Session 27 – n°4659

Modelling of dairy cow feeding system to assess farms' adaptability to technical changes

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What about grassland use…

- Intensification of livestock production has produced a decrease in grassland use
- But grasslands have a multifunctional role
- In the case of cheese production with Geographical Indication labels farmers' practices are subject to stricter specifications using grass in the cow diets
- In many regions farmers must to change their feeding practices to adapt their systems to the "new" specifications

Aims of this work

- The adaptability of the farms and farmers' practices
- Animal feeding is strongly interlinked with land use, resulting in a coordinated set of grassland and livestock practices
- Consistency of the feeding system which we use to assess farms' adaptability to technical changes.

Case Study: 2 less-favoured areas

- Two research projects conduced with actors during 2 years in each area (2003-2006)
- Massif central area
- Pyrenean area
- *How involves grassland use in the dairy farms to adapt them for new specifications cheese production?*

Case Study: massif central area

- West side of Cantal Mountain
  - Wet hilly area (1200–1800 mm/y); volcanic soil; 650-950 m above sea
  - " Cantal " PDO cheese new requirements limiting silage use

- Aubrac_
  - Wet upland area (1000-1600 mm/y); granitic and volcanic soil; 700-1000 m
  - " Laguiole " PDO cheese with detailed requirements

- Margeride
  - Dryer upland area (800-1200 mm/y); granitic soil; 900-1200 m
  - " Bleu des Causses " PDO cheese without specifications

Case Study: Pyrenean area

- Pyrenean plain
  - Dry area (1000–1200 mm/y); calcareous soil; 400-500 m

- Pyrenean piedmont
  - Hilly area (1000–1400 mm/y); calcareous soil; 400-700 m

- Pyrenean mountain
  - Wet hilly area (1200–1400 mm/y); calcareous soil; 400-500 m

- " Tome des pyrénées " PGI cheese made by dairy firms
  - modern and intensive farms using maize silage
  - traditional cheese produced with raw milk without the PGI label
  - Development of a new PGI label "tomme des Pyrénées au lait cru"

Methodology

- To analyse the diversity of feeding systems and to assess consistency of feeding systems in dairy farms
  - defining and characterizing different feeding patterns *(Thénard et al publication in progress).*
  - method based on *Defining-Establishing-Designing-Interpreting (DEDI)* steps:
    - *Step 1: Defining the problem in a specific context with stakeholders*
    - *Step 2: Establishing criteria selection which must be collected*
    - *Step 3: Designing farm's types based on the feeding systems patterns*
    - *Step 4: Interpreting results of feeding systems patterns as an evaluation of the consistency between grassland use and milk production stakes*

Methodology

- In this presentation we used a feeding typology based on a Multivariate Correspondence Analysis
- The farms' diversity is approached with analysis of 37 farms. These farms were defined with partners (agriculture advisors, dairy factory advisors…)
- Data were collected during farmers' interviews.
- We used a n-level trade off linked the specifications' adaptation as the "room for manoeuvre" of the different feeding systems' patterns .

Results: defining problem

- Each new specifications defines different levels of requirements
  - Forage requirements
    - Maize silage abandonment
    - Grass silage abandonment
  - Animal production requirements
    - Milk yield limited to 6000 kg per cow and year
    - Concentrate feeding limited to 4kg per cow and day

- What are technical changes necessary for different farming systems?
  What are requirements probably acceptable by farmers?

Results: establishing criteria

Analysis of data has permitted to define

- 4 criteria to qualify the grassland management:
  - - Turnout date
  - - Date of the full grazing
  - - Percentage of "good" quality hay or grass silage
  - - Percentage of sown meadows
- 5 criteria to identify milk production strategy:
  - - Milk yield per cow and per year
  - - Type of breed (specific or rustic...),
  - - Calving period: it is linking with the milk production period,
  - - Feeding in winter,
  - - Quantity of concentrate per cow in the dairy diet.

Results: designing diversity

MCA has permitted to described diversity with 6 feeding patterns explaining by:

- the earliness of grass use for grazing and cutting (early vs. late),
- the period of milk production (spring vs. winter)

↳ That is could be see as a grassland and/or livestock intensification

Results: designing diversity

	Precocity grazing	Precocity cutting	Milking period	Breed
Traditional Milk Farming	**-**	=	**spring**	**Rustic**
Grassland Farming	=	=	**spring**	**Milk**
Grassland & Meadow Farming	**+**	**+**	various	**Rustic**
Meadow Farming	**+ +**	**+**	**year**	**Holstein**
Maize & Pasture Farming	**+**	=	**winter**	**Milk**
Maize Farming	**-**	**-**	**winter**	**Holstein**

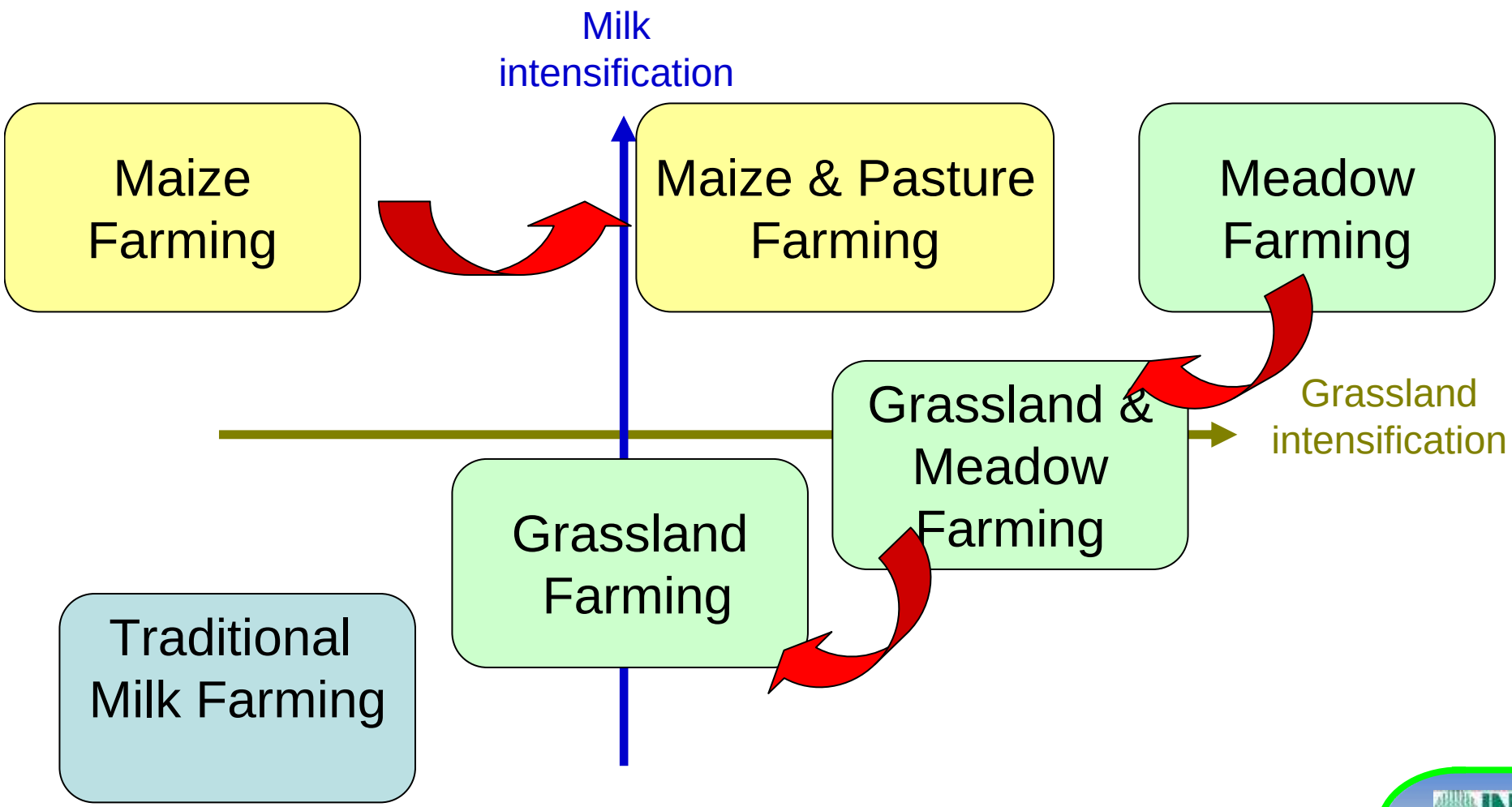
Results: designing diversity

	Precocity grazing	Precocity cutting	Milking period	Breed	Winter forage	Milk <>6000	Concentrate <> 1200
Traditional Milk Farming	-	=	**spring**	**Rustic**	hay	under	under
Grassland Farming	=	=	**spring**	**Milk**	hay	under	under
Grassland & Meadow Farming	+	+	various	**Rustic**	grass silage	under	over
Meadow Farming	+ +	+	**year**	**Holstein**	grass silage	over	over
Maize & Pasture Farming	+	=	**winter**	**Milk**	maize silage	under/over	over
Maize Farming	-	-	**winter**	**Holstein**	maize silage	over	under

Results: interpreting 'room of manoeuvre

	Precocity grazing	Precocity cutting	Milking period	Breed	Winter forage	Milk <>6000	Concentrate <> 1200	AOP/ IGP level
Traditional Milk Farming	-	=	**spring**	**Rustic**	hay	under	under	* *
Grassland Farming	=	=	**spring**	**Milk**	hay	under	under	* *
Grassland & Meadow Farming	+	+	various	**Rustic**	grass silage	under	over	* *
Meadow Farming	+ +	+	**year**	**Holstein**	grass silage	over	over	*
Maize & Pasture Farming	+	=	**winter**	**Milk**	maize silage	under/over	over	
Maize Farming	-	-	**winter**	**Holstein**	maize silage	over	under	

Results: interpreting 'room of manoeuvre



Results: interpreting 'room of manoeuvre

❖In Massif central area farmers conduce mainly:

- ➢Traditional Milk Farming
- ➢Grassland Farming
- ➢Grassland & Meadow Farming
- ➢Meadow Farming

❖ Specifications with different levels of requirements could be adopted

❖In Pyrenean area farmers conduce mainly:

- ➢Grassland Farming
- ➢Maize & Pasture Farming
- ➢Maize Farming

❖ Specifications with different levels of requirements could be adopted by a small part of farmers

Discussion:

- This methodology is adapted to assess adaptive strategies to changing local socio-economic environment
- Feeding systems' typology is based on farms' consistency : technical management but farmers' targets too
- Usually, technical changes must be acceptable by the major part of farmers
- Grassland intensification and biodiversity