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Identification of research activities for the dairy sector development in Uganda: systemic and participatory approaches

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Abstract

The objective of the French ACSS (Agricultural Consultation and Sector Structuring) Project is to participate in the implementation of the Plan for Modernization of Agriculture by contributing to a learning approach on farmers' groups, commodity chain professional organization, and agricultural policy design. Research activities for the dairy sector development in Uganda in the frame of this Project aim to meet the farmers' requirements while promoting the partnership through multi-stakeholder participation; they were so implemented according to three phases: (i) The first phase identified the different farm systems and their own constraints according to a systemic and participatory appraisal, (ii) The second phase led to getting some referential in dairy farms necessary to identify priority actions in research and development, and (iii) The last phase, which is the research support of the development process, could then be implemented with all the stakeholders' participation to insure its relevance and its efficiency. The research activities on milk production improvement in the South West of Uganda detailed in this paper evidence that the interaction between research and development acts at different levels, and in all the different phases of a development project. Research must not be considered as the verity which has to be applied for a good development process, but must be included in the development process for a better understanding of the stakeholders, their strategies and their constraints, and for the delivery of relevant technical information.

Key words: Agricultural research and development, systemic and participatory approaches, Ugandan dairy sector

Introduction

Milk consumption is increasing in most southern countries and especially in Africa (Delgado et al., 1999). In Central and Eastern Africa, a high development of milk production is observed, predominantly around the major towns to supply the urban populations. In Uganda, the highlands around Mbarara in the south-western part of the country with a temperate climate are particularly well adapted for such a development, including the use of exotic dairy cows (Holstein-Friesian) and the crossbreds with local breed (Ankole). The French Co-operation in Uganda launched in 1998 a dairy development programme, going under the general programme of poverty reduction in the rural areas in Mbarara district. This programme has been housed by ACSS (Agricultural Consultation and Sector Structuring) Project since 2003, which is the first development project in Uganda supported by the French Ministry of Foreign Affairs. The overall management of the programme is entrusted to MAAIF (Ministry of Agriculture, Animal Industries and Fisheries), with the objective to participate in the implementation of the Plan for Modernization of Agriculture. The present paper aims to describe how the research activities for the development of the dairy sector in the scope of this programme have been identified and implemented through stakeholder participation, and how the research programmes have contributed to the identification of relevant development activities.

Area description

Mbarara District is located in the South-West of Uganda. With a 10,389 km^2 surface, it represents 5% of the whole country, at both frontiers of Rwanda and Tanzania. The district is administratively divided in 9 counties, equally distributed in eastern lowlands and western highlands. The equatorial climate is moderated due to a mean altitude of 1,200 m above sea level and the average rainfalls range between 700-1,000 mm during the two rainy seasons that generally occur from March to May and from September to December, with major variations as shown in figure 1. Average minimum and maximum temperatures are 14.6 and 26.3 C, respectively.

With four other districts, Mbarara District provides more than one-third of the national milk production. Dairy producers are distributed in three agro-ecological zones with heterogeneous ways of management, from pastoral and extensive systems where local Ankole cattle are bred, to

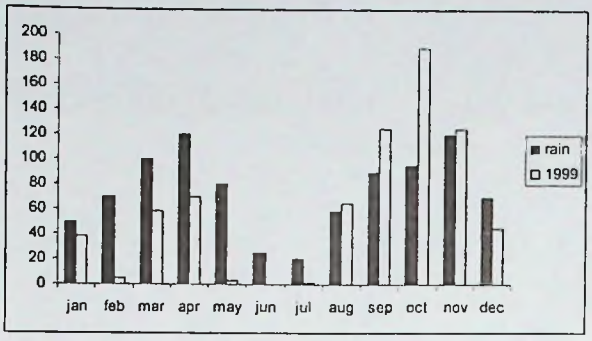

Figure 1: Average rainfall (mean of 35 years) and rainfall in year 1999 in Mbarara

agro-pastoral and agricultural intensive zones where the herds often include exotic cows with a predominance of Holstein-Friesian.

Material and Methods

The main objective of the Project is to develop dairy production both in quality and in quantity, with the agreement of the stakeholders (mainly producers, traders, dairy factories and veterinary authorities). Three phases have been identified:

Phase 1- Diagnosis of farm management practices and constraints analyses

As no data was available at the beginning of the study, a first step consisted on the identification of the main types of dairy farming systems in the study area, according to the systems approach methodology (Landais et al., 1987). In all, 184 farms were randomly selected by taking into account their spatial distribution. Using questionnairs focused on the herd structure; the feeding practices; the milk use; the source of incomes and the general farm management, were filled in with the farmers. A classification of the farms was deduced from these results and the main constraints identified for each type of them.

Phase 2- Elaboration of thematic referential

A representative sample of 6 farms per dairy farms type was randomly selected and was monthly visited during 18 months, to collect a variety of data on the following aspects: dairy and reproductive performances; pasture management; feeding strategies; technological milk quality; health survey; milk-transmitted diseases and economical aspects.

Phase 3- Needs assessments and potential partnerships

The two previous phases resulted in an appraisal of the needs for every identified production system. This appraisal makes it possible to propose some actions specifically focused on particular constraints, which can be implemented at different levels. At the farm level, they must meet the requirements of the producers that have been identified and implemented on the basis of a participatory rural appraisal methodology, with the objective to reinforce the farmers' associations and their linkages with the national research institutes. At the district and the national levels, they are the results of think tank with all the stakeholders and, due to their implication on the regional and national policies, they must be implemented in promoting partnerships with regional and national administrations and non-governmental organizations.

Results

Diversity of farm management systems

Five categories of farmers have been identified: (i) The Ranchers (22 %) own crossbred and / or Ankole animals in the pastoral zone, which are mainly bred for meat production. They are non transhumant and milk is a by-product of the farm. (ii) The Settlers (26 %), with Ankole cattle, live in the pastoral area, where they were recently settled. Dairy cattleperformances are very low and these extensive farmers have no other source of income than those from cattle. (iii) The Multipurpose farmers (15 %) are sedentary. They breed crossbred or Ankole animals and produce some coffee. Milk productivity is higher than in the settlers' farms. (iv) The Crop-livestock integrated farmers (33 %) constitute an intermediate between the two last previous groups of farmers. They are sedentary in the pastoral zone and cattle breeding (crossbred and Ankole) is as important as crop production. (v) The Modern farmers (3 %), finally, breed high potential Holstein-Friesian.

On the basis of this distribution, which *a priori* reflects the farm management diversity on Mbarara district, a representative sample of farms has been selected for the following stage of the study.

Biological, sanitary and economical referential

Different surveys have been conducted for 18 months in 24 farms (6 farms for every farm category in which the milk is commercialized, *i.e.* settlers; multipurpose farmers; crop-livestock integrated farmers and modern farmers).

Biological performances have focused on dairy productivity and calves' growth (Chalimbaud et al., 2001). Milk productivity is higher in the modern farms and lower in pastoral settlers' farms (6.7 *vs.* 1.8 L/d, respectively), with intermediate values in mixed farms (4.1 L/d) and in agro-pastoral farms (2.6 L/d). This productivity is mainly related to the genotype of the lactating cows (1.8; 3.7 and 7.7 L/d, respectively for Ankole, crossbred and Holstein-Friesian) figure 2. The highest values of calf's growth are reported with Holstein-Friesian breed in modern farms. A high variability in Ankole calf's weight points out the potential for improving the breed. Meanwhile, pasture management and animal feeding have been studied in the different agro-ecological zones – pastoral, agro-pastoral, agricultural, and mountainous zones. In the dry season, the decrease in pasture yields which leads to a decrease in dairy production could be compensated by fodder production or by the use of industrial and agricultural by-products.

A health survey was conducted in order to determine the main healthy constraints in the farms, and to follow the treatment policies of the farmers (Chalimbaud et al., 2001). During 18 months, 44 % of the animals have been treated at least once, general antibiotics and internal deworming being responsible of 83 % of the treatments. In the same time, 7 % of the monitored animals died, and 21 % of the calves less than 1 year of age died mainly due to East Coast Fever. Within this survey, a high prevalence of brucellosis and tuberculosis in bovine herds was observed, with herd prevalence respectively equal to 75 and 56 % (Faye et al., in press).

Economical results have concluded on a new farmers' classification based on commercial strategies and on the size of the farms (Chalimbaud et al., 2001). Four new groups of farmers have so been identified, from the small farmers who produce for home-consumption to the capitalist farmers who own big herds and have a marked-oriented dairy production. Between them, mixed farmers with medium-scale farms and traditional cattle-keepers in the pastoral zone constitute the two intermediate groups (Table 1).

Needs assessment

These previous studies focused on the need to implement some research activities. They can be listed according to the 3 following points:

- To remove the nutrition constraints in dry season
- To improve the forage crops techniques
- To improve the pasture quality and range management
- To improve the water supply for cattle
- To use the by-products for animal feeding
- To improve the zootechnical and economical productivity of dairy farms
- To increase the growth and milk performances in dairy farms
- To identify the economic constraints for the development of the milk sub-sector
- To evaluate the productivity of the Ugandan dairy farms-
- To control the health constraints and the milk products safety
- To facilitate the access to veterinary medicine
- To support local veterinary services
- To improve the material for milking, collecting milk and carrying
- To motivate the farmers for the milk quality
- To facilitate an independent milk quality control system

Discussion

Identification of research activities for the development

The research activities conducted in the scope of the programme that has been launched to improve the dairy productivity in the milk basin of Mbarara have followed a chronological and logical statement in three phases.

The first phase consists of a systems and participatory appraisal in order:

- To identify the different farming systems that could be a sampling frame for further development actions or research activities. The methodology used for this identification can lean on statistical methods as cluster analysis or hierarchical classification analysis which are able to identify groups of farms with similar structures or common system of practices (Faye, 1995). For this approach, the three "poles" of the farming system have to be taken into account in a typology questionnaire (Lhoste, 1986), *i.e.* the farmer (status and activities), the herd (composition and use) and the environmental conditions (feeding system, housing conditions, moving). The identification can also be achieved according to experts, based on a participatory interview of farmers and the personal knowledge of farming system by local experts (Perrot, 1990). The types of farms are considered as the image of the diversity in a specific situation. In the absence of a sampling frame, this typology could be a sampling procedure, for example to get production referential (see below), or to identify the risk factors for quality product or animal diseases linked to farming practices (Faye et al., 1999).
- To identify the specific constraints in each farming system, because the advices in livestock farming cannot depend on a standard speech, but have to be adapted to each specific situation (Faye and Lhoste, 1999). Whatever the methodology for system identification, the type of farming system is the basic cell to propose specific action. For example in the dairy farm typology in Mbarara district, it is possible to consider that water is the main constraint in the pastoral area, feeding and pasture are the main constraints in the agro-pastoral system, land is the most important constraint in mixed system farming, and dairy market is the main constraint in modern type farms. So, the research activities and development actions have to enlighten those aspects.

The second phase leads to getting information on zootechnical, economicand sanitary situations in dairy farms. Indeed, most of the time, no information is available in tropical countries that is linked to data collected in research station, not in private farms. This information has to take into account the diversity of the farming systems allowed in the first phase as it is difficult to have random sampling for herd monitoring. Information is essential in the understanding of farming systems because it is an element of decision-making for the farmer. This information is necessary:

- To identify priority actions both for research and for development. For example, calf growth is quite different between the Ankole and the Holstein-Friesian breed in Ugandan farming systems, even if the two breeds are simultaneously reared on the same farm. But the main feature is the high variability of Ankole calf growth compared to Holstein-Friesian. So, it is possible to consider that genetic improvement could be suggested to standardise calf growth in that breed.
- To set up supplementary actions or research out of the only farming activity. For instance, the importance of

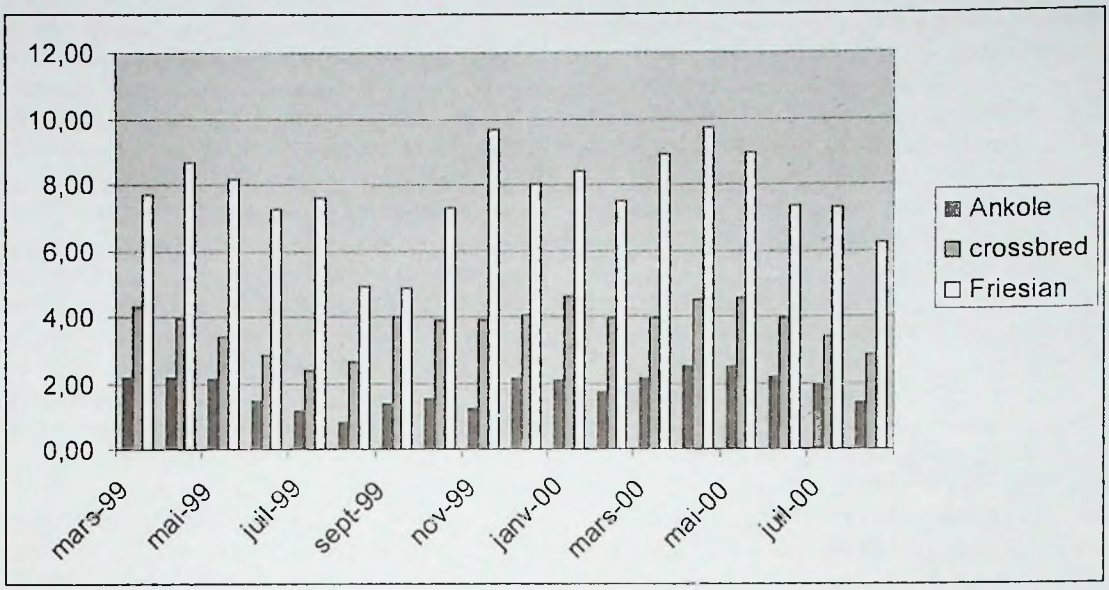

Figure 2: Productivity (L) per genetic type

Table I: Typology of farmers according to economical results

	Small Farmers	Mixed Farmers	Traditional Cattle-Keepers	Capitalist Farmers
Milk Sales (L/year)	< 566	3,100 – 4,500	595 – 2,800	> 5,688
Milk Production (L / year)	< 3,400	-	7000 – 10,000	> 11,000
Milk Investment (Ug Sh / year)	< 200,000	< 200,000	750,000 – 850,000	> 920,000
Milk Specialization (%)	28 - 44	< 12	28 - 44	50
Yield milk (L / cow / year)	< 413	-	-	> 1,387
Number of Cows	< 10	< 10	16 - 30	> 39
Other activities	-	Matooke	Meat	Commercial activity

tuberculosis prevalence in Mbarara district both in bovine and human populations can suggest a possible interaction between bovine and human tuberculosis. So, the health information has lead to the proposal of a specific study on the possible transmission of *Mycobacterium bovis* from cattle to human or, at reverse, the importance of cattle contamination with *Mycobacterium tuberculosis*.

The development project will be implemented in the last third phase. This is focused on the promotion of farmers' associations, the organisation of the dairy channel, the improvement of the feeding resources for cattle and the improvement of the milk quality. These activities are clearly the consequences of the constraints identification by research activity in former phases. However, the implementation of the development project cannot be considered as the end of research activities. A research activity is still necessary in the development process. So, the last phase is the research support of the development process. In this phase the objectives are:

- To solve some constraints to development processes; for example, the feeding shortage during the dry season: before extending the transfer of forage from the rainy season when the grass is high in quantity to the dry spell when pastures are very poor, or before promoting new forages varieties, trials in private farms could be necessary to make sure of the feasibility on the farms of the grass storage conditions or to guarantee the sustainability in the self-supplying ofnew species seeds by producers from the study area.
- To deepen some questions contributing to a better understanding of the development process. The milk quality was identified as a general problem in the dairy sub-sector in Uganda. The research activity cannot solve

the problem formerly, but may contribute to a better understanding of the critical points all along the channel. A current study will try to identify the main contaminants at different levels (producer, collector, carrier, vendor, and consumer). The expected results will be of great interest to engage development actions in order to improve the general quality of the milk.

Therefore the interaction between research and development can be at several levels and in the different phases of a development process. In the present example, research is not considered as the verity which has to be applied for a good development process, but is included in the development process for a better understanding of the stakeholders, their strategies and their constraints.

Implementation in the scope of ACSS Project

Pasture improvement and animal feeding

Most of the pastures are low in nitrogen by lack of legumes, and the control of the forage systems in the farms could be improved through the knowledge of the feeding value of the forages used, as the results of laboratory analysis. The inventory of potential complementary feed must also be completed, this study being combined with the analysis of the changes in their availability and their costs along the year. The project intends to benefit from the experience of the Farmers Field Schools, a participatory and interactive learning approach which was developed with assistance from FAO in the 1980s in South East Asia as a way for small-scale rice farmers to investigate, and learn for themselves, the skills required for, and the benefits to be obtained from, integrated pest management practices in their fields. The experience of a similar study in Kenya which hosts a project adapting "Farmer Field School" methodology for livestock (Minjauw et al., 2003) could be reproduced within the Project. The main principle of this methodology is learning-by-doing and building farmers' capacity to analyze their systems, identify constraints and test possible solutions.

Milk safety

The technical, and institutional aspects of the milk quality management have been studied at the different levels of the raw milk commodity chain, with the aim of developing operational propositions for ACSS Project: types of commercialisation channels; types of products to focus on; and types of actions to be implemented in the domain of milk quality. A survey on milk safety which has begun in June 2004 benefits from the collaboration of Dairy Development Authority and from the lab facilities of both Mbarara University and Uganda National Bureau of Standards. Depending on the results, the identification and management of the critical points could be implemented for a global milk quality improvement strategy.

Zoonotic diseases

In the context of a high rate of HIV infection in the human population, medical services observed a dramatic increase in the opportunistic diseases like human tuberculosis. The zoonotic nature of bovine tuberculosis has received little attention in Uganda , and contacts have been taken by the Project to evaluate the interest of medical researchers and public health officers in collaborating on the study of the impact of disease transfer from livestock to humans. Both the Universities of Mbarara and Makerere are interested in this study, which could benefit by the laboratory facilities of the National Tuberculosis and Leprosis Programme.

Conclusion

French ACSS Project has been elaborated to be a contribution of PMA, which aims at the eradication of rural poverty through the development of agricultural production, improvement of the conditions of living of the rural populace and environmental protection. Research activities in the frame of this Project have been identified according to systemsand participatory approaches implemented in three chronological and logical phases. Besides the actions implemented towards milk marketing and those to facilitate the access to financial facilities, which both appear to be major constraints for the development of Ugandan dairy sector, the Project has so identified in conjunction with the players of the milk sector three types of research actions to provide a beneficial support to dairy farmers' organisations. These actions aim at delivering technical information at the level of the farm, like pasture improvement and animal feeding, while enhancing institutional linkages through the activities developed in milk safety and risk analysis of the major zoonotic diseases. This project, through the improvement of the milk sector productivity in Uganda, is based on one of the particularities of the French Co-operation action in agricultural development, *i.e.* the professionalization of world agricultural actors.

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