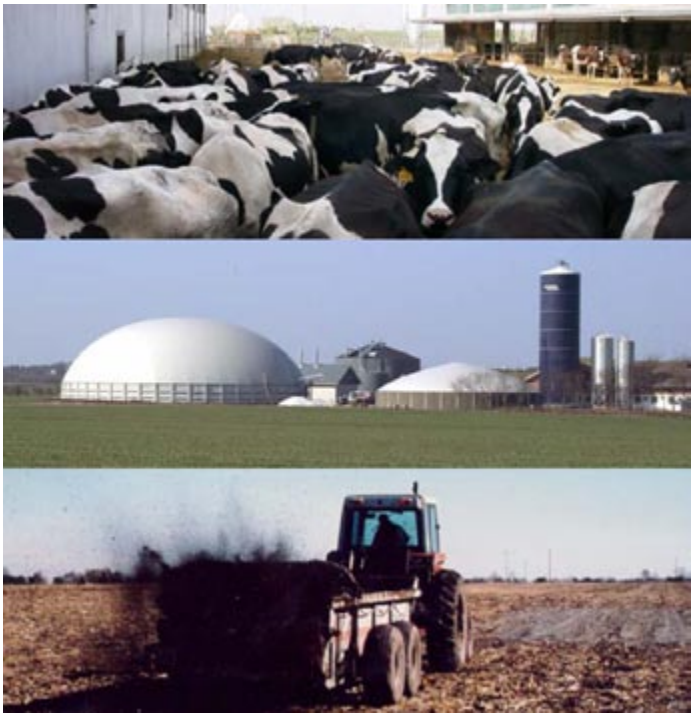
# DIAS report

## 12th Ramiran International conference

Technology for Recycling of Manure and Organic Residues in a Whole-Farm Perspective. Vol. II



**Ministry of Food, Agriculture and Fisheries**
Danish Institute of Agricultural Sciences

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## Technology for Recycling of Manure and Organic Residues in a Whole-Farm Perspective. Vol. II

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## About RAMIRAN

The Network on Recycling of Agricultural, Municipal and Industrial Residues in Agriculture (RAMIRAN) is part of ESCORENA - the European System of Cooperative Research Networks in Agriculture. ESCORENA was established by the FAO Regional Office for Europe (REU) in 1974. It is a form of voluntary research cooperation among interested national institutions involved in research in food or agriculture in European countries. Over the years, ESCORENA has expanded its field of activities to include topics and themes of interest to other countries, particularly those from the Near East and Mediterranean area.

**The objectives of ESCORENA are to:**

- Promote the voluntary exchange of information and experimental data on selected topics.
- Support joint applied research on selected subjects of common interest according to an accepted methodology and an agreed division of tasks and timetable.
- Facilitate voluntary exchange of experts, germplasm and technologies.
- Establish close links between European researchers and institutions working on the same subject to stimulate interaction.
- Accelerate the transfer of European technology advances to, and in cooperation with, developing countries.

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Much of the detailed work of the network is undertaken by the Working Groups. There are currently 7 Working Groups within RAMIRAN including 2 new groups that were established at the last Workshop in Gargnano.

The titles, chairmen and contact details for these groups are listed below.

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# Assessment of the balance between livestock effluent production and nutrient demand by crops in a small agricultural area of The Reunion Island

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## Introduction

Recycling livestock effluents has interest as a way to improve the sustainability of livestock farms as far as it is based on agronomical reasoning. In the Reunion Island, these effluents represent the main source of organic matter, the recycling of which without risking water and soil pollution is a true challenge for the island's agriculture. In the Southern part of the island (e.g., in 'Petit Tampon' and 'Grand Tampon') significant and diversified livestock farming (pigs, poultry, dairy, suckling and fattening cattle) is found together with diversified cropping systems (sugar cane, fruit crops, market gardens, and grasslands). The current farming practices exhibit management drawbacks: on the one hand effluent recycling on crops is badly developed, generating pollution risks, whereas on the other hand the requirements of crops for organic fertilisers remain unsatisfied. Until now no agronomic diagnosis had been carried out in this area at the regional scale in order to assess the harmony between crop requirements and the effluent supply from the livestock farms. This baseline study bridges this gap, which is essential to allow us to consider possible transfers of organic matter between farms. The aim of this paper is to present the method which we implemented to achieve this diagnosis.

## Material and methods

Usually, the balance between supply and demand is simply given by the difference between the amount of nitrogen in the livestock effluents produced and the crops requirements for nitrogen (Figure 1). The originality of our approach lies in the method used for calculating the nutrient requirements by the crops. This approach is based on the reasoned fertilization principle using the nitrogen efficiency equation (Muller et al., 2001) in a tropical area with a strong altitudinal gradient. Calculation at the plot scale is based on the effective supply of endogenous nitrogen by the soil and the nitrogen efficiency ratios of fertilizer applications (apparent fertilizer use ratio and equivalent fertilizer ratio) experimentally measured. The plot data (crops, expected yield,

nitrogen supply from soils, nitrogen efficiency ratios) were stored in a database allowing us to calculate the crop requirements at the plot scale. This calculation was carried out according to allocation rules of effluents to crops, the relative part of mineral fertilizers in the total nitrogen fertilization, and the type of spreading regulations holding in France. This last option coupled with a GIS allowed us to define the net spreading area of a plot and thus to adjust the crop requirements as well as possible.

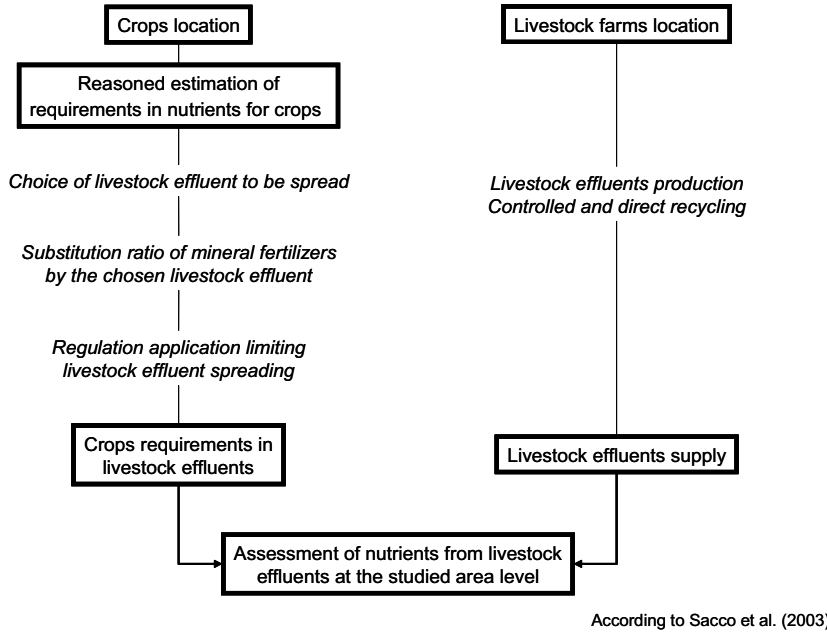


Figure 1. Method for the assessment of the balance between livestock effluents production and nutrient demand by crops.

**Results**

According to the inventory of nutrients stemming from livestock production (57 500 kg of nitrogen), the determination of crop requirements and the cartography of the spreading areas of the agricultural land, it appeared that the Petit Tampon and Grand Tampon area could recycle all nitrogen from the solid manure. With regard to liquid manure, the results lead us to establish two diagnoses according to the spreading regulations that should apply to the livestock farms: If it was assumed that the livestock farms comply with the French 'Réglement Sanitaire Départemental' (i.e., general constraints on spreading), then surpluses were found. If it was assumed that all the livestock farms

comply with the French 'Installations Classées pour la Protection de l'Environnement' regulation, then by substitution of 66% of mineral fertilizer needs with organic fertilizers it would be possible to recycle all nitrogen produced in the area (Figure 2). In addition to this diagnosis, this work enabled us to devise, with Microsoft Access, a calculation tool of the crops requirement using a generic form of request. This tool was built to be used by agricultural advisers.

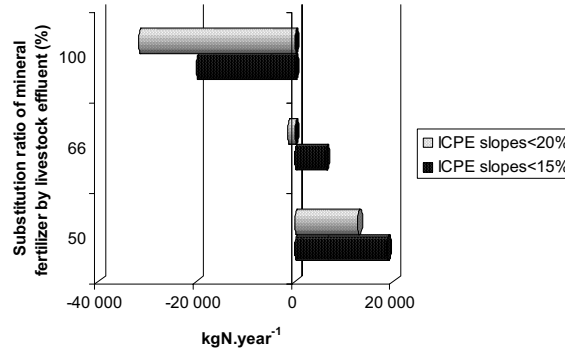


Figure 2. Livestock effluent mass balances (kg of nitrogen per year) for the studied area of 'Petit Tampon' and 'Grand Tampon' according to the French 'Installations Classées pour la Protection de l'Environnement - ICPE' regulation. The levels of substituting mineral fertilizers were evaluated, i.e. 50, 66 and 100%.

**Prospects**

This global diagnosis will be completed by diagnoses to be made within individual farms in order to determine possible difficulties of effluent management at the farm scale. These farm diagnoses should also enable us to use flow simulation models in order to design more efficient effluent management strategies in association with the agricultural stakeholders of the area.

**References**

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