gold

black gold

or manure

Management practices to preserve the **fertilizer N value** of dairy manure in Vakinankaratra region, Madagascar

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decrease in soil fertility
inappropriate agricultural practices
forced by increasing pressure on land
amplified by reduced use of mineral fertilizers

but Vakinankaratra region
large dairy cattle herds
high producers of organic fertilizer (manure)





characterization of manure

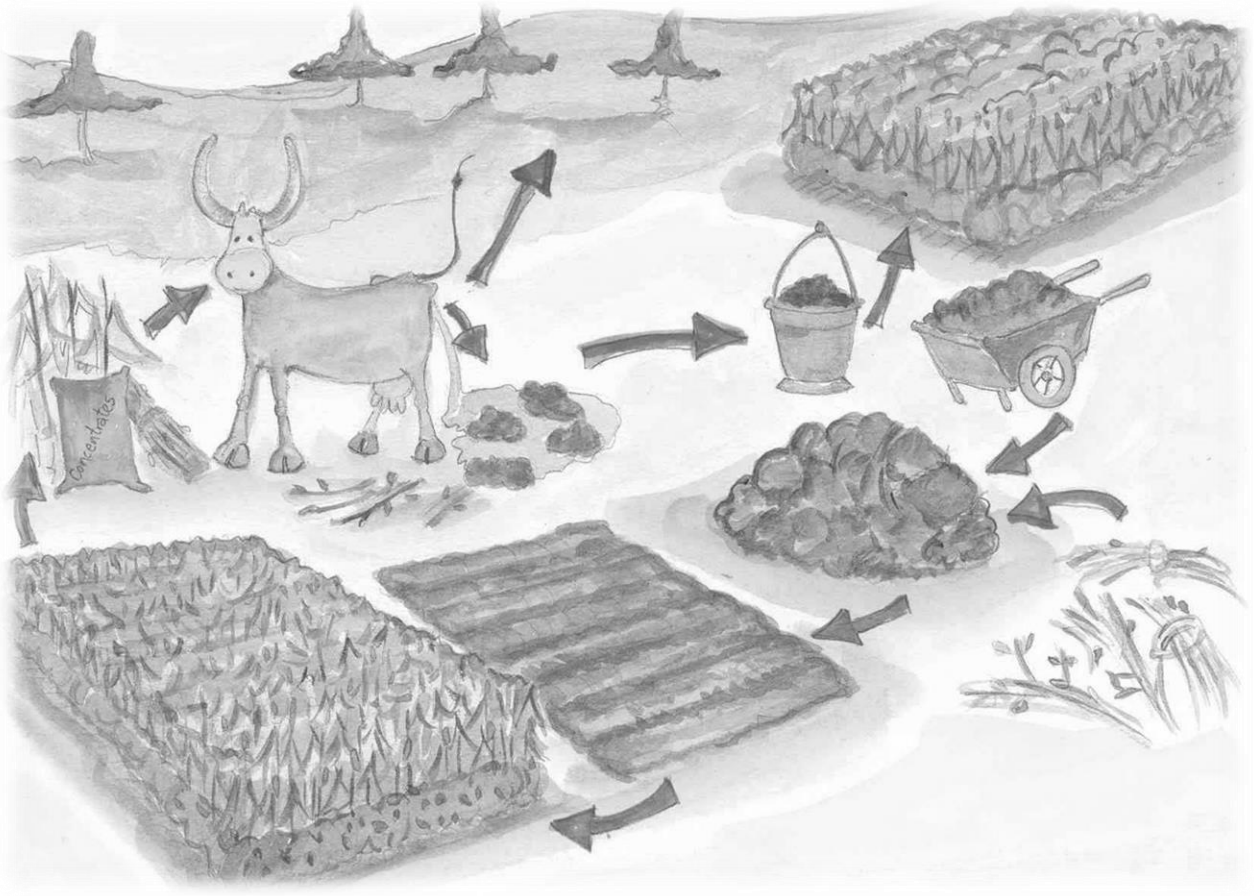
many different types

fertilizer value little documented in southern countries

farmers recognize manure value

restore or maintain the long term fertility

ensure food security or boost their income

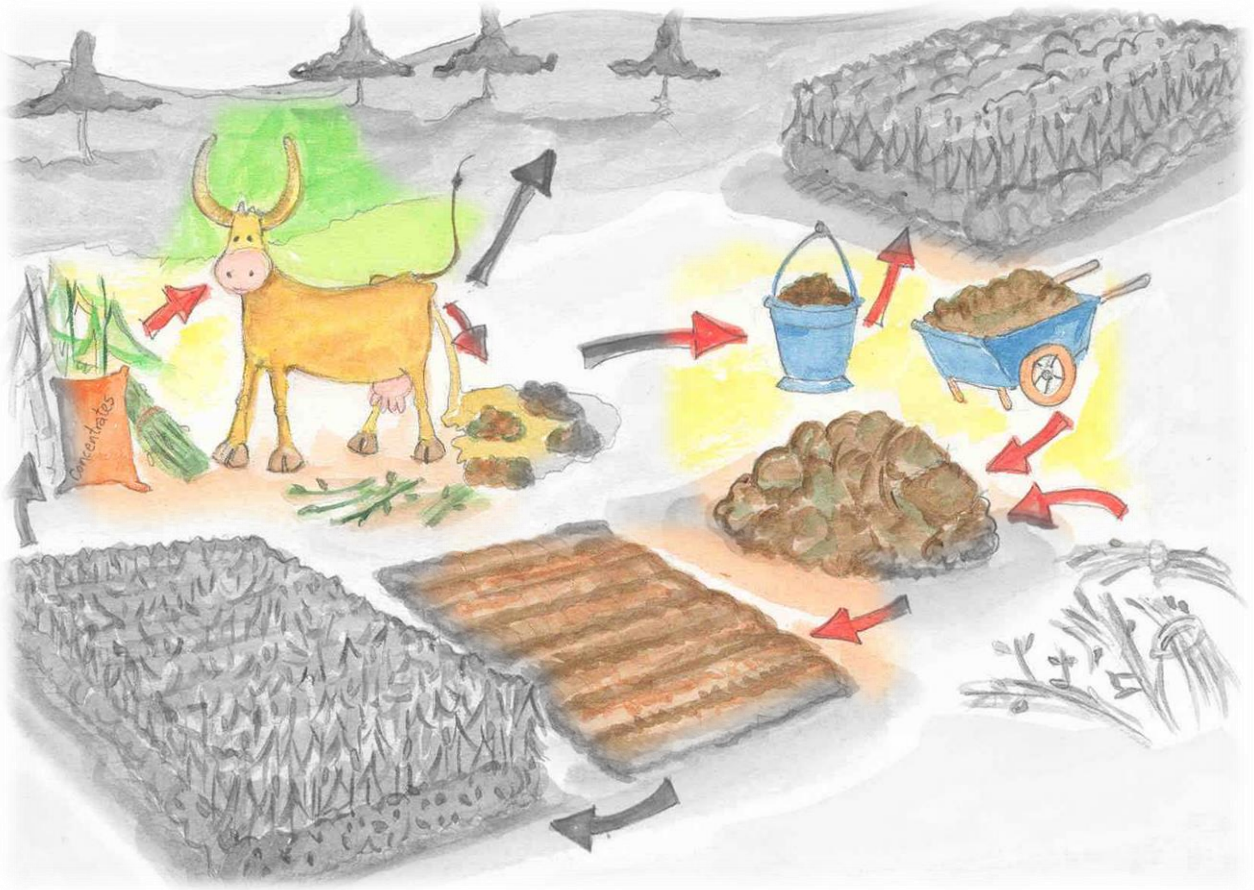


animals are essential to improve soil fertility
ability to collect, use, convert and recycle biomass/nutrients

the quantity of mineral fertilisers applied each year on crops and pastures in the world is about **78 MT N / year** (Smil, 1999)

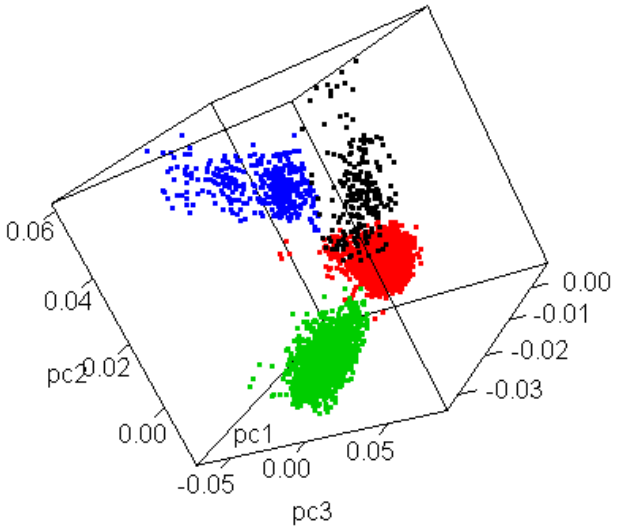
it is estimated that livestock sector can provide **102 MT N / year** as effluents directly applied on field or as collected and treated fertilising products (Vayssières and Rufino, 2012)

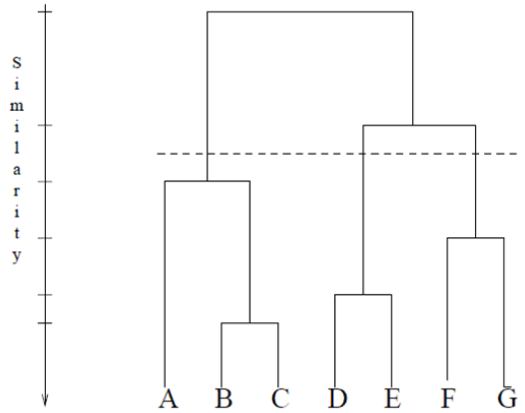
objectives



characterize factors affecting manure quality

identify practices to preserve/increase fertilizer N value of dairy manure





typology of dairy farms
PCA and hierarchical clustering

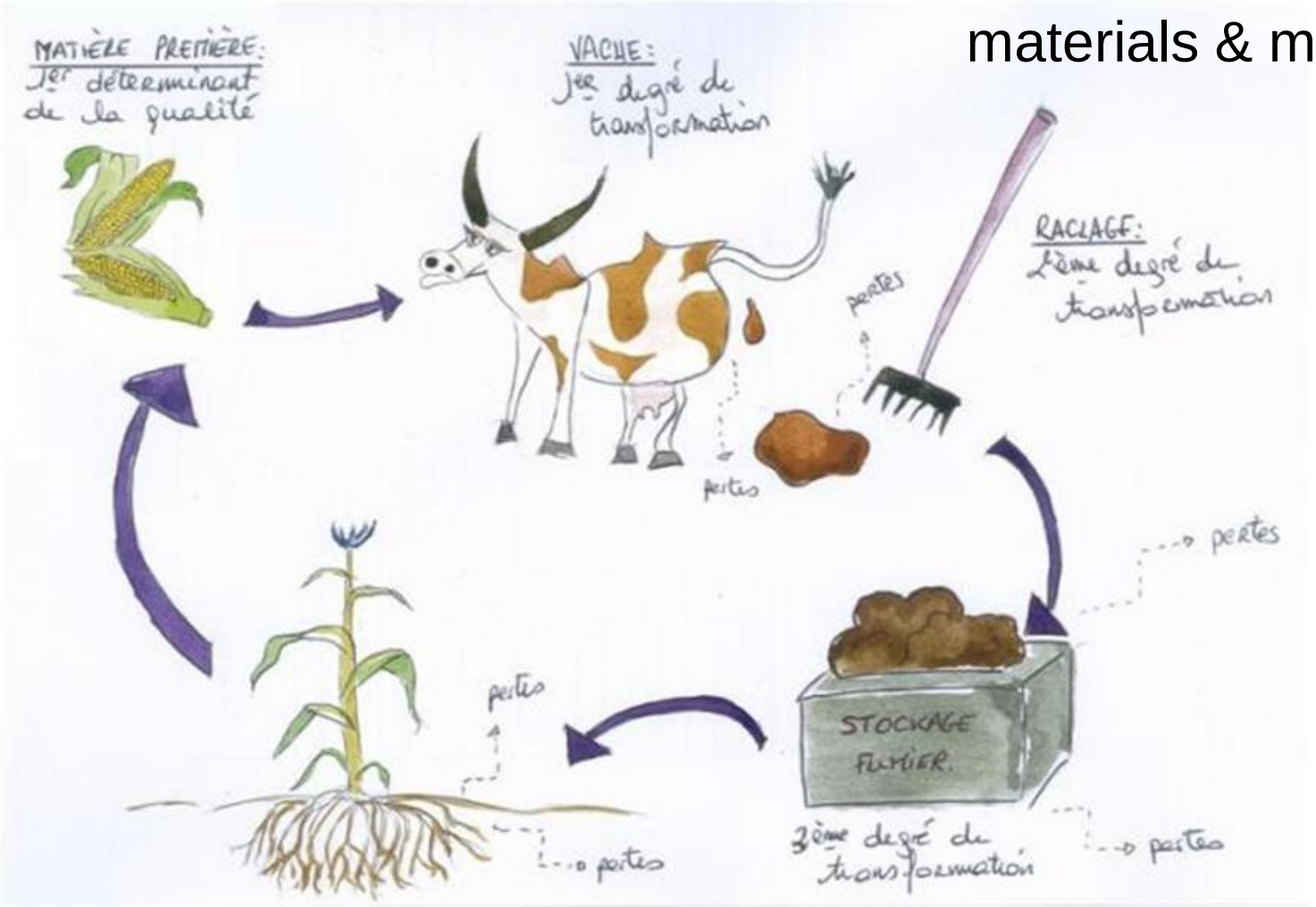
sixty farms selected to represent the variability of manure management practices





interviews with the herd managers
observations on management practices
samplings (feeds, faeces, litter, manure)

drying in oven (24 to 72 h, at 48 °C)
milling (1 mm)
scanned using portable NIRS
to predict chemical composition (N, P and C)

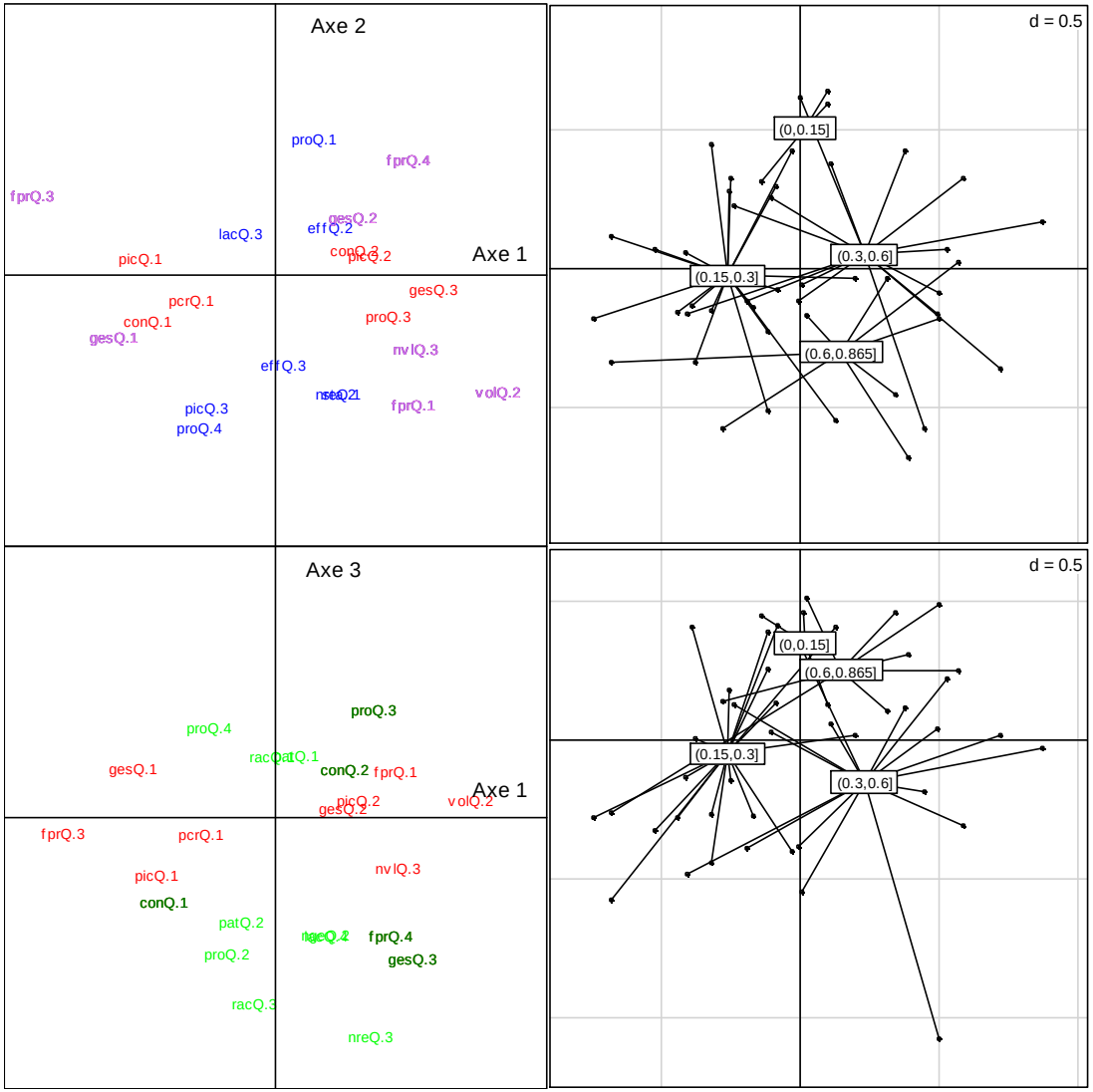


three groups of factors linked with manure fertilizer (N) quality

(i) dairy herd and feed (16 factors)

(ii) type of cowshed and litter management practices (12 factors)

(iii) mode and practices of manure storage (28 factors)



Discriminant Correspondence Analysis (Greenacre, 1993)
used to determine management practices specifically associated with the variations of the N content of organic matter (faeces litter and manure)

results & discussion

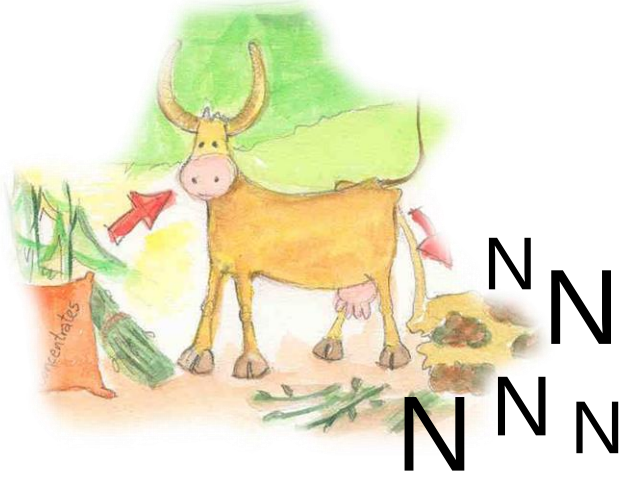
dairy herd and feeding

herd with high number of **calves and heifers**

adult cows receiving only **one meal per day**

rice straw as the main forage of the diet

lack of concentrate feed



linked with **high nitrogen content of faeces**

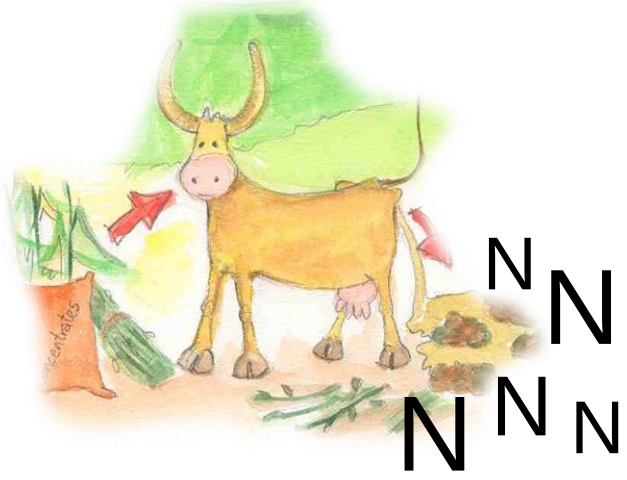
(low nitrogen digestibility)

results & discussion

dairy herd and feeding

young animals under development
lower digestive capacity, especially fibrous feeds

rumen microflora efficiency (nutrient digestibility)
depends on combined supply of energy & protein
(sufficient, equal, simultaneous and continuous throughout the day)



linked with **high nitrogen content of faeces**

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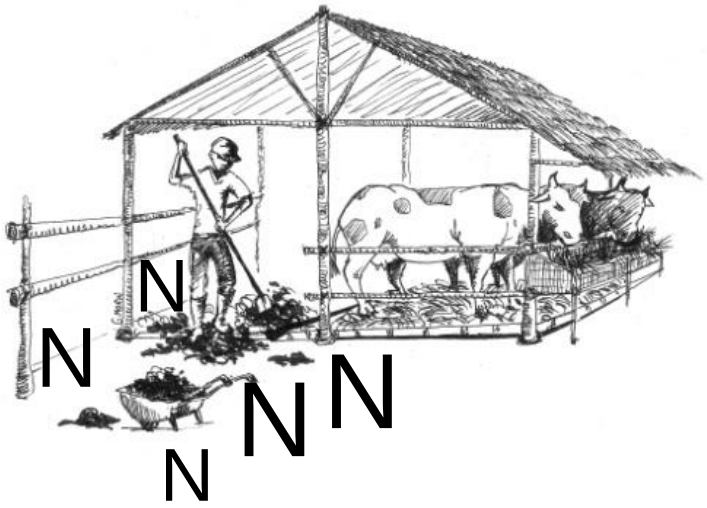
results & discussion

cowshed and litter management practices

rice straw litters

cowshed with **paved floor**



linked with **the highest nitrogen content of scrapped litters** (1.9 to 2.6% DM)

results & discussion

cowshed and litter management practices

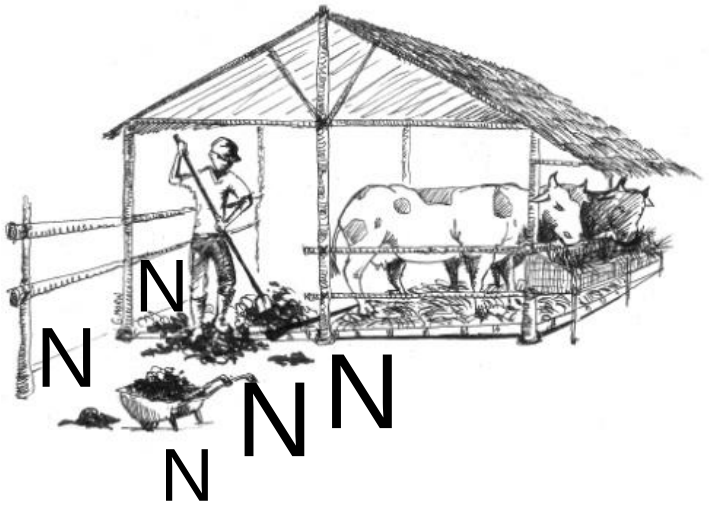
fiber composition plays a role in urine absorption during storage and scraping

(reduce losses of urinary N by ammonia volatilization up to 85%)

paved soils avoid faeces & urine infiltrate into soil allows moistening & enriching straw

litter is decomposed thanks to urea (biological action)

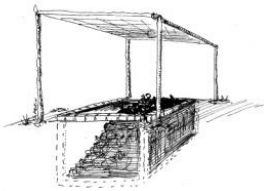
litter is degraded thanks to crushing against paved floor (mechanical action)



linked with **the highest nitrogen content of scrapped litters** (1.9 to 2.6% DM)

results & discussion

mode and practices of manure storage

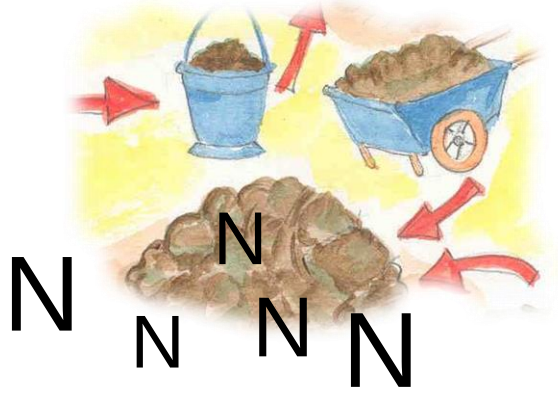


manure storage **in ditches**

addition of **pig nitrogen-rich manure**

addition of **poultry litter**

manure storage period of **less than 90 days**



linked with **the highest nitrogen content of manure** (2.0 to 2.6% DM)

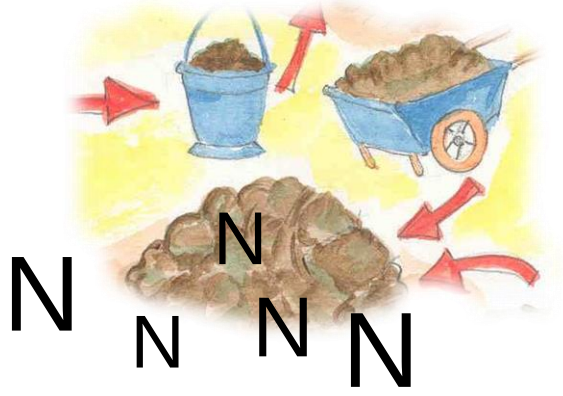
results & discussion

mode and practices of manure storage

a manure heap uncovered is much more exposed to losses by leaching and/or evaporation

air, rain and wind amplify nitrogen volatilization phenomenon in ammoniacal form

the greater the manure surface in contact with air and wind, the greater are the losses



linked with **the highest nitrogen content of manure** (2.0 to 2.6% DM)

conclusion

adding-value to manure and to other livestock effluents has become **essential** to maintain **soil fertility** in Vakinankaratra region

composition & fertilizer value of manure are **highly variable** from one farm to another strongly related to farming systems and to **management** and **storage practices**

improvements not only help to **increase food self-sufficiency** and income levels but also to **reduce reliance** from “outside” inputs

moreover, reducing mineral fertilizer use helps to **improve environmental efficiency** of agricultural activities (reduction in greenhouse gas emissions and fossil fuel consumption)

Thank you for your attention

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