

RESEARCH ON IMPROVEMENT OF TROPICAL PASTURES: CASE STUDY IN NEW CALEDONIA

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ABSTRACT

The establishment of a laboratory for pasture research in New Caledonia three years ago lead to the design of a program of studies and experiments aimed at meeting the needs of the country. The general scope of research of the laboratory had been defined by the technical services and the administration of the territory and covered most of the pasture management problems encountered in New Caledonia. It became then necessary to identify, select and formulate the research priorities in order to adapt the laboratory activities to the available means.

This paper analyses how the most important research topics including ecological, technical and social aspects were defined and how the methods were adapted to the requirements of New Caledonia.

Brief description of New Caledonia

New Caledonia is a 400 km long and 50 km wide mountainous island situated in the South Pacific near the tropic of Capricorn. The climate is tropical with maximum rain during the summer while during the winter rainfall and temperature are suitable for the maturation of crops of temperate regions.

The presence of mountains and the risks of river flood in the valleys restrict very much the area suitable for cultivation and thus most of the land is only suited to animal husbandry. Only beef cattle are raised. The system of production is extensive with nearly 110,000 head of cattle on 400,000 hectares. Cattle management systems and techniques have been much influenced by those adopted in Australia. For the past twenty years, Caledonia cattle breeders have undertaken the modernization and intensification of animal management techniques in order to increase production. At present we also witness the expansion of cattle farms managed by the Melanesian Kanaks who adopt production systems which only necessitate low money investments.

Identification of research topics

The general systems applied to studies on pastures and experiments for their reclamation and improvement, such as those developed in Africa, were not directly applicable to the physical and social conditions of New Caledonia and had to be amended. A prerequisite to any setting-up of a program was to analyse the various types of environment, the main types of animal production systems and the main pasture management practices.

This preliminary survey led to the identification of 5 levels of pasture reclamation or intensification. The importance of each of the levels has been evaluated and research and experimentation topics have been defined. In a new country such as New Caledonia, all stages coexist, from the hunting of feral cattle (rare and anecdotal) or of deer to trough feeding of animals for fattening (still at the experimental stage).

1 The first level corresponds to land reclamation: the land owned by the animal breeder

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is fenced, and the limits of the property are defined. The farms cover generally several hundred to several thousand hectares. The vegetation is originally woody and clearing is often undertaken to make room for grasslands in areas where burning has not transformed the landscape into savannas.

Present water points are not numerous because many rivers are not permanent. The pastoral watering system holds an important place. The most commonly encountered constructions are small earth dams and boring holes with a windpump but the network of pipes of the city water services starts to be used. Although important, land reclamation work is not the pastoralist's responsibility and no program has been implemented at this level.

2 The second level involves the management of native pastures. The animal breeder attempts to maintain the native species, to control woody plant encroachment and to stabilize the grass resources all the year round. Only simple methods are available such as burning or slashing along with sound grass resource management. Paddock rotation necessitates heavy preliminary investments for inside fencing and boring of water holes. But subsequently the management cost remains low.

Most cattle farms are established at this level. The research results may not lead to high productivity gains but they should involve almost all the European and Melanesian breeders and the greater part of the livestock. The overall results could be significant.

Therefore the research topics on native pastures have been defined carefully as follows:

- (1) Identification and description of the main types of native pastures based on environmental and botanical studies together with determination of forage output, seasonal productivity and value of pastures after proceeding to the inventory of the main native species.
- (2) Maintenance of grasslands, bush control and elimination of unpalatable species.
- (3) Associated research topics related to the local problems: risks of mineral deficiencies, plants toxic for cattle.

3 The third level is concerned with the improvement of grasslands. A higher grass output and a better quality of forage can be obtained after improving the soil fertility and replacing native species with selected ones. The breeder makes a real investment which must pay off within a few years. At present the breeders' initiatives are still empirical in many fields or insufficient due to the lack of data. They often lead to discouraging failures and the investments do not always seem profitable because the results obtained are less than what was expected.

The technical services and thus indirectly research, are in high demand in all the fields which are connected to this level of intensification. The fraction of the Caledonia livestock concerned is still small but it increases year by year. The more dynamic breeders settled in regions with a high potential are very much interested in the results.

The problems encountered are numerous and often specific to the country. Research and experimentation are necessary in the following fields.

- (1) Correction of mineral deficiencies or mineral excesses (some soils have a very high rate of magnesium) by soil improvement: fertility enhancement by use of fertilizers.
- (2) Equipment and techniques for land work.
- (3) Choice of fodder species suited to the various environments. The use of forage legumes is still limited.
- (4) Methods for the acclimatization of fodder plants: the amount of rainfall is not always reliable and jeopardizes the success of seeding. Weeds may smother the young growth.
- (5) Use of fodder plants: they are often used as native species and a part of the advantages obtained is wasted due to the abundance of unpalatable species.
- (6) Economic results and profitability of the various measures adopted.

4 The fourth level deals with the build-up of forage reserves. This stage is often performed concurrently with the previous one but it involves more recent practices.

The dry season lasts 3 to 4 months (September to December). In some years, animals lose weight and some even die. To avoid this, breeders use various techniques such as the making of hay from natural or artificial pastures and they grow some reserve fodder plants (sorghum) which are then kept in silage, hay or grazed standing.

At this level the need for technical information is essential because the money and work investments are considerable. The main research and experimentation topics are as follows:

- (1) Choice of the fodder crop to be kept, season of cultivation, harvesting stage, preservation method.
- (2) Choice of the harvesting and preservation equipment.
- (3) Feeding methods.

5 The fifth level deals with the irrigation of fodder crops. It is a very recent practice which is likely to expand with the implementation of irrigated perimeters. Due to the lack of valuable animal products (dairy farms are very scarce), the production costs will probably be too high to make this practice profitable. In addition to the technical experiments, in particular concerning the choice of the fodder species, an economic analysis must be carried out.

Research topics requiring priority

New Caledonia is a small country, with a variety of climatic, physical and human characteristics. The results of research on pastures and fodder plants obtained in other tropical or subtropical countries cannot be applied directly without adapting them to the local conditions, hence New Caledonia requires original research. To solve the numerous problems and remain within the limits of its modest means, the laboratory had to establish an order of priority in the research topics.

The main determining factors were as follows:

- (1) The results had to reach the largest number of breeders and not deal exclusively with the latest technology. This is why the study of native pastures was given priority over any subject dealing with intensive grazing.
- (2) In countries with extensive animal raising research workers attempt to develop inexpensive animal production systems in which large money investments are not necessary and the management of natural resources is most profitable. These guidelines seem appropriate to New Caledonia where the reclamation of rangelands is difficult and the study of native pastures as well as animal production systems developed on native pastures appears to be particularly suitable.
- (3) It was essential to gather all the basic data on the environment of animal production and on the characteristics of pastures in their present state in order to design, in future, precise experimental projects. This analysis led to the proposal of joint research on pastures and corresponding environments, especially the soils.
- (4) Since improvement and animal production intensification are extremely important, the introduction of fodder plants seemed necessary after testing them in the main environments previously identified.

Main research topics were as follows:

- a) Study of native pastures: inventory, environment and plant composition leading to joint soil-pasture typology, evaluation of seasonal productivity and annual output, fodder analysis and assessment of value of pasture, identification of management methods, and main limiting factors.
- b) Study of the behaviour of fodder plants in various areas. Inventory of native species and new species. Comparative study of the agricultural and pastoral potential of these plants. Work involved grass species and subsequently legumes with a view, for the latter, to enriching the native pastures.

Conclusion

These remarks concerning the setting up of a program correspond to the objectives or needs of various people concerned with animal production intensification and agricultural development. These people transmit the results obtained by researchers and breeders.

Some programs have been set up and implemented with the help of scientists specialized in other fields including a pedologist and a botanist from ORSTOM*. An innovative methodology for the processing of data was also developed.

Pasture research covers many aspects and includes the participation of researchers in specialized fields and development workers.

Discussion

Cocks, P. S. (ICARDA): What is the economic benefit of fertilization ?

Answer: Fertilization is a very complex problem in New Caledonia. Contradictory results have been obtained, due to the mineral composition of the soils associated with the presence of nickel mines which are responsible for the accumulation of magnesium and other elements. Also there is phosphorus deficiency due to the fixation of aluminium to phosphorus. Up to now, no economic analyses have been performed.

Siregar, M. E. (Indonesia): 1. What is the size of the holdings ? 2. With regard to the ownership of cattle, what is the proportion between the European and Melanesian communities ?

Answer: 1. In the West Coast (dry area), the size of the farms which are chiefly owned by Europeans must amount to 400 ha if the farmer is to make good profit. In the East Coast where the majority of the Melanesian population lives, land tenure is based on collective ownership associated with the tribal organization of the Melanesian community. Animals are grazed on non-improved pastures in well irrigated valleys. 2. Ten percent of the cattle farms are owned by Melanesians and 90% by Europeans.

* ORSTOM: Office de la Recherche Scientifique et Technique d'Outremer (Overseas Scientific and Technical Research Office).