions offset the benefits of soil organic carbon storage?
• Nitrogen emissions along global livestock supply chains
• A climate-dependent global model of ammonia emissions from chicken farming
• Improved accuracy and reduced uncertainty in greenhouse gas inventories by refining the IPCC emission factor for direct N₂O emissions from nitrogen inputs to managed soils
• Bioeconomy for sustainable food and Agriculture
• The soil microbiome: a game changer for food and agriculture
• Indicators to monitor and evaluate the sustainability of bioeconomy
• Sustainable and circular bioeconomy in the climate agenda: Opportunities to transform agrifood systems
• Sustainable and circular bioeconomy in the biodiversity agenda
• FAOSTAT data: Nitrogen budget in collaboration with partners
UNFCCC Decision – Koronivia Joint Work on Agriculture

- 2(d) improved nutrient use and manure management
- Summary of UNFCCC workshop on topic 2(d) Improved nutrient use and manure management towards sustainable and resilient agricultural systems
- FAO’s submission on topic 2(d)
- Analysis of all submissions by Parties and Observers on topic UNFCCC – Koronivia Topic 2(d) Improved nutrient use and manure management towards sustainable and resilient agricultural systems
Fertilizer code

The International Code of Conduct for the Sustainable Use and Management of Fertilizers was endorsed by member countries at the 41st session of the FAO Conference.

The Code aims to guarantee an effective and efficient use of fertilizers and address issues of global importance including:

- Global food production and food security;
- The preservation of fundamental ecosystem services
- The maximization of economic and environmental benefits;
- The reduction of negative impact of excess nutrients in ground and surface waters;
- The minimization of negative effects and potential toxicity of contaminants in fertilizers;
- The improvement of food safety, diets, nutritional quality and human health.