SELF-SUFFICIENCY FOR ANIMAL FEED: A MULTI-LEVEL FRAMEWORK TO PROMOTE AGROECOLOGICAL FARMING SYSTEMS

Vincent Thénard, Anaïs Charmeau, Pierre Triboulet, Guillaume Martin
INRA-UMR1248 AGIR, F-31326 Castanet Tolosan, France,
One ‘s upon a time lorries travelling across frontier
We want hay, straw, ammonium nitrate, and soya for Roquefort production

We could be self-sufficient for feeding!!!
Main points for this presentation

- A conceptual framework and indicators to assess feed sufficiency
- Choice of sample farms & methods
- Using framework at farm level to define feed self-sufficiency
- Examples and Challenge at territory and supply chain level
Issue and objective of the study

- Self-sufficiency as a driver of agroecological transition.
- Most farmers combine livestock with forage and crop production to increase self-sufficiency for animal feeding.
- Few farms can develop local exchanges to use local resources.

To build framework characterizing self-sufficiency for animal feeding at farm level in order to discuss the issue of this feed self-sufficiency at different levels: farm, local farmer’s group, territory or supply-chain.
Hypothesis for the conceptual framework

- How to scheme the feed sufficiency at farm level using stock and flow approach:
  - Explaining different feed inflow and outflow used by animals.
  - Calculating the production impacts at farm level.

- What is the relevance of these flows at territory level?
  - Flows approach can be used at territory level by aggregating data.
  - Exchanges between farmers at local level can foster feed sufficiency.
  - Supply chain actors must take into account needs for self-sufficiency for animal feeding.
Conceptual framework

1. Grassland
   - Sown Pastures
   - Fodder Crops:
     - Maize
     - Lucerne
   - Annual crops:
     - Wheat, Barley, Rye...

2. Leaching
3. Cereals selling
4. Supply organic fertiliser
5. Feed Supply
6. Sale/exchange: straw/manure
7. Milk & Meat
8. Grazing
   - Forages
   - Concentrates

N_{\text{mineral}} \rightarrow \text{N}_2 \rightarrow \text{Fertilisation}

Effluents animaux
**Methodology: Sample Farms and studies**

**Analysis at farm level**

*Agriculture census (Agreste, 2010) in Aveyron department:*
Dairy cow, suckling cow and Dairy sheep farms represent 70% of the farms

Collect data from:
- 20 farms Dairy and suckling cows *(Dumas 2015)*
- 21 farms Dairy sheep *(Di Bartolomeo 2014, Galtier 2015)*

**Stock & Flow Modelling and indicators assessment**

**Territory Level**

Aggregation of the farms at the agricultural region “Segala” 2 199 EA *(Grimaldi 2013)*

Analysis of exchange and agreement between farmers in two local regions *(Mélac 2014, Péquignot 2015)*

**Stock & Flow Modelling at local region without performances analysis**

**Territory and Supply chain Level**

Interviews of stakeholders at farmers’ groups and supply chain level ③ ④
Indicators to assess feed sufficiency

**Feed Sufficiency**

- Forage Sufficiency Indicator → based on ratio forage production / consumption
- Energy Sufficiency Indicator → based on energy part of forage and concentrates
- Protein Sufficiency Indicator → based on protein part of forage and concentrates

**Production Impacts**

- Nitrogen Environmental Impact → based on nitrogen losses (kg Nitrogen lost by ha of AA)
- Food Productivity Impact → based on protein production (kg protein produced by kg Nitrogen input)

**Farm Features**

- Crops & Forage crops area
- Rangeland per LU
- Stocking rate
- Animal Productivity
Feed sufficiency at farm level

A large diversity in dairy farms, mainly for Energy and Protein.
Feed sufficiency at regional scale

Feed self-sufficiency for different livestock farming

The averages of sample farms and all farms of the census in this small region are close
Impacts for different stages of farm sufficiency

FPI NEI
7.3a 12.4a
3.7b 18.5a
2.3b 87.9b

Three stages of farm sufficiency defined by PCA and clustering method:

- **Farms very sufficient (forage Energy and Protein)**
  - Stocking rate and animal productivity low
  - Weak Nitrogen Environmental Impact
  - High Food Productivity Impact
  - FPI: 7.3a, NEI: 12.4a

- **Farms sufficient for forage, lack of Energy and no-sufficient in Protein**
  - Medium stocking rate and animal productivity
  - Weak Nitrogen Environmental Impact
  - Low Food Productivity Impact
  - FPI: 3.7b, NEI: 18.5a

- **No-sufficient farms**
  - Stocking rate and animal productivity high
  - Strong Nitrogen Environmental Impact
  - Low Food Productivity Impact
  - FPI: 2.3b, NEI: 87.9b
Improving agreements and exchanges at Territory level

- Local initiatives arise to develop exchange between farmers

A web-network for organic farming

Exchanges between crops farmers and livestock farmers: www.ecebion31.fr

After one year:
- 41 livestock farmers and 65 crops farmers
- 95 offers (mainly hay and « meteil »)

**Stakes**
- Limiting prices hazard
- Local food network
- Crops with agronomic benefits

**Levers**
- Agronomic training
- Technical advises and monitoring
- Economic agreements
- Durable exchanges

**Limits**
- Web interface & design
- Price agreement
- Haulage and Storage services
Local protein for animal fed: a challenge for supply chain level

- Agricultural cooperatives attempt to propose new services and products to the farmers

Stakes

- Increase the area limiting haulage
- Preserve the water catchment
- Add value to productive areas

Limits

- 1st cutting management and use
- Availability of 800ha for Alfalfa within a radius of 20km

Levers

- Alfalfa fields in irrigated areas
- Small units for the dehydration of Alfalfa
- Sufficient group of crops and livestock farmers
Outlook for regional level

- The actors of territory share an incentive for local production of forages and cereals. Debate is more complex for proteins.
- Technical weaknesses could be overcome.
- Logistic threats could limit the local initiative.
- Territorial sufficiency or local feed production can be improved by new cooperation between farmers and supply chain actors.
- Large types of resources can be used by farmers (knowledge, training, experiment, technical advises...).
The different stages of self-sufficiency are linked to farm performances:

- Intensifying production and animal productivity increase energy and protein requirements.
- Farmers need to supply animal with purchased concentrates, limiting the self-sufficiency at farm level.

Aggregation at the regional level shows similar results to self-sufficiency for animal feeding among the main part of the farms.

Conclusions: a framework for farm sufficiency
Three stages of farm sufficiency defined by PCA and clustering method
Echanges céréaliers / éleveurs

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