

Integrated modelling of cropping practices and biomass flows in agricultural production systems



▲ *View of a cattle farm in the highland region of Réunion.*

The 'Mafate' approach was developed for modelling and analysing mass flows on farm and territory scales, and designed to represent farmers' practices and test management strategies. It involves four steps: (i) acquisition of knowledge on practices, (ii) their conceptual representation (action models, typologies), (iii) construction of simulation models, (iv) use of these models to evaluate the functioning of targeted production systems. Several models have been developed with the same representation and goals, i.e. to simulate mass transfers between production units represented by stocks, linked by flows, which in turn are controlled by actions:

- 'Magma' was designed to simulate effluent management on livestock farms in Réunion. It was also adapted to represent family farms in Vietnam which include pig rearing, crop growing, fish farming ponds and biodigesters to process manure.
- 'Biomass', which was developed in partnership with the

Université de La Réunion, simulates effluent transfers between farms with surpluses and farms with shortages within territories. It was parameterized in the territory of Petit-Grand Tampon in Réunion.

- 'Approzut' has been used to study pig slurry supplies to processing units in Réunion (Grand Ilet, Saint-Joseph).
- 'Comet' is used to assess logistical and environmental plans, and a collective pig slurry spreading plan involving several dozens of livestock farms and land lenders in southeastern Ile-et-Vilaine department (France).
- 'Gamede' (developed by J. Vayssières during his PhD research at CIRAD's UPR Livestock Systems and Animal Product Management), simulates overall nitrogen flows on cattle-dairy farms in Réunion.

Ongoing research is focused especially on environmental assessment of simulated production systems and representation of farmers' activities.

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