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Development of a farm-level database on the French dairy sector

25th Pacioli workshop – October 2, 2017

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Center for studies and strategic foresight

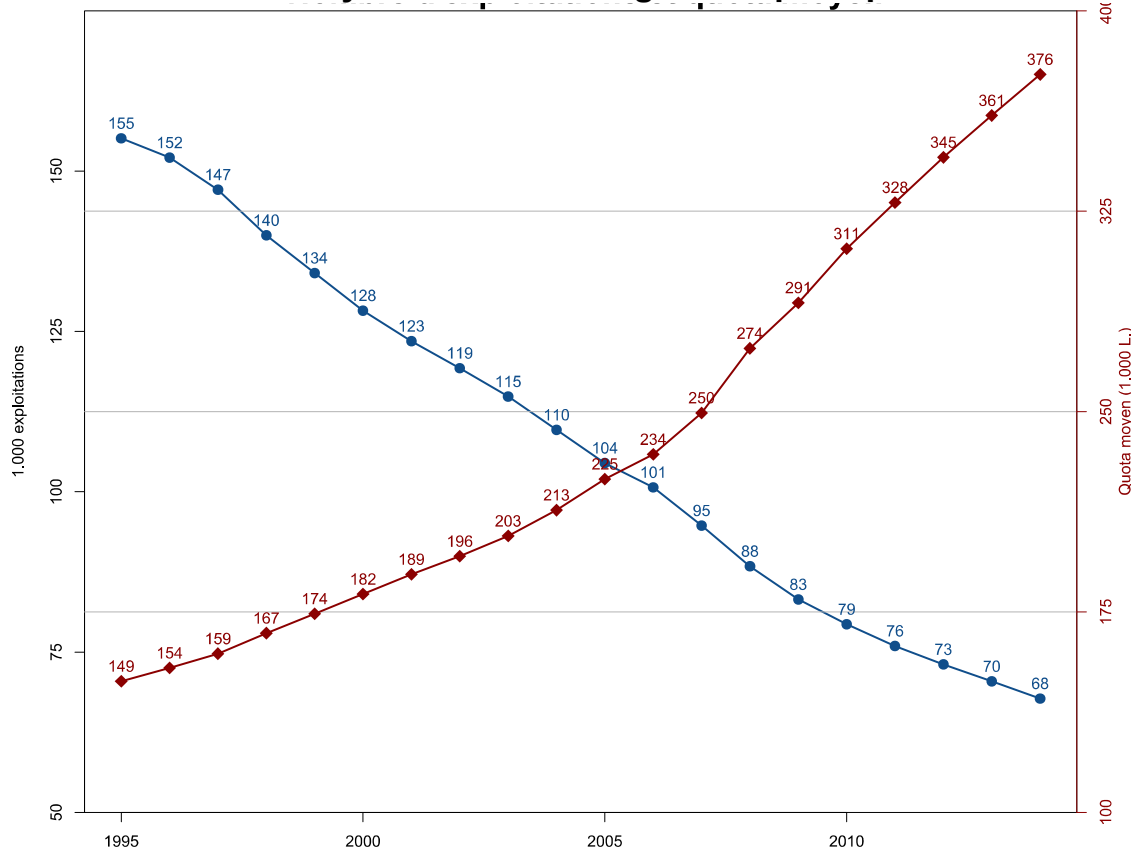
Development of a farm-level database on the French dairy sector

1. Structural changes in the dairy sector: the need for an annual, large covering database.
2. ADEL database: built from administrative data.
3. First results and analysis.
4. Further developments and analysis...

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Structural changes in dairy sector: the need for an annual, large covering database.

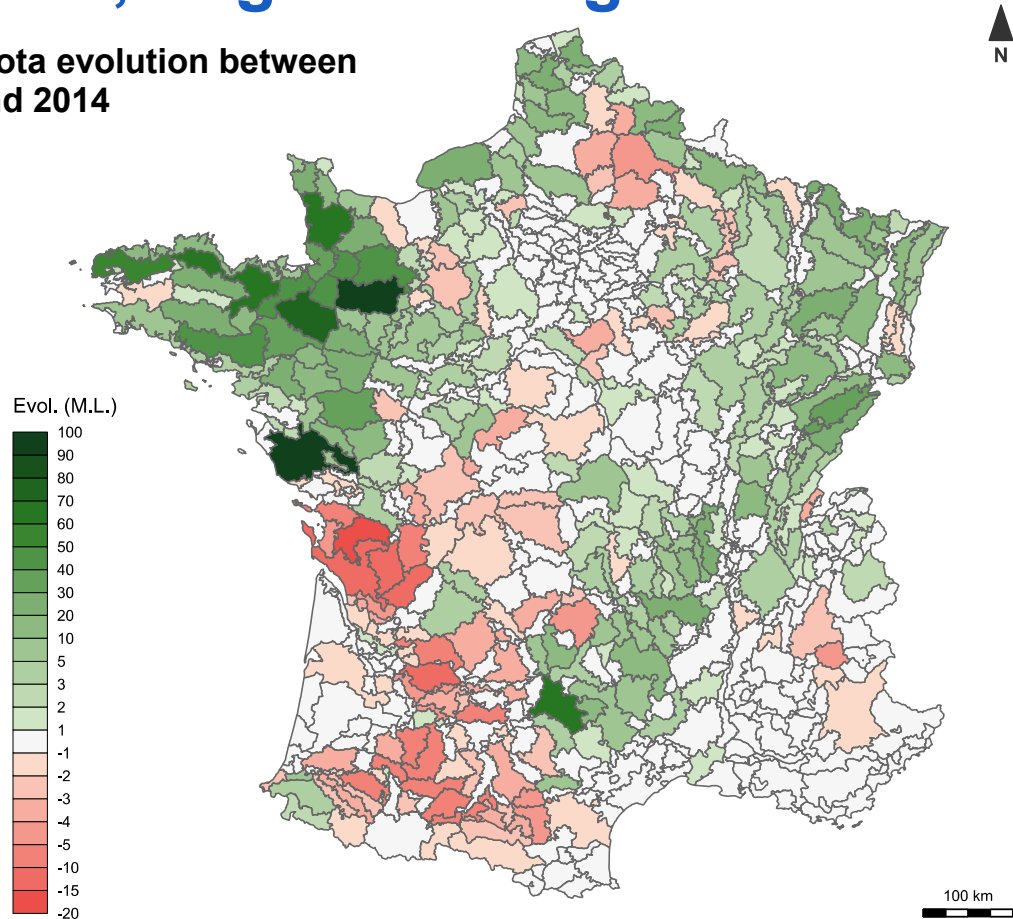
Number of French dairy farms and average milk quota per farm between 1995 and 2014



- Continuous restructuration
- Ramping up since 2007: lifting of European dairy quotas
- Drastic change

Structural changes in dairy sector: the need for an annual, large covering database.

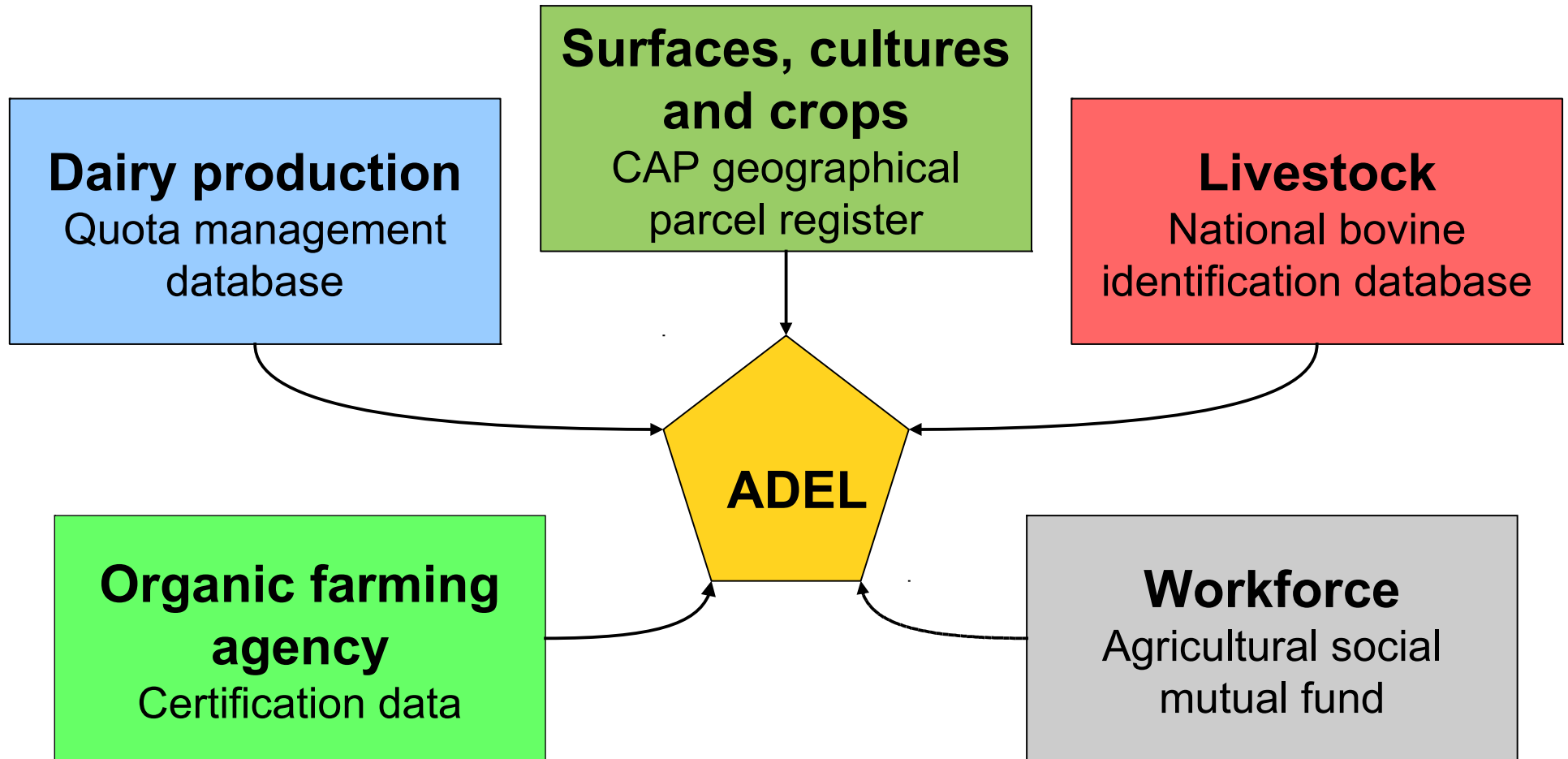
Milk quota evolution between
2007 and 2014



- Strong local dynamics
 - Importance of the dairy production for local economic networks
- => understanding the dairy sector restructuring on a local scale

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ADEL: Data pairing on dairy farms



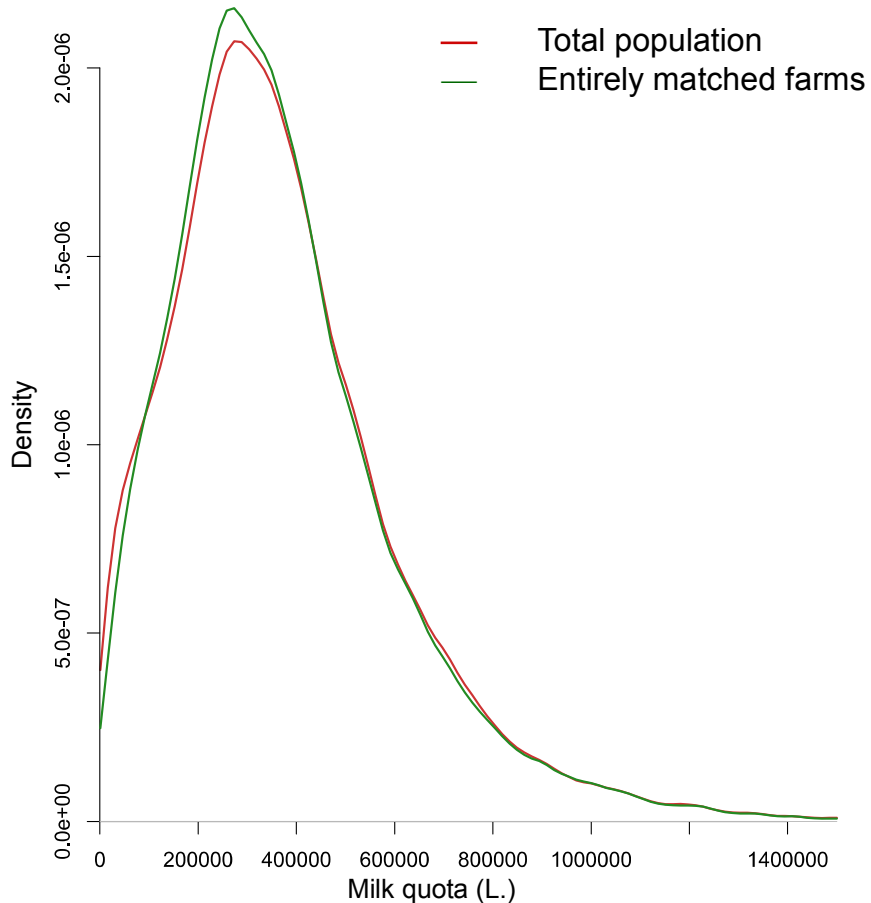
ADEL: Data pairing on dairy farms

- Data management: *R-cran* open source program.
- Data pairing: recursive matching on different unique identifiers.
- Non cylindrical panel covering over 240.000 farms for the 1995-2015 period (cylindrical on 51.000 farms over 2010-2014).
- 208 technical variables at the farm level, workforce data at individual level, and dairy farm parcels GIS files.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Milk quota	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Surfaces						Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
Livestock													Red	Red	Red	Red	Red	Red	Red	Red	Red
Workforce																Purple	Purple	Purple	Purple	Purple	Purple
Organic certification																Green	Green	Green	Green	Green	Green

ADEL data quality

Dairy farms distribution

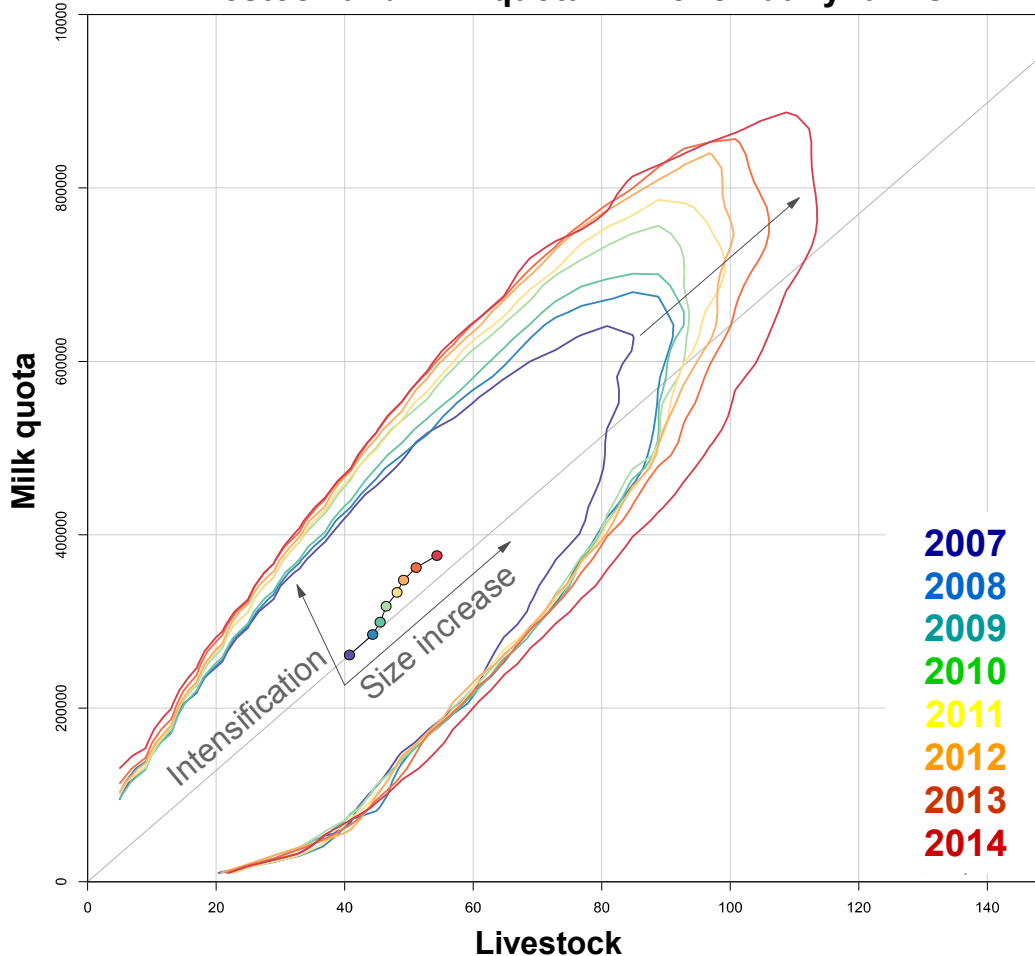


- Consistency with the results of the 2000 & 2010 agricultural census,
- Matched data representativity tested with Welsh's unequal variances t-test of mean quota equality (vs total population):
 - Total pairing: no significant difference excepted for 2010 (1,2%)
 - Accuracy at local scale.

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Dairy farms size increase and intensification

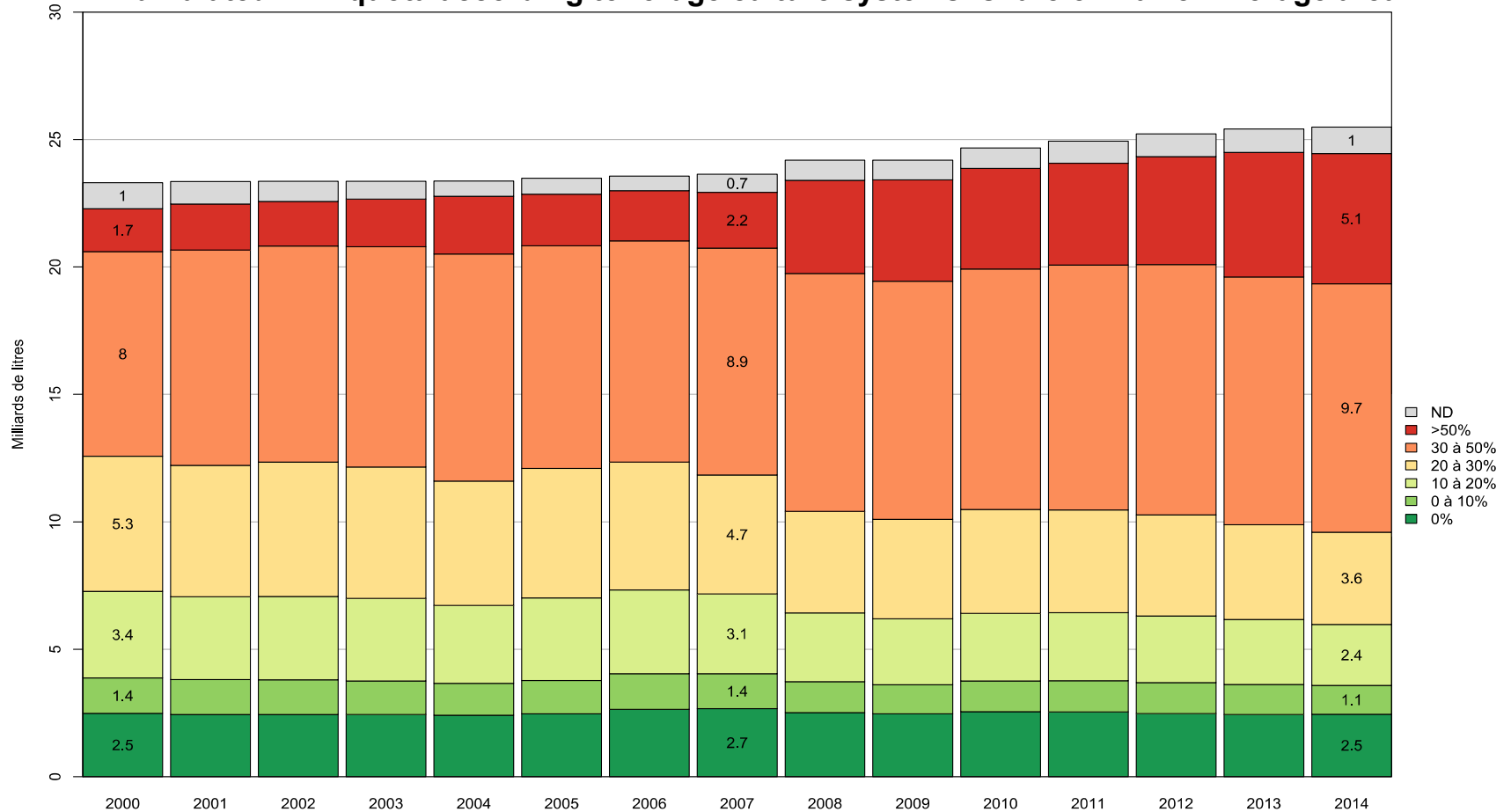
Livestock and milk quota in French dairy farms



- Historical cluster analyses:
 - An annual cluster approach based on a two dimensional kernel analysis.
 - Areas of maximum density gathering 90% of dairy farms.
- Two dynamics:
 - Increasing size (livestock and milk quota together)
 - Livestock intensification.
- 2014: decrease in livestock intensification: capitalisation on post-quota anticipation

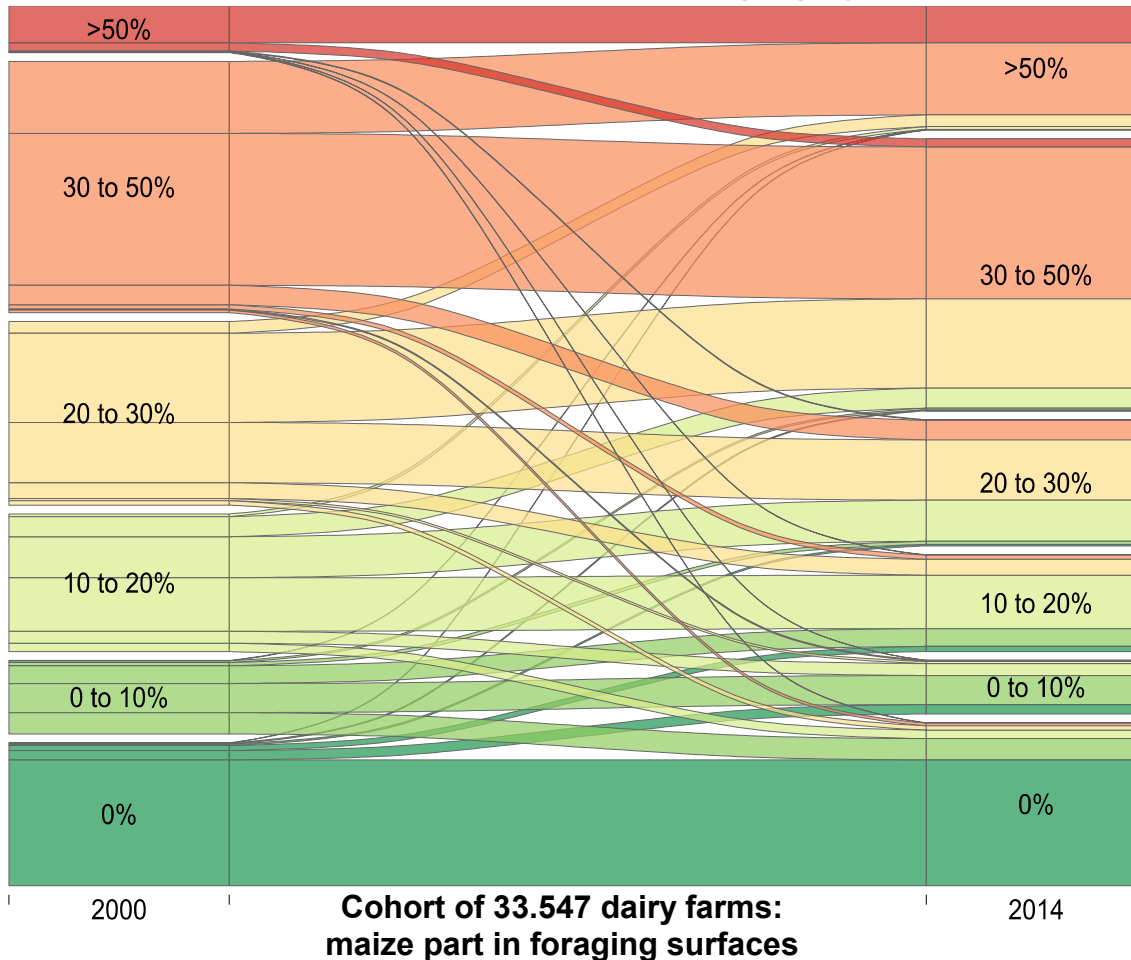
The increase of French milk production relies on an enhanced use of maize:

Cumulated milk quota according to forage culture systems: share of maize in forage area



Cohort analysis: individual farms' trajectories

Transfer matrix between foraging systems



The increase in French milk production relies on an enhanced used of maize...

But in a dual evolution:

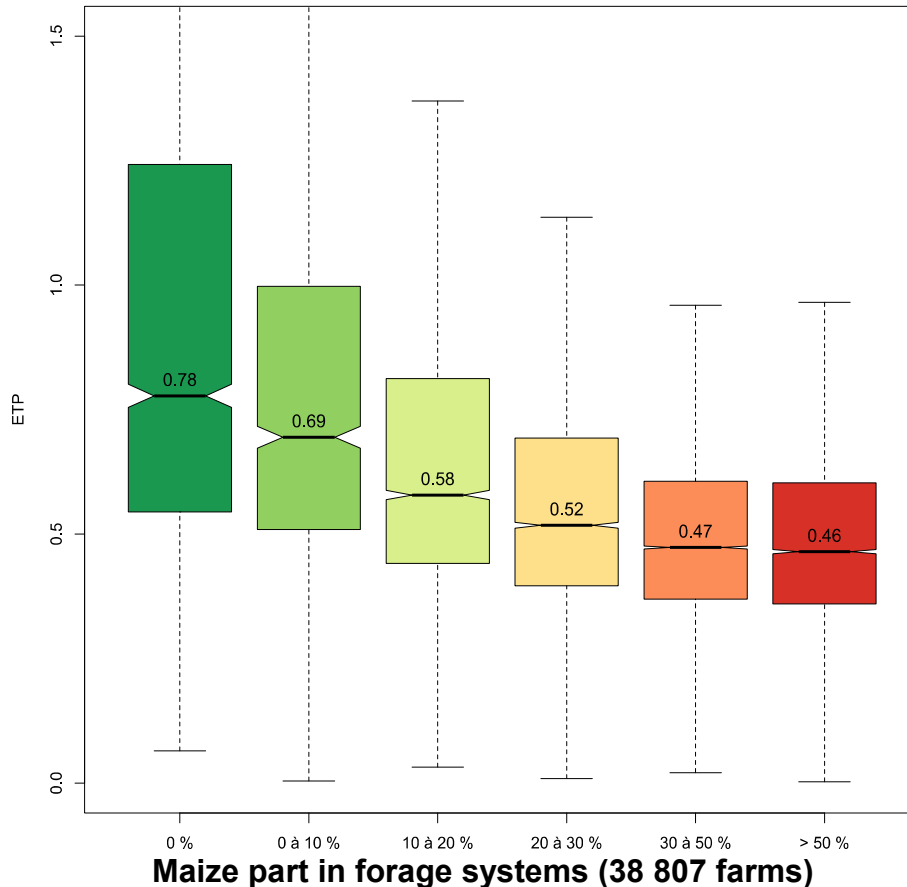
- Intensification and size increase, based on enhanced maize use.
- Alternative grass strategy: consolidation of grass-based systems, grass conversions (1.500 total maize removal).

cf. analyses on production costs (France, Ireland, New-Zealand)

Minority strategies could not have been shown without detailed data.

Forage systems implications on workforce

Full-time equivalent for 100.000 L. milk / forage systems
(farms in lowland areas, organic farms excluded)



- Grass-based systems create more jobs.
- Differences are statistically significant between forage systems (except when >30 % maize)
- Volumic productivity vs. economic productivity.
- Grass-based systems' performances:
 - Farm-level economics
 - Environnemental performances
 - Rural development.

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Further analysis and developments

- A wide potential for in-depth and original analysis:
 - annual quantification of workforce changes (first estimates of 12.000 job losses between 2010 and 2014),
 - local consequences of structural changes,
 - key factors in farm sustainability, environmental performances,
 - impacts of parcel spatial organisation
 - ...
- ADEL database developments:
 - post-quota data: milk deliveries declarations at the farm level
 - economic data: CAP subsidies and tax returns?
(Dedieu & Lorge, 2017)

Development of a farm-level database on the French dairy sector

- Forthcoming publications:
 - Depeyrot J.-N. (2017), « Observer les changements structurels des exploitations laitières françaises : constitution de la base de données ADEL », *Notes et Études Socio-Économiques*, vol. 42.
 - Depeyrot J.-N. (2017), « Les transformations du paysage laitier français avant la sortie des quotas », *Analyse CEP*, Centre d'études et de Prospective.
- Thank you for your attention,

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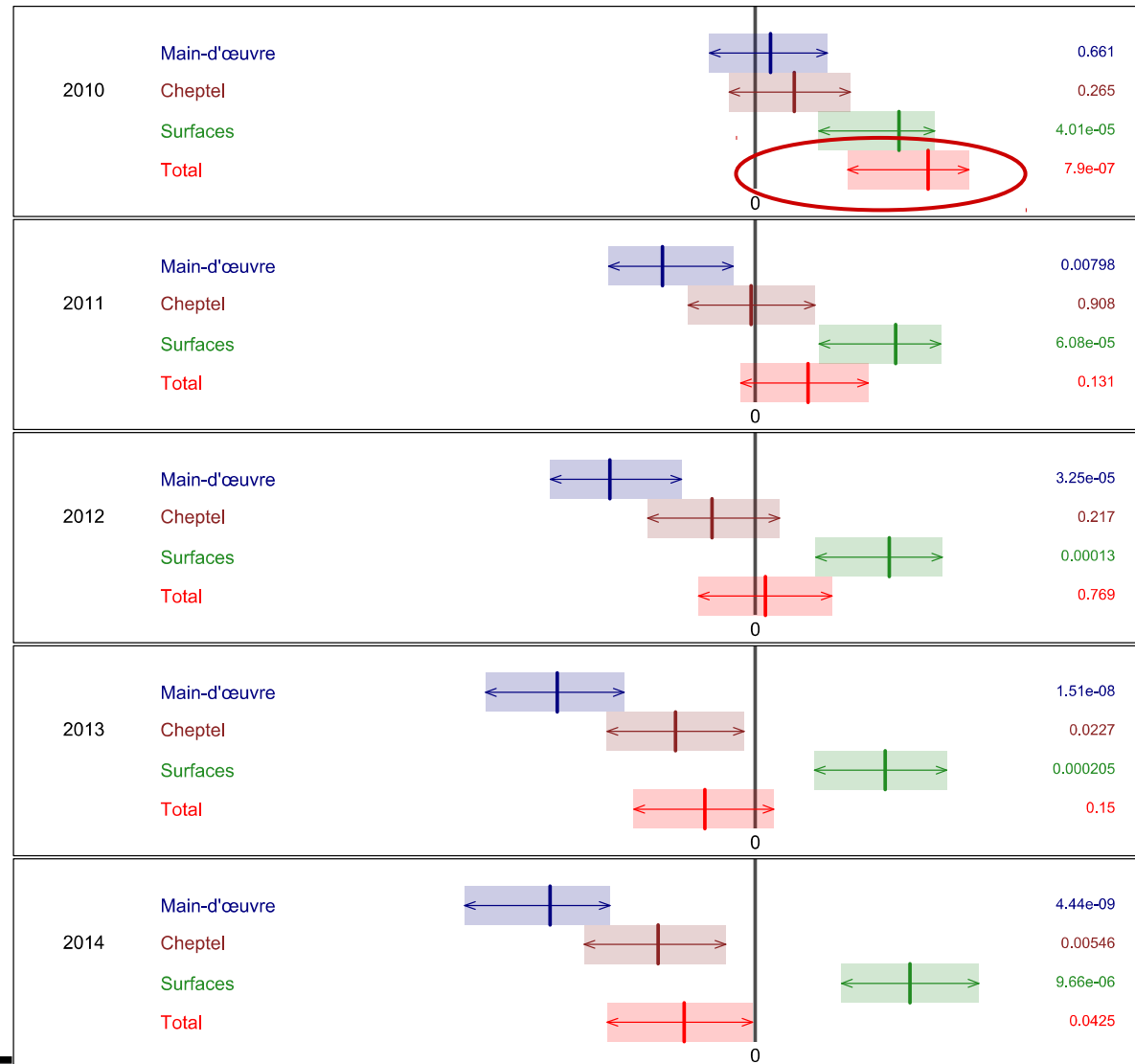


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Development of a farm-level database on the French dairy sector - *appendix*

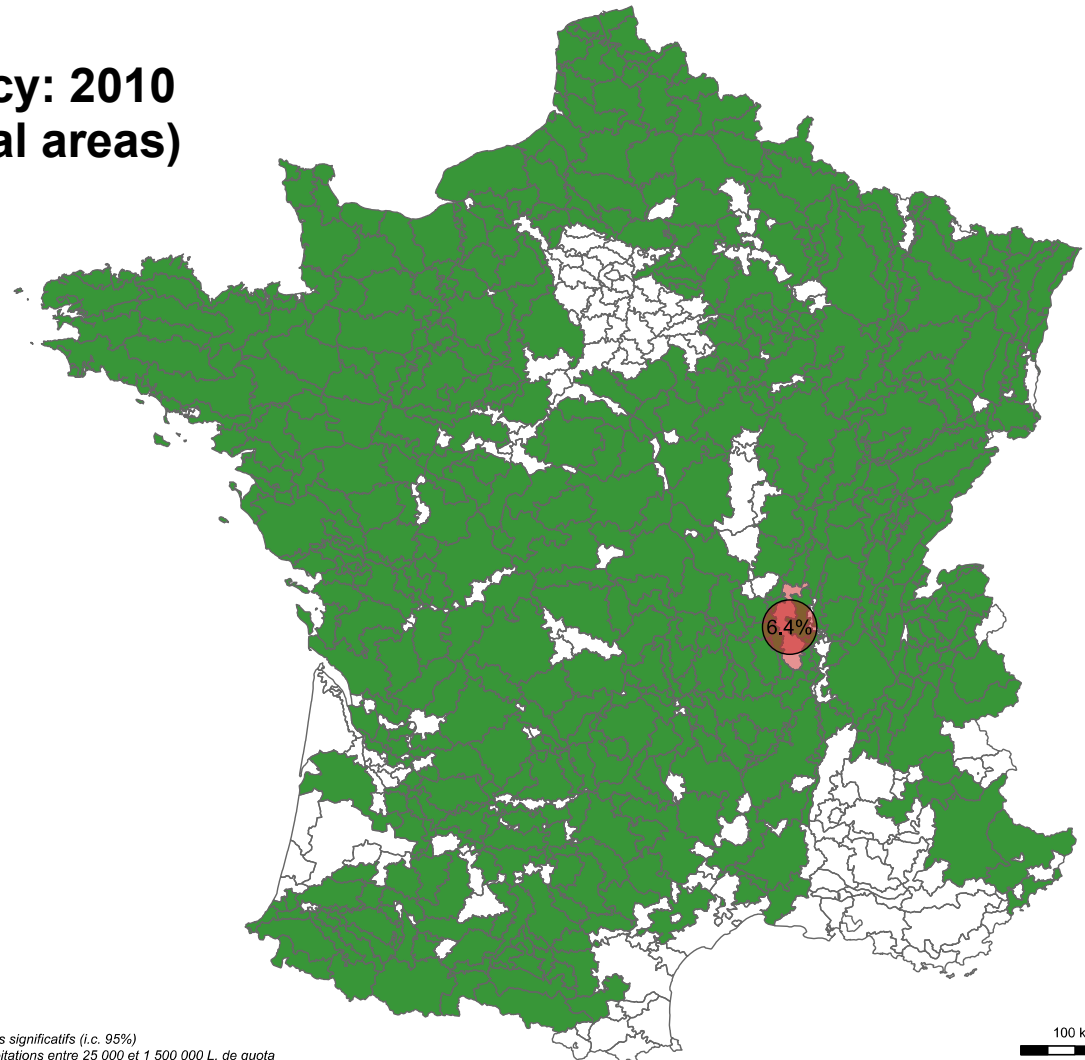
- Welsh's t-test mean quota equality (paired population – total population)
- Farms between 25.000 and 1.500.000 L.
 - Workforce
 - Livestock
 - Surfaces
 - Total pairing



Paired data mean quota deviation :

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Surfaces	2,4%	2,2%	2,1%	2,3%	1,9%	2,3%	1,7%	1,6%	1,6%	0,9%	1,2%	0,2%	0,2%	0,8%	1,0%
Livestock								2,4%	1,6%	0,8%	X	X	X	0,8%	1,0%
Workforce											X	0,2%	0,2%	0,8%	1,0%
Total pairing											1,2%	X	X	X	1,0%

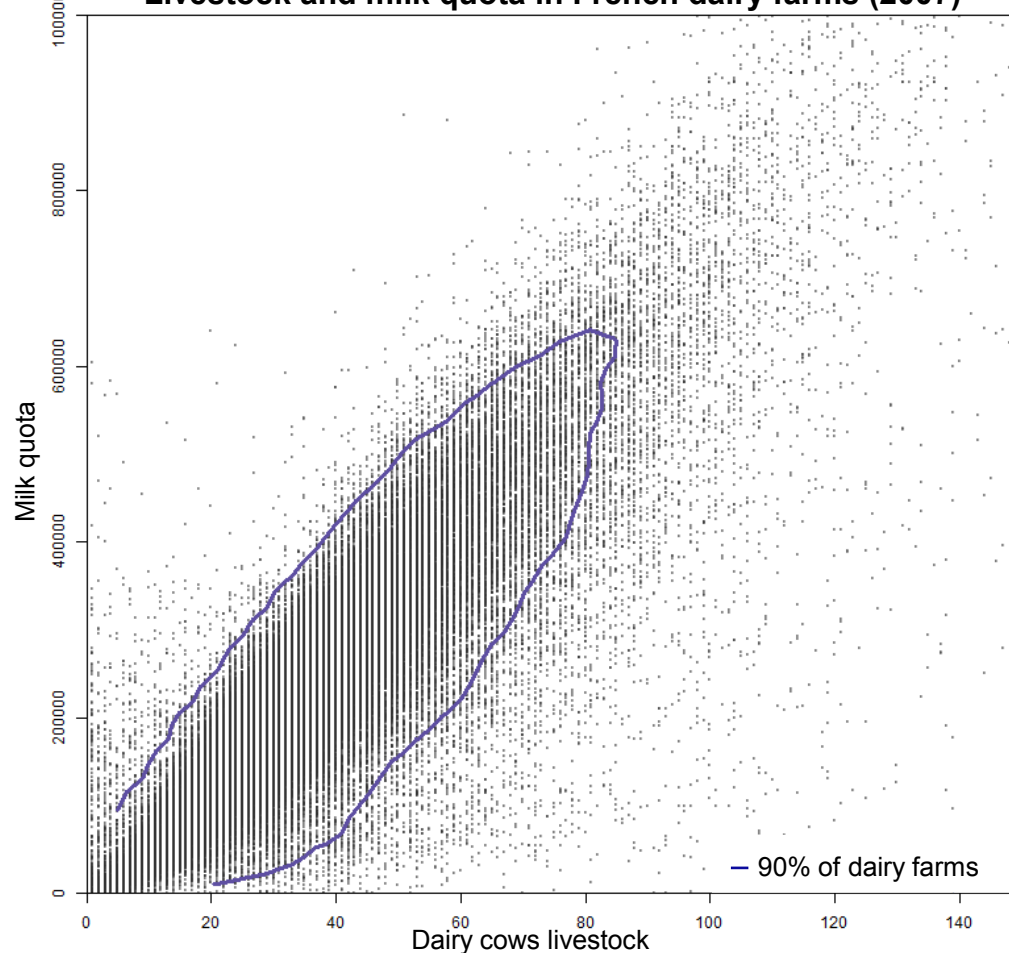
**Local data pairing accuracy: 2010
(homogeneous agricultural areas)**



*Écarts significatifs (i.c. 95%)
Exploitations entre 25 000 et 1 500 000 L. de quota*

A large farm level database enabling original analyses

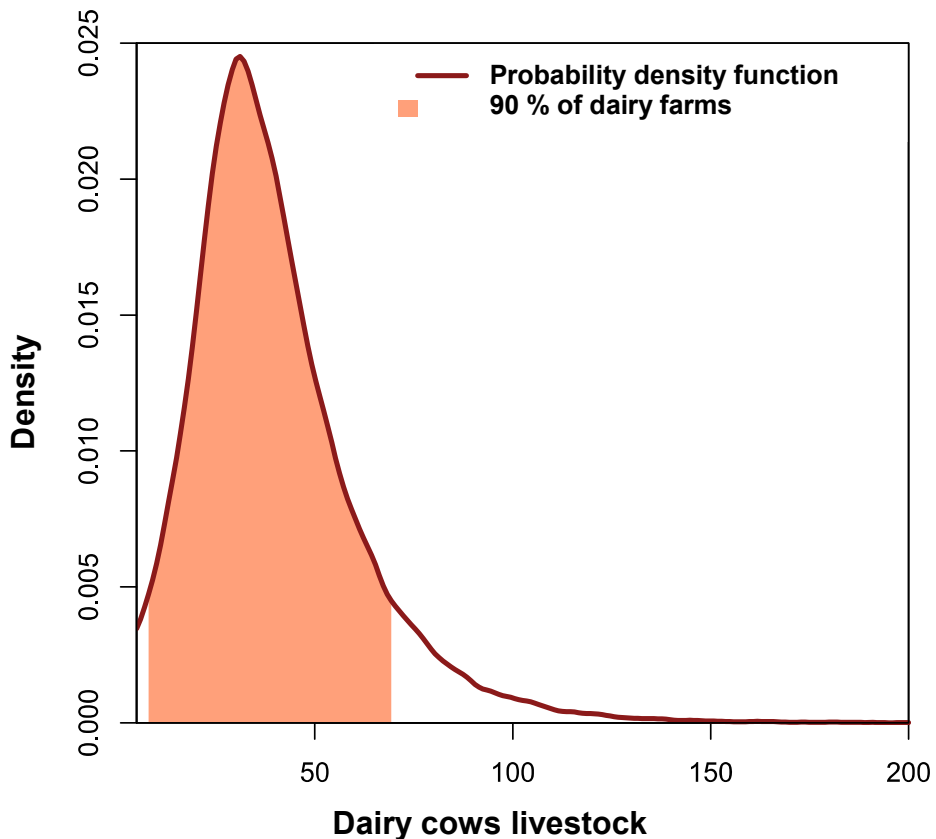
Livestock and milk quota in French dairy farms (2007)



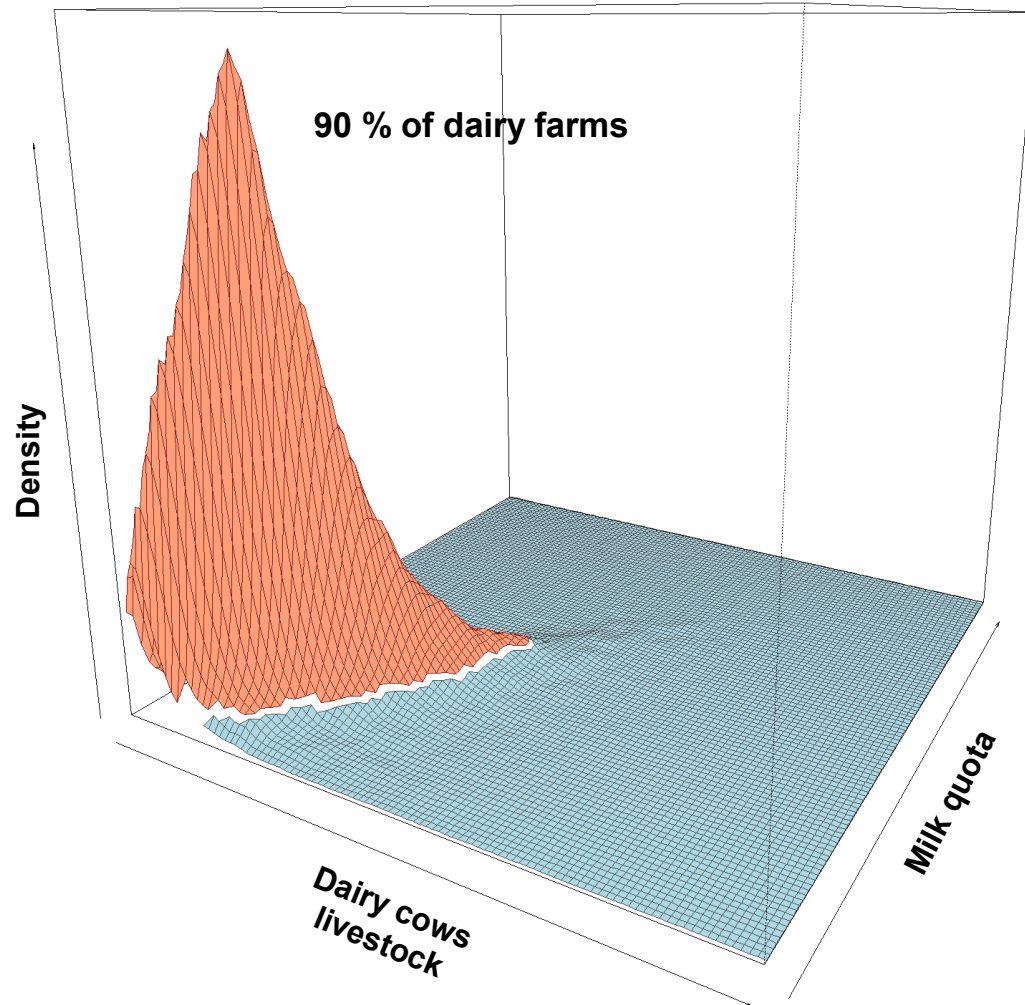
A cluster approach based on density analysis

A cluster approach based on density analyses

Farm distribution according to livestock (2007)

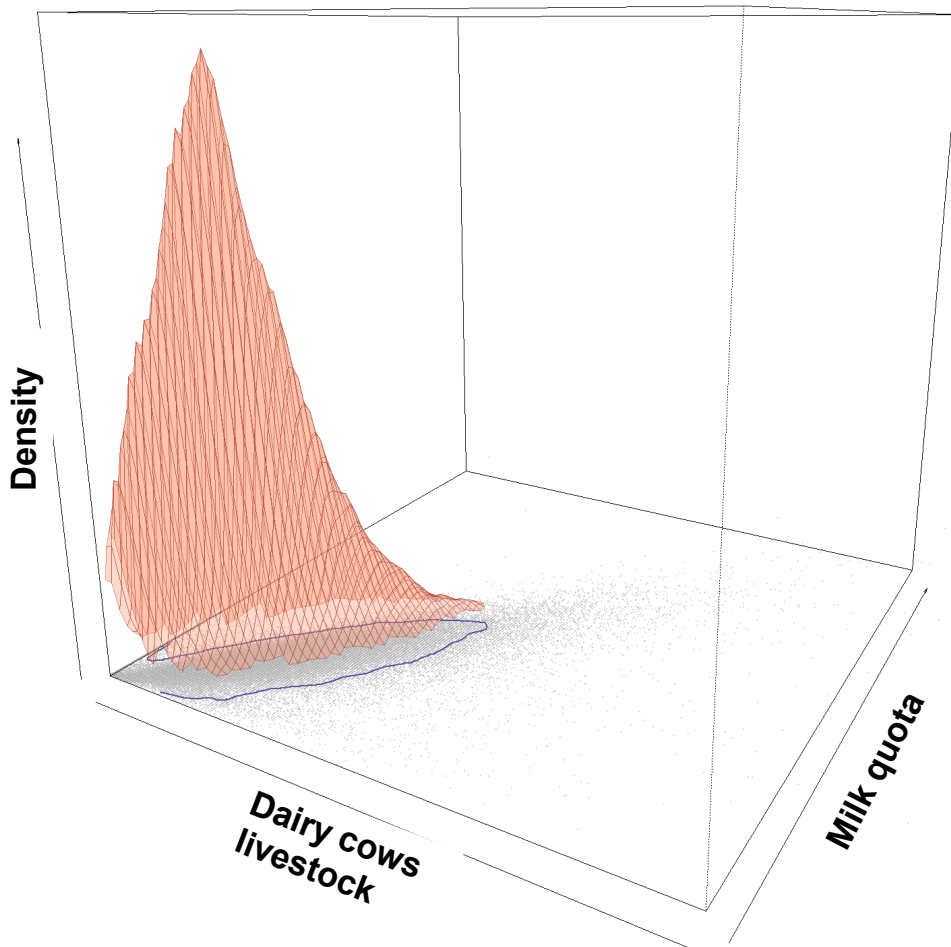


Farm density according to livestock and quota volume



A cluster approach based on density analyses

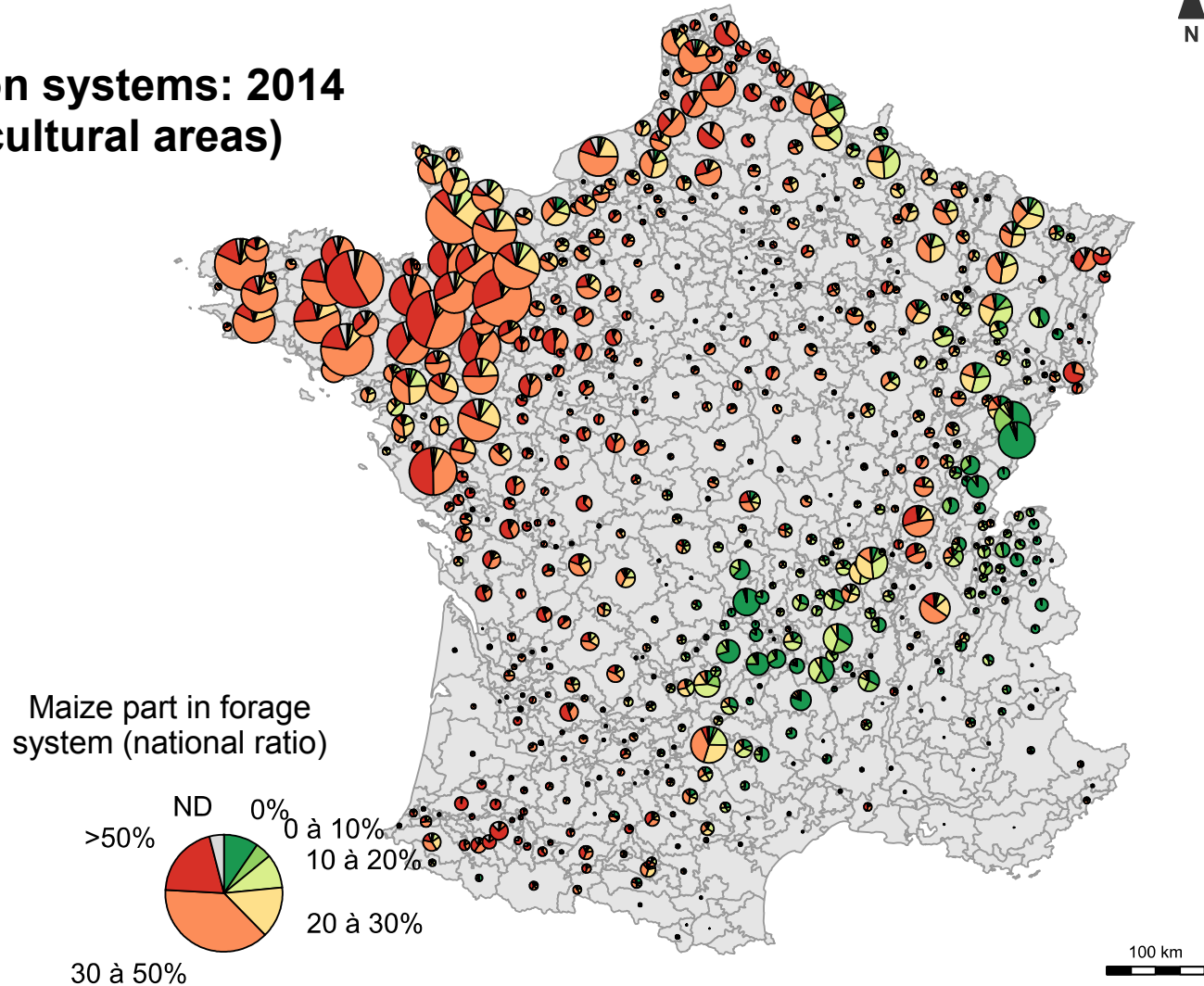
Farm density according to livestock and quota volume



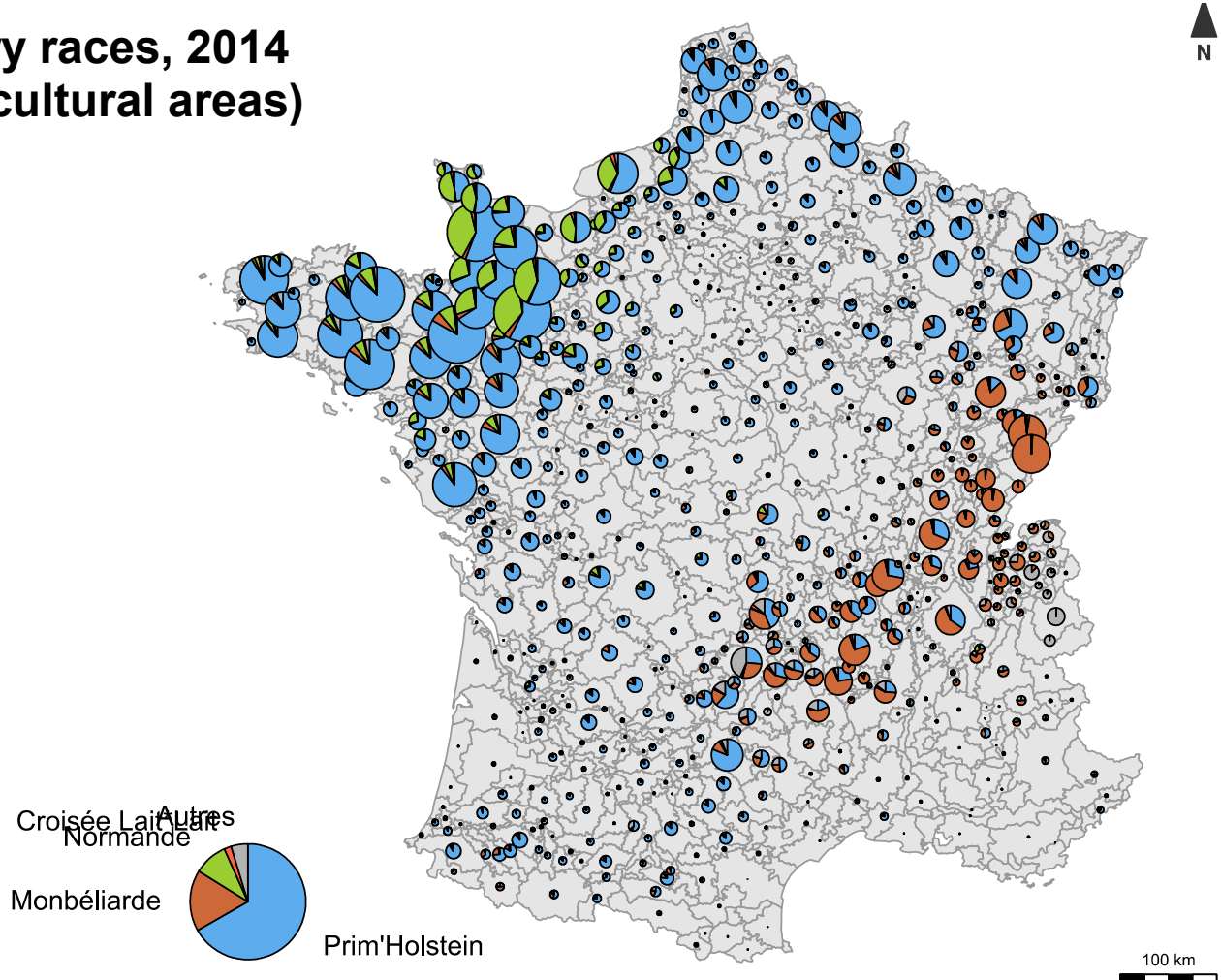
- A two dimensional kernel density analysis.
- Probability density function
- Area of maximal density gathering 90% of dairy farms.

(method inspired from biochemical research)

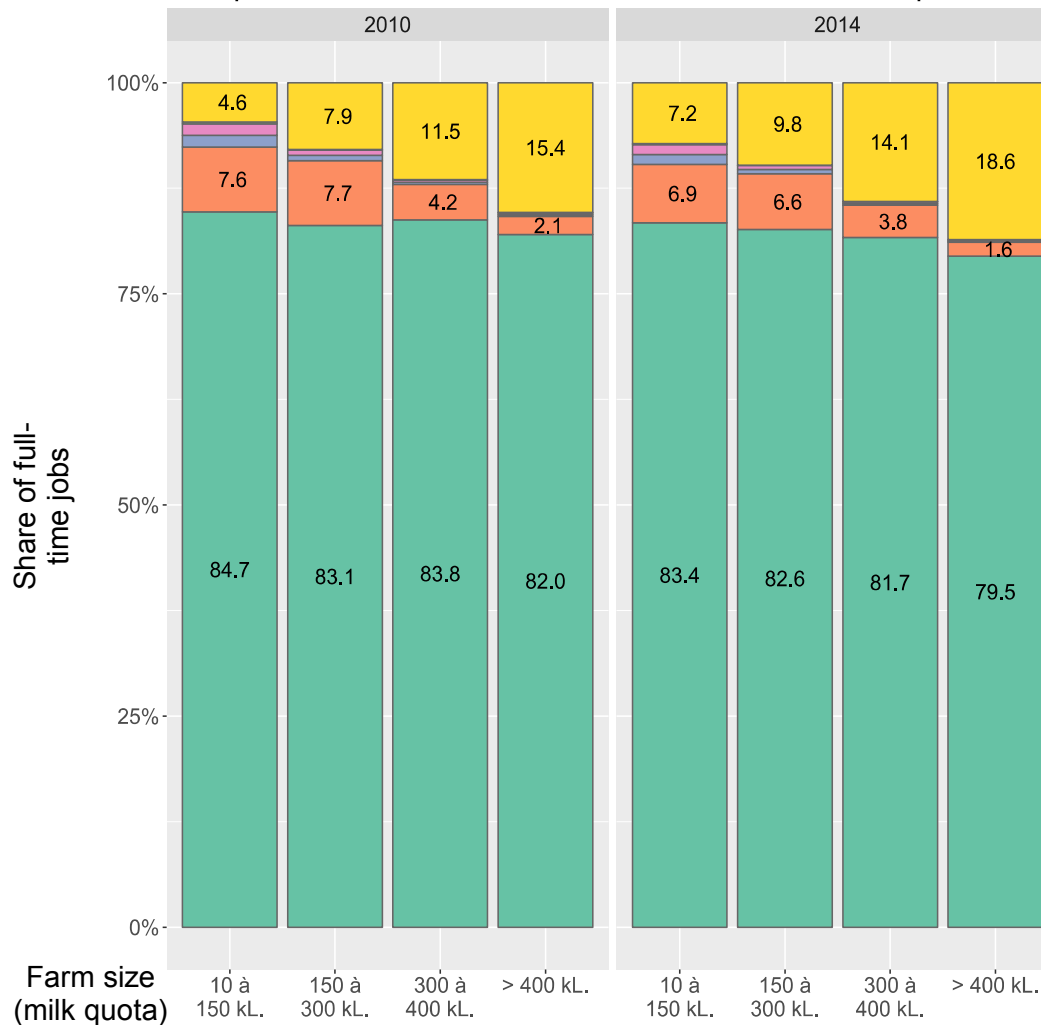
Local milk production systems: 2014 (homogeneous agricultural areas)



Local livestock: dairy races, 2014 (homogeneous agricultural areas)



Workforce composition according to farm size: 2010 vs 2014



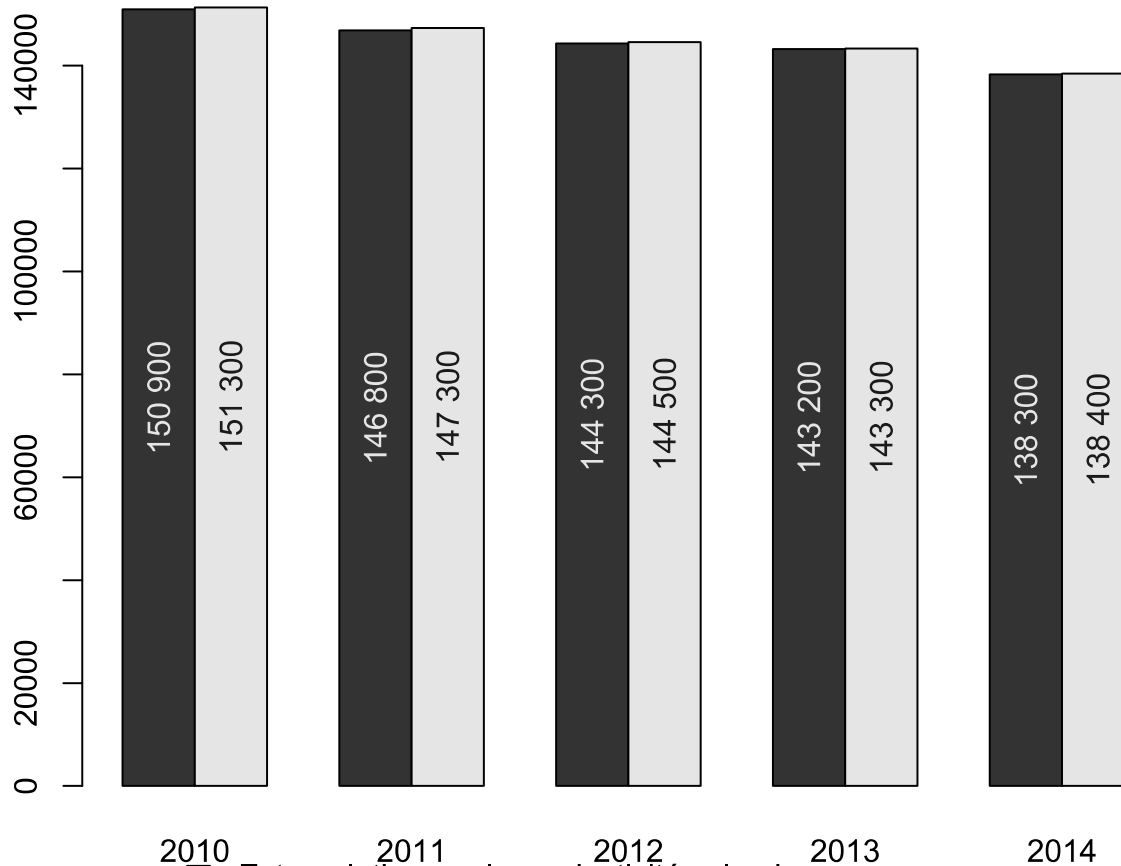
Workforce status évolutions:

- Increase of salaried workforce share
- In every farm size categories

Workforce categories:

- salaried workers
- retired
- unpaid family workers
- family workers
- spouse
- agricultural holders

Total extrapolated full-time equivalent workforce in French dairy farms



Loss of 12.000 full time equivalent jobs

=> further local analysis

- Extrapolation / volumic productivity
- Extrapolation / weighting farm sample (marginal calibration – CALMAR / ICARUS)