CHAPTER 7

7. Improving the dairy production sector in Cameroon

7.1. Abstract

A study was carried out to investigate to effect of an integrated method to improving dairy systems in Cameroon. This involved reviewing dairy research done in the country, carrying out a participatory rural appraisal and an economic opportunity survey in selected dairy farms, setting up on-farm interventions, investigating cow reproduction, evaluating milk quality and the impact of integrated interventions. Guidelines for improvement of the sector were set up. It was found that the integrated approach had a positive impact as farmers adopting interventions to solve constraints had nearly 200% economic returns in cash. In order to boost the Cameroonian dairy section, it is suggested that the government acts as a dragging force by organizing the market, ensuring the monitoring of epizootic diseases and providing artificial insemination services and organizing breeding societies. It is also suggested that the integrated method becomes a discipline in dairy science.

Key words: Cameroon, integrated method, interventions, small holder dairy, small scale dairy

7.2. Introduction

Milk production in Cameroon stands at 184 000 tons (MINEPIA, 2002). Yet the demand of milk products is far above production and 24% of national consumption is imported (Ndambi and Bayemi, 2006). Due to urbanization and population growth, milk production needs to double by the year 2020 if it is to meet the demand (Ndambi *et al*, 2006). Therefore, efforts have been gathered to increase production (Bayemi *et al*, 2005a; Bayemi *et al*, 2005b). Domestic production has for long been ensured by pastoralists keeping traditional zebu cattle (*Bos indicus*) in extensive systems where milk is a by-product of beef production. The introduction of improved European milk breeds (*Bos taurus*) such as Jerseys and Holstein led to the existence of semi intensive and intensive systems with agriculture being closely associated with dairying. However the efforts of Non-governmental organizations, Research and government institutions failed to significantly boost domestic production because farmers did not see the economic gain associated with potential biological improvements (Perera, 2007). A hypothesis was then devised whereby an integration of interventions at the level of farmers associating nutrition, health, reproduction and management would bring more economic benefits to small holder farmers and improve dairy production. This involved reviewing dairy research done in Cameroon, carrying out a participatory rural appraisal and an economic opportunity survey in selected dairy farms, setting up various interventions on farms, investigating post-partum resumption of ovarian activity, study the epidemiology of brucellosis and the impact of integrated interventions. This paper intends to evaluate the results of this work and set up guidelines for a successful sustainable improvement of dairy production in Cameroon.

7.3. Results of the integrated interventions

7.3.1. Research on milk production in Cameroon

Formal research on dairy cattle started in Cameroon in the early 1970's (Tchoumboue and Jousset 1982) on imported and local cattle. This research was extensive in the 1980's till date and mainly involved breeding, health and production systems (Mbanya *et al*, 1995, Kamga *et al*, 2001; Bayemi *et al*, 2005a; Bayemi *et al*, 2005b, Ndambi *et al*, 2006, Bayemi *et al*, 2007a, Bayemi *et al*, 2007b, Bayemi *et al*, 2007d ;Bayemi *et al*, 2008). Milk production in Cameroon has been characterized by the traditional system using local zebu cows (Gudali, White Fulani, Red Fulani). However, this production has been insufficient reaching only an average of 3 litres per cow per day. Per capita annual consumption was 10kg in 1984. Since then improvement in production has been possible thanks to importations of high yielding breeds such as Holstein Friesian, Jersey and others. This gave room to other semi intensive and intensive production systems in such a way that in 1998 per capita production was 12.8kg. Presently crossbred cows produce 12 litres per cow per day and pure bred Holstein go up to 25 litres per cow per day with hand milking. Little work has been done on nutrition using available local material. This is an area where research in needed, particularly in adapting research done in similar environments in other countries to Cameroonian conditions.

7.3.2. Participatory rural appraisal

A Participatory Rural Appraisal (PRA) was conducted in dairy farms of the North West Region of Cameroon. The aim of the PRA was to have a better understanding of the prevailing dairy systems, identify problems, and set priorities for research and development that can contribute to improved systems of production. It was found that five small scale dairy

production systems are found in the region (Bayemi *et al*, 2005b): transhumance, improved extensive, semi intensive, zero grazing and peri-urban. Agriculture is well integrated to dairying. Main constraints include in order of importance: poor marketing opportunities and long distances to market, limited grazing land and poor supplementation strategies, poor reproductive management and poor calving interval, inadequate knowledge in processing, hygiene and milk preservation, and limited health control. In market oriented farms, reproduction and feeding were the most important constraints. Main factors influencing production are milk processing plant, consumer demand, fresh milk price and genotype/management. The marketing channel involves processing plants and open markets.

Recommendations were geared towards government and research institutions working more to help farmers to solve constraints. Processing plants were also advised to find ways of establishing more confidence with farmers in the measurement of their milk. Women were found to be more involved in milk production and benefiting more of the marketing. This is a good prospect for their welfare if production improves. The most urgent interventions to follow in market oriented farms seems to be tackling constraints of failure in reproduction and heavy work load in chopping grass. This is coupled with the extension of improved feeding and breeding methods.

7.3.3. Economic opportunity survey

The Economic opportunity survey (EOS) showed that medians (range) of three (0-24) and four (3-10) litres of milk were sold per farm per day, corresponding to 30% and 60% of milk produced; 24% and 13% of total cattle per herd were milking cows in the zero grazing and transhumance systems respectively (Bayemi *et al*, 2005; Bayemi and Webb, 2005; Bayemi *et al*, 2007d). More milk produced per cow per day represented the best economic opportunity in

both systems while reduced age at first calving and longer lactation length were the next in both systems, respectively. Wastage of milk through spoilage from poor hygiene and lack of cooling was a major problem. Holstein cows, which were in the zero grazing system, had unexpectedly short lactations. Constraints found led to the setting up of interventions geared towards improving milk sales and milk production per cow.

Transhumance farmers are pastoralists and their herds cannot be easily monitored all year round because of seasonal movements of cattle. They were however encouraged to use AI because they are requesting to have some crossbred Holstein cows. This would be beneficial particularly to women and children because often the cow belongs to the men and the milk to the women. Transhumance farmers were also trained in reproductive management and milk processing. Partial budgeting was to be used to assess the financial benefits of these interventions and to provide evidence to show to other farmers to encourage them to follow suit.

7.3.4. Monitoring of reproduction

Poor reproduction was one of the constraints needing intensive investigation. Thus a human progesterone enzyme immuno assay kit more available in the country was tested for validation for use on cattle in Cameroon. Progesterone ELISA Kits (EH-511) were obtained from Clinpro International. It was found that this kit can be used for measuring progesterone levels in cattle. Cows with 1ng/ml for two consecutive samples or one sample at or above 3ng/ml are an indication of the presence of corpus luteum while cows below 1ng/ml will be in anoestrus. Therefore the kit was use for monitoring post-partum progesterone profiles in dairy herds (Bayemi *et al*, 2007c).

Pregnant dairy cows were selected for studies on post partum return to ovarian activity and milk production. The period of post partum first ovulation was 34.09±9.18 days in Holstein compared to 39.50±24.98 days for crosses and 55±25.93 days for local cows. The mean interval to first service was 58 days (Bayemi *et al*, 2007a). It was seen that in this area, cows producing more milk tend to take less time to resumption of ovarian activity. When cows were supplemented before calving for an investigation on the effect of feed supplementation before calving on milk production, ovarian activity and calf growth, there was little benefit of pre-partum supplementation on the parameters investigated. Consequently low income farmers are advised to concentrate their efforts of supplementation early in lactation.

7.4. Cattle health

Cattle were screened for *Brucella abortus* antibodies in 21 villages by ELISA. Results show a general seroprevalence of 8.4%. It was advised that a specific control programme be organized in the most infected locations and an effort should be made to determine the causes of the spread of the infection. Owing to the fact that animals screened are from the high milk yielding Holstein breed, measures should be taken to ensure the eradication of the disease within the population and sound control measures adopted to avoid a further spread of the disease to larger cattle populations in the region. It is recommended that infected animals should be slaughtered systematically. All farmers should be advised to boil milk before consumption. Vaccination against *Brucella abortus* should be instituted. In order to ensure a productive and healthy population of Holstein cows within the dairy production scheme, regular *Brucella* testing should be instituted.

7.5. Impact of interventions

Interventions designed in the study were set up to be carried out for two years. They primarily consisted of advice, education and training. This was done by: 1) Encouraging farmers to be involved in the zero grazing system and keep the Holstein breed. Spreading this breed was done by introducing artificial insemination using chilled semen 2) Looking ways to help farmers increase forage consumption by pasture improvement, putting them in contact with hay producers and formulating a new feed concentrate 3) Supplementation of better yielding cows by stage of lactation 4) Training farmers in milk processing to cheese and yoghurt in order to improve the shelf life of milk and therefore better sales 5) Linking farmers with better health care services. These interventions were applied in a holistic manner. Any problem faced by a farmer could be addressed, whether it be in the area of marketing, health, management or reproduction. They showed that there was a decrease in average monthly expenditures of 18% relative to the month before interventions started. Much of the expenditures were related to feed (38% of all costs). This shows that even in intensive small scale dairying, feed cost accounts for most of the expenditures. Consequently it is good to continue using local agro industrial by-products in feed formulations. There was an overall increase in income. Close to 2/3 income were derived from milk products due to home processed milk and culled animals. Only 7% income came from milk sold to the processing plant. The partial budget shows that before interventions, farmers lost -$4.5/cow/month and gained $38/cow/month because of the interventions. Returns were 1.93 and 2.32 without or with opportunity income for milk home consumed and shared. The positive impact of interventions led to poverty alleviation and some farmers acquired more cows. A spill over effect is that more crop farmers are willing to be engaged at least partially in dairy farming (Bayemi *et al*, 2008).

7.6. Guidelines for improving the dairy sector

7.6.1. Marketing

The most important constraint to dairy production raised by farmers was the lack of adequate market to milk. It seems sort of a paradox to increase the production of a farm commodity that lacks buyers. However, there is much demand for milk products in the country as the urban population is growing fast reaching already 50% of the total population (Bayemi *et al*, 2005a). Therefore a quarter of the milk consumed is imported. If milk were available it would be marketed. Ndambi and Bayemi (2007) showed that milk prices increase in Cameroon by +3.3% per year. This trend is to continue as predicted by Delgado *et al* (1999) with the livestock revolution. The vicious circle is that farmers are ready to increase investment, improve feeding and buy new breeding stock if they are sure that the milk will have a ready market. The informal market presently operating is insufficient in ensuring real market outlets to farmers. This is different in countries like Pakistan, India, Sudan and Uganda, where traditional, small-scale markets control over 80% of marketed milk (Stall *et al*, 2008). On the other hand business people would like to invest in the sector if they are sure that they will get enough milk to use their equipment at full capacity.

This is where the state needs to come in to subsidize initial investments necessary for marketing which may in future be sold to private investors. A good example comes from Operation Flood in India in the 1970's, where the dairy sector was heavily subsidized by surplus milk from the EEC. This led to a tremendous development and India is today the largest producer of milk in the world (MACDES, 2007). This subsidy can for instance come from the Heavily Poor Indebted Countries programme, whereby money that could have been

used to pay the country's external debt is used for investing in the development of key sectors of the country. Such a scheme will surely boost milk marketing   in Cameroon.

7.6.2. Feeding

The EOS showed that milk production per cow per day was the greatest opportunity. If farmers increased milk production per cow per day,   they would get up to $1300 more per farm per year. Besides genetic make up of cow, feeding is a key factor which limits the milk production of dairy cows. In   traditional systems, where communal grazing is practiced, the main feeding problem lies in the fact that less forage is available in the dry season which leads farmers to go on transhumance, a sort of periodic nomadism until grass becomes abundant again.   But, because of demographic pressure, grazing land is gradually reducing and pastoralists must find alternative sustainable ways of feeding cattle (Ndambi *et al*, 2008). These farmers could then involve in pasture improvement with *Bracharia spp, Pennisetum purpureum* and *Trypsacum laxum.* Unfortunately most pastoralists are landless and are afraid of improving land that does not belong to them. In many places, there are permanent conflicts between croppers and graziers. The problem could be solved by having large commercial farms whose aim is to produce hay for these farmers. The second feeding problem faced by traditional stock keepers is that most cattle feeds commonly available in the tropics are nutritionally unbalanced (Sansoucy, 1995). They require adequate supplementation to ensure good productivity. These farmers should be encouraged to supplement cows with agro industrial by products. Giving just 0.5kg per animal per day will lead to   great improvements in productivity especially in the dry season and this improvement will be sustained in the subsequent season (Njoya, 1997).

In zero grazing systems, grass is cut and chopped before being offered to cattle and they do not receive as much forage as they should. In this case as well, farmers could purchase hay or silage if available. The experience is that the few farmers commercially producing hay cannot honour all orders. Most farmers are very willing to improve feeding if milk market is available. As far as research is concerned little work has been done on nutrition using available local material. This is another area where research in needed, particularly in adapting results obtained in similar environments to Cameroonian conditions.

7.6.3. Milk processing and milk quality

Dairy plants make sweetened yoghurt, set yoghurt (natural), stirred fruit yoghurt, stirred plain yoghurt, and cheese. The following products are found at farm level: Pendidam (fermented milk), Kindirmu (Set yoghurt), heat treated milk, Lebol (butter), Nebam (butter oil) and sour milk (Kameni *et al*, 1999). Figure 7.1. shows that most milk consumed in Cameroon is either through the informal channel or on farm. However, dry imported milk is increasingly gaining ground.

Though milk products are not traditional in most Cameroonian habits, they become so because of rapid urbanization. There have been a number of small processing plants owned by small farmers' groups or milk cooperatives making primarily cheese and yoghurt, the two key products preferred by urban dwellers. This has been possible thanks to the training of farmers for processing by researchers of the Institute of Agricultural Research for Development (IRAD). This training also needs to be extended to milking and milk processing hygiene. It would be good if such training sessions were to be multiplied so that more farmers benefit from this knowledge. This will also help to increase the shelf life of milk for remote areas. The government should always ensure good milk quality by settings up standards and screening animals for Tuberculosis and brucellosis. Research therefore needs to be done in order to help in setting up acceptable standards for dairy products in the country
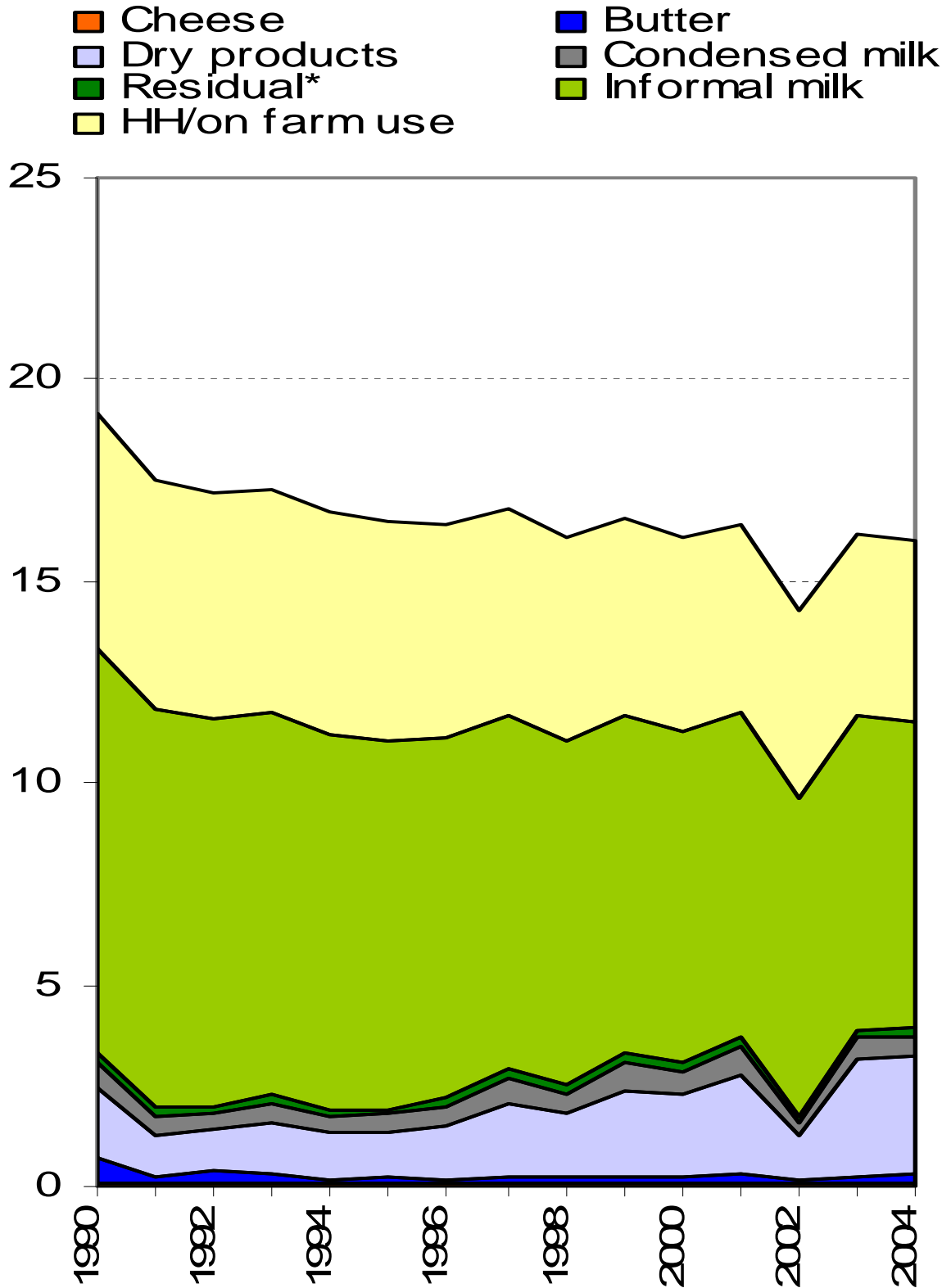
Figure 7.1. Consumption patterns of milk in Cameroon- Inkg ME (ECM)/ capita/ year

(Ndambi and Bayemi, 2006)

7.6.4. Breeding and reproduction

There is no official breeding policy in Cameroon unlike in Uganda which developed a comprehensive National Animal Breeding Policy in 1997 (Staal *et al*, 2008). Enough work has already been done on crossbreeding local with exotic dairy breeds (Bayemi *et al*, 2005a). These studies have recommended upon the use of F1 progeny. But because of the lack of a stabilized breed, there is a dependence on imported bulls or semen and artificial insemination. This leads to the lengthening of the calving interval in times of unavailability of imported semen and artificial insemination technicians. The dependence on imported semen has the advantage of farmers benefiting from genetic progress made in developed countries. However, as in the present situation, unplanned crossbreeding may lead to the disappearance of local breeds. Luckily, many traditional farmers are unwilling to crossbreed all their cows with imported semen because they are keen to keep the traditional breeds which have proven to be adapted to the challenging local environment. There is a need for research to tackle the preservation of local cattle genetic resources in the country, by characterizing, selecting and breeding local purebreds for meat production in order to lead to dual purpose F1.

Recently, artificial insemination has been introduced in the country using chilled semen with the financial support of the International Atomic Energy Agency, IAEA (Bayemi and Mbanya, 2007c). This is the first step to introducing an intensive use of frozen semen in the country as previous attempts were not sustainable because of the high cost of liquid nitrogen of nearly $30 per litre. There is a need that the government strongly supports such a scheme by making it possible for the AI centre to acquire nitrogen plants and means to distribute nitrogen throughout the country. Other aspects necessary for the successful breeding scheme

include: organization of breeding societies for traditional and imported breeds; empowering of research institutions in the short term, to multiply valuable offsprings for milk production to be available to farmers, in the long term, to carry out research in stabilizing Cameroonian dairy breeds well adapted to local conditions; in subsidizing pregnancy diagnosis to be done by the AI centre. The extensive systems can use AI in selected cows while the zero grazing system is advised to rely on AI.

7.6.5. Health and management

In the 1970's, all cattle were vaccinated for free by the Cameroonian Government. The government later decided that farmers should show an interest by contributing to the vaccination costs. This led to the introduction of a subsidized vaccination charge of 390 FCFA (about 0.78 USD) per animal per year, for three major vaccines: black quarter, haemorrhagic septicaemia, and contagious bovine pleuropneumonia. For this reason, cattle owners expressed dissatisfaction and reluctance to attend vaccination campaigns (Ndambi *et al*, 2008). Since then there has been a liberalization of veterinary services in the country. Veterinary services are provided by non-governmental organizations or private veterinarians. Livestock government institutions need to continue to educate farmers on the need of prophylactic programmes.

One area needing much attention in dairy farms is record keeping (Bayemi *et al*, 2005b) where farmers need intensive training and follow up. Without a sound records keeping, it will difficult if not impossible to have a good monitoring of reproduction, progeny testing and registration of cattle. Owing to the fact that milk production per cow per day is the most

economic limiting factors of dairy farms, it will be good for research to investigate three times per day milking and its consequences.

7.6.6. Milking cooperatives and general dairy policy

It has been demonstrated that proximity to a co-operative milk collection centre was significantly associated with an increased probability of a household successfully entering into dairy production (Baltenweck, 2000). In the Western Higlands, farmers have already been organized in successful dairy groups and cooperatives in which the government has very little control.

The Cameroonian government needs to practically be involved in improving the dairy sector. As already stated, it needs to boost dairy marketing by: 1) requesting that processing plants use a certain percentage of fresh milk instead of 100% imported milk powder. 2) creating and encouraging commercial dairy farms. In other countries like Ethiopia, India and Pakistan, the informal sector is the leader of dairy production but the Cameroonian case is different whereby most people did not have milk as a traditional diet and so the informal market is not developed in peri-urban major towns. 3) promoting and organizing AI services, breeding societies and registration of cattle 4) disease screening such as TB and brucellosis and carrying out a policy of eradication and control of these diseases (Figure 7.2).
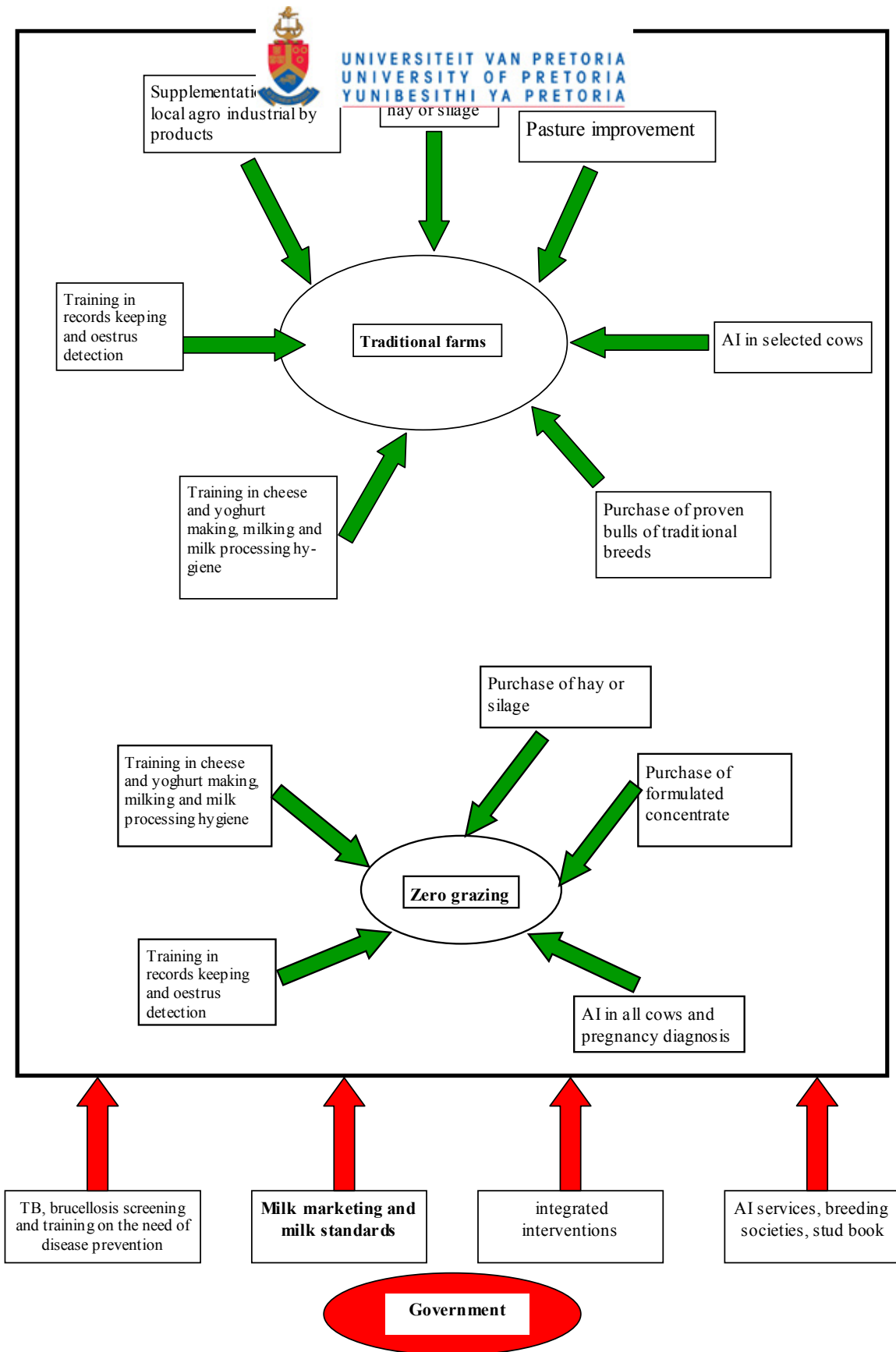
Figure 7.2. Actions needed to boost the dairy sector in Cameroon

7.7. Evaluation of the integrated approach in improving dairy systems

As already stated, in small scale dairy systems the uptake and use of research results by wider communities of farmers, organization and livestock extension services has often been less than expected. This in turn resulted in interventions for supplementary feeding, or for improving reproductive performance that did not demonstrate an economic benefit to the farmers. One of the reasons is that they focused on only one constraint or one discipline at a time, and other concurrent production problems were limiting the economic benefits. Therefore this study was designed to evaluate the impact of interventions carried out holistically. The PRA and EOS clearly demonstrated that many constraints concomitantly limit dairy production. It has been shown that an integrated method in solving these constraints will bring much improvement and clear economic benefits to small holder farmers.

For instance a farmer complained of the drop of 50%   in the production of the whole herd. She suspected the effect of the dry season.   The investigation of the 'integrated team' discovered that the feed mixture used did not contain enough protein and milking and milk processing hygiene were appalling.   The solution to its problem was the formulation of a balanced died and training in milk processing hygiene, after which the herd production came back to normal.

Whitaker (2003) says that it is natural for someone trained in a particular discipline to fall in to the view that a problem and its solution lie within that discipline. That often clouds other aspects and approaches which may be more important. He reports a complaint from a farmer that an early lactation group were averaging 35 litres per day. Late calved, in the same mob and so having the same chance at the same food, had all normal energy measures and were producing 50 litres per day. The latter finding showed that the ration contained perfectly

adequate energy for much more milk than the earlier were producing. So the cause of their energy stress was that they were not eating enough and not the energy density or content of the diet. Appetite in the new calved is always delicate by comparison to later on. Could anything be done here to help? Pre-calving nutrition and/or a change in components at calving were not constraints. What about access to food? These cows were milked three times a day. They spent two hours each milking in the collecting yard, being milked and waiting to be allowed onto bedded areas (for mastitis control), making six hours in total. Cows need to lie down – chewing the cud and sleeping – for at least 10 hours a day. That left only eight hours for eating. More food was not being put out until troughs were empty and so for some of that potential eating time there was often no food available. Ensuring that there were always enough food so that some was left – removed and fed to young stock – each time fresh food was put out and cutting the time spent around milking by half an hour solved the poor oestrus picture within weeks. The second example concerns a farm with 145 cows housed in cubicles in the winter months had a rate of 20% with severe lameness of sole ulcers. High protein feeding and rumen acidosis had both been blamed, investigated and changed in previous years – without effect. The milking cow area had 110 cubicles. 20% of cows dry at any one time in another house meant that 116 cows on average lived in 110 cubicles. In fact several cows always 'lay out' in the passageways – all of them 1st lactation heifers. A lack of comfortable lying time is the prime cause of laminitis related conditions such as sole ulcers. In cubicle systems more than one per animal is essential because cows do things as groups and all like to lie down together, all feed together and all drink together. More cubicles and new mattresses on the concrete beds resulted in a 70% reduction in lameness, 1000 litres per cow more milk and 15 days off the herd calving interval in the following year.

These examples show the pressing need for integrated interventions and open minds in dairy farms. Even when multidisciplinary teams work together there is sometimes a lack of

interrelationship between various disciplines. In fact we can argue that there is a need of a new discipline, new specialists in integrated interventions. Though calling a team of 7 specialists may be expensive or difficult to carry out at every moment, it is possible to insert in the curriculum of veterinarians and animal scientists lectures on integrated interventions. There can even be a specialization on integrated interventions in deepening the relationships between various areas of actions on a dairy farm (Figure 7.3).
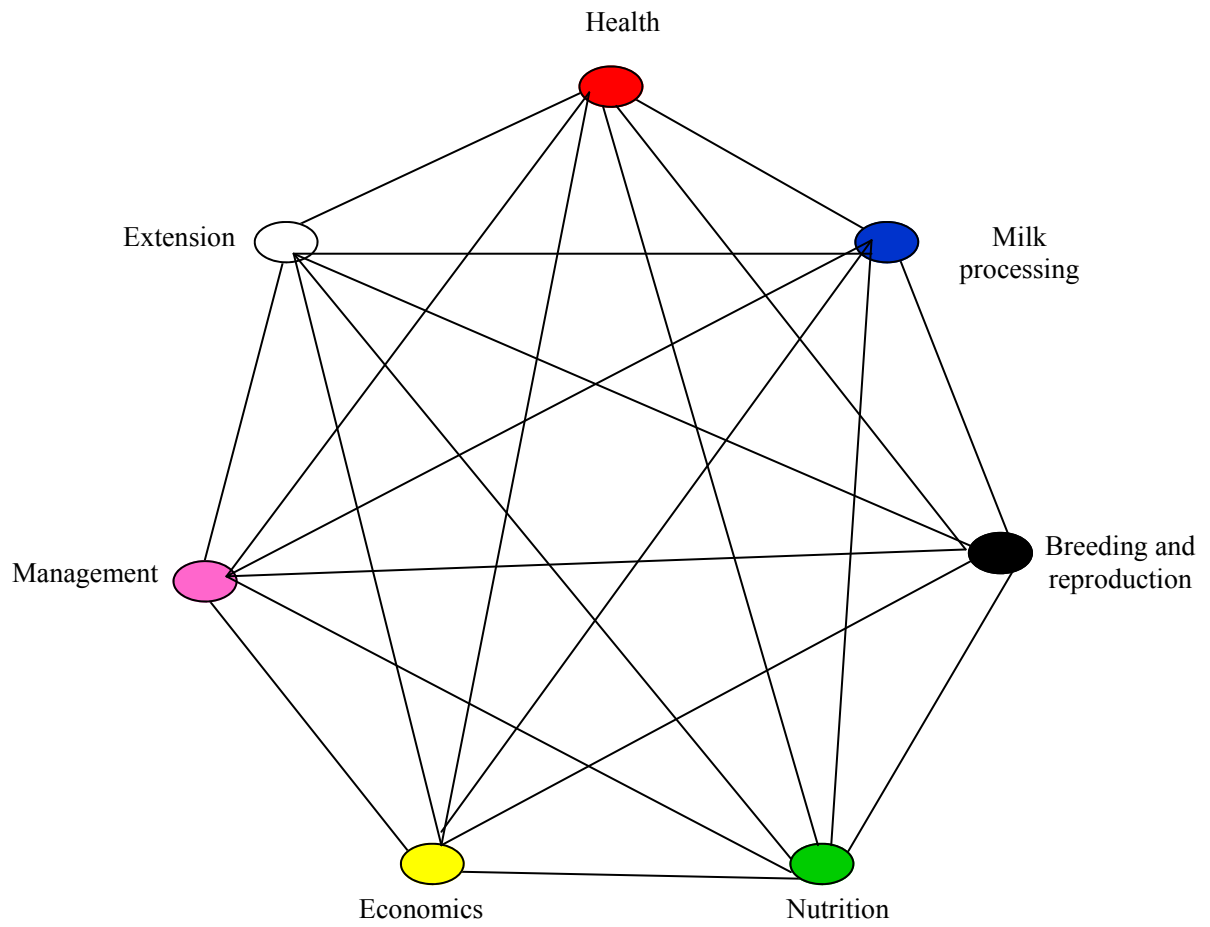
Figure 7.3. Diagrammatic representation of interactions between disciplines relating to integrated interventions

In Cameroon the application of integrated interventions in dairying requires the synergistic action from the government, researchers, non-governmental organizations and farmers. It requires expertise from many different fields and calls for the need to create integrated action teems in each administrative subdivision. Each team will be multidisciplinary constituted of an extension agent, an animal nutritionist, a veterinarian, a socio-economist, a dairy technologist and a reproduction scientist. It is quite likely that there be a lack of such specialists in each subdivision. In which case there can be a creation of intervention teams covering special areas of the country. It is not that these intervention teams will replace the private sector but they will guide local authorities in the extension of research results and in actions needed for regulation, advice and support the private sector.

7.8. Conclusion

This study has developped an integrated method in improving dairy production in Cameroon and has found that marketing and milk production per cow per day were the most limiting factors of dairy improvement. Interventions were carried out to solve these constraints and others. Farmers adopting interventions had returns of 193% and 232% with or without opportunity costs (milk home consumed, shared or given to calves) proving the positive impact of interventions using a holistic approach. These interventions need to be spread to more farms in the country. The integrated approach was proven to be effective in ensuring improvement of dairy systems in Cameroon. This method needs to be adopted for further dairy production improvement by the creation of multidisciplinary intervention teams and the training of integrated intervention specialists in the dairy sector.

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