Applying agroecological principles to analyse and to assess dairy sheep farming systems

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**Issue and objective of the study**

- **Agroecology:** one way to address the challenge of agricultural systems adaptation to global change

- Some **agroecological principles** based on key ecological processes were proposed to (re)design sustainable farming systems (Altieri, 2002; Dumont et al., 2013; Dumont et al., 2014; Bonaudo et al., 2014)

- **Critical issue to supporting the agroecological transition:** How to turn these principles into operational levers for action?
  
  ✍️ Usable by farmers and advisors to describe and to assess the farms
A project with sheep farmers...

• A participatory approach with dairy sheep farmers and based on their practices

• This 10 farmers-group seeks to better use local forage resources and to reduce farm inputs. They define themselves as: “Economical and Locally grown Farms” (ELF)
... located in Southern France

- An ecological region: “Grands Causses” Natural Park ➔ stakes of native calcareous grassland preservation

- Agricultural area with drought season for cheese production (Roquefort PDO) ➔ stakes of farms sustainability
Questions

• How agroecological principles can be used to redesign and to assess dairy sheep farming systems mainly to improve their self-sufficiency at farm level?

• How describe and assess these types of farms to demonstrate their multi-performance?
Methodology

• Some steps Alternating of laboratory analysis and participative process with partners
Methodology

• First step: Two participative work sessions with farmers and advisors to identify levers for action for them to develop agroecological practices.

✦ A share understanding of three notions: “self-sufficiency farming”, “economical farming”, “local grow farming”.
Methodology

- Second step: Interviews and performance database analysis: 27 farmers interviewed in spring 2013
  - To link farmers practices to levers for action
  - To characterize the diversity of dairy sheep farms by identifying patterns of LFS
  - To assess their performances with agroecological properties: self-sufficiency-productivity-efficiency
Methodology

• Third step: Exchange with farmers and advisors about results, analyses and emergence of new questions

⇒ Purposes are improving “new” indicators well-adapted to assess their systems
Agroecological frame

- Agroecological principles turn into operational process for farmers

３ levers for action:
Managing diversity,
Renewing resources,
Limiting inputs
How describe Agroecological LFS

- 10 practices to describe the diversity of LFS

Managing diversity
1- Selection criteria for ewe lamb
2- Combination of grassland diversity for spring grazing
3- Specific grassland for summer grazing

Renewing resources
1- Reproduction management and drying off
2- Genetic Gain use
3- Increase species diversity and grassland types in farms

Limiting inputs
1- Combination milking period and grass growth
2- Purchase of concentrates for ewe diet
3- Outdoor or indoor management for ewe lamb
4- Supply in ewe diet during summer

- Four types of management
  - Intensive Farming: forage and supply
  - Economical & Locally Farming: natural pasture
  - Organic Farming: diversity and supply
  - Alternative Farming: diversity of resources
Agroecological LFS assessment

- According to the management ➔ farmers perform compromises to optimize Performances
Feed back & new questions

Give me Ammonium Nitrate Fertilizer!!!
I’ll produce Self-sufficiency!
Feed back & new questions

• How farmers manage self-sufficiency in the farm?

Self-sufficiency at farm level

What type of self-sufficiency?

How manage it? Which practices?

Feeding Self-sufficiency

Decisions Self-sufficiency/decisions sovereignty

Nitrogen Self-sufficiency

Energy Self-sufficiency

ENVIRONMENTAL IMPACTS

FARMING PRODUCTIVITY

ECONOMIC EFFICIENCY
Critical issues of self-sufficiency

• Farmers improve self-sufficiency in 4 ways:
  – Reducing feeding supplies
    ➔ trade-off among produced vs. purchased supply and milk production
  – Reducing or suppressing mineral Nitrogen and pesticides
    ➔ trade-off among organic farming, milk production level and purchased supplies
  – Limiting tilling and no-tilling
    ➔ trade-off among working time, fuel consumption and pesticides
  – Increasing diversity ressources
    ➔ trade-off among long-term grassland, tilling, and intensive pastures
Example of indicators to assess performances and discuss Trade-off

Trade-off between Nitrogen losses and Nitrogen efficiency at farm level

- Protein produced (kg) with 1 kg of Nitrogen introduced in the farm
- Nitrogen losses (kg) per area cultivated (ha)

$R^2 = 0.6434$
Discussion and perspectives

Contribution to:

– Define a conceptual framework to analyze LFS (practices and performances) in an agroecological perspective.
– Discuss self-sufficiency stakes with more attention including agronomic and environmental aspects.
– Produce a first stage to redesign and to assess livestock farming systems based on agroecological properties.

In further works:

– Integrate farm resilience as 4th performances of AE LFS.
– Improve this conceptual framework with farm advisors to support farmers’ agroecological transition
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