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# BEEF AND DAIRY CATTLE IMPROVEMENT SERVICES: A POLICY PERSPECTIVE

By

**PAUL GAMBA**

Tegemeo Institute of Agricultural Policy and Development, Egerton University.
P.O Box 20498 Nairobi.
Tel: (02) 2717818
**Email:** egerton@tegemeo.org

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# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ..... ii
TABLE OF CONTENTS ..... iii
LIST OF TABLES AND FIGURES ..... iv
LIST OF ACRONYMS ..... v
ABSTRACT ..... vi

INTRODUCTION ..... 1
METHODOLOGY AND DATA ..... 3
LITERATURE REVIEW ..... 3
BEEF AND DAIRY CATTLE DISTRIBUTION ..... 6
Beef and dairy cattle breeds distribution in selected areas ..... 6
Beef and dairy cattle breed distribution within grazing systems ..... 7
SOME FACTORS INFLUENCING BREEDS KEPT ..... 8
Income Categories and cattle breeds ..... 8
Education levels and cattle breed distribution ..... 9
Influence of age on type of breed kept ..... 9
BEEF CATTLE IMPROVEMENT ..... 10
Indigenous breeds and beef cattle improvement ..... 10
Beef cattle improvement and food security ..... 10
Beef cattle improvement research ..... 11
Status of Registered Beef Breeding Stock ..... 11
Provision of beef cattle genetic material ..... 12
DAIRY CATTLE IMPROVEMENT ..... 14
Status of dairy cattle improvement ..... 14
Grazing system and dairy cattle improvement ..... 16
Models of private AI service provision ..... 17
Supply of Dairy Genetic Material ..... 18
Domestic supply of genetic material ..... 18
Genetic material imports ..... 19
Dairy cattle registration and recording ..... 20
BEEF AND DAIRY CATTLE IMPROVEMENT INSTITUTIONAL STRUCTURE ..... 22
BEEF AND DAIRY CATTLE GENETIC POOL MAINTENANCE ..... 23
CONCLUSION AND POLICY IMPLICATIONS ..... 24
REFERENCES ..... 26

# LIST OF TABLES AND FIGURES

## LIST OF TABLES

TABLE 1: CATTLE BREED DISTRIBUTION ACROSS PROVINCES (%) ..... 6
TABLE 2: CATTLE BREED DISTRIBUTION WITHIN GRAZING SYSTEMS ..... 7
TABLE 3: DISTRIBUTION OF CATTLE BREEDS WITHIN INCOME CATEGORIES ..... 8
TABLE 4: HIGHEST EDUCATION LEVEL OF HOUSEHOLD HEAD AND TYPE OF BREED KEPT ..... 9
TABLE 5: AGE OF HOUSEHOLD HEAD AND TYPE OF BREED KEPT ..... 9
TABLE 6: REGISTERED BEEF ANIMALS (PEDIGREE) ..... 12
TABLE 7: BREEDS OF CAIS BEEF BULLS (2004) BY AGE GROUPS ..... 13
TABLE 8: COMPARISON OF GOK AND PRIVATE PROVISION OF A.I IN SELECTED DISTRICTS ..... 16
TABLE 9: SOURCES OF LAST BREEDING SERVICE BY GRAZING SYSTEM ..... 16
TABLE 10: DOMESTIC MONTHLY SEMEN DISTRIBUTION ..... 18
TABLE 11: AGES AND BREEDS OF CAIS DAIRY BULLS-2004 BY AGE GROUPS ..... 19

## LIST OF FIGURES

FIGURE 1: GOVERNMENT VS PRIVATE ARTIFICIAL INSEMINATION COUNTS ..... 14
FIGURE: 2. SEMEN IMPORTS FROM USA ..... 20
FIGURE 3: FOUNDATION DAIRY HERD REGISTRATION ..... 21

# LIST OF ACRONYMS

| | |
|---|---|
| ADC | Agricultural Development Corporation |
| AI | Artificial Insemination |
| BLUP | Best Linear Unbiased Prediction |
| CAIS | Central Artificial insemination Station |
| CAP | Chapter in an Act. |
| CCM | Contemporary Comparison Method |
| DF | Deep Frozen |
| DRSK | Diary Recording Services of Kenya |
| DVS | Director of Veterinary Services |
| DVO | District Veterinary Officer |
| GRIPS | Graduate Research Institute for Policy Studies |
| KARI | Kenya Agricultural Research Institute |
| KLBO | Kenya livestock Breeders Organization |
| KNAIS | Kenya National Artificial Insemination Services |
| KSB | Kenya Stud Book |
| LBSB | Livestock Breeding Services Branch |
| LRC | Livestock Recording Centre |
| MOLFD | Ministry of Livestock and Fisheries Development |
| RT | Room Temperature |
| SRA | Strategy for Revitalizing Agriculture |
| USA | United States of America |
| USD | US Dollars |

# ABSTRACT

*In the beef and dairy industry, one of the most cost effective and assured means of lowering production costs and improving competitiveness, is through the development of a vibrant and efficient livestock improvement service capable of providing and sustaining superior breeding stock. The importance of livestock improvement services finds expression in major government policy documents. The Strategy for Revitalizing Agriculture (SRA) considers livestock improvement services a key input in the growth of the agricultural sector.*

*This study evaluates the state of beef and dairy livestock improvement from a policy perspective including breeding and genetics. It examines options for improved productivity, food security and competitiveness within a liberalized market economy.*
*Data is obtained from a Tegemeo 2004 field survey that covered Rift valley, Eastern, Central, Western and Nyanza provinces. This is complemented by secondary data and interviews with livestock producers, traders, livestock improvement service providers, related institutions and key informants in selected areas.*

*The results indicate that large herds of indigenous cattle are found in Nyanza, Eastern and Western provinces while Central and Rift Valley harbour the largest stock of pure breed cattle and crosses. Rural households with low incomes keep indigenous breeds while high income rural households keep pure breeds or various levels of crosses. Discrepancies exist in breeding objectives leading to low emphasis on animal registration and recording. While beef cattle producers focus on survival traits, market requirements emphasize fast growth and high live weight. Dairy producers on the other hand attempt to maximize exotic genes in their herds contrary to scientific evidence that require conditioning to environmental and resource endowments. Pre-occupation with re-stocking concerns contribute to food insecurity and aggravate losses during drought due to lack of an organized restocking initiative. It is observed that private provision of AI services is gradually edging upwards after government withdrawal but is far from the peaks achieved by the disbanded Kenya National Artificial Insemination Services. To avoid government policy reversal in areas unable to develop private AI service, replication of the successful Agro-vet shops and dairy co-operative models need to be accelerated. Organized bull schemes will also have to be revamped in recognition of the prevalent use of natural service to avoid inbreeding. The commercialization of CAIS' services and it's placement under the DVS complicates its role in the provision of cattle genetics. Beef and dairy cattle genetics regulatory services need to be consolidated, streamlined and strengthened under a legally empowered institution. The absence of a custodian for beef and dairy cattle genetic material and related regulations raises issues that tie in with the raging global debate on animal genetic resources and intellectual property rights.*

# INTRODUCTION

The current trend in the Livestock industry particularly the beef and dairy sub-sectors, is more inclined toward tapping the opportunities presented by the export market especially within the region. Some forays into the export market have recently been made but concerns exist as to the ability of the Livestock industry to confront the challenges presented by the highly competitive export environment. One of the available channels to confront increased competition is through improved productivity and ultimately lower production costs.

In the Livestock industry, the most cost effective and assured means of lowering production costs is through the development of a vibrant and efficient livestock improvement service capable of providing and sustaining superior breeding stock. For dairy, this was recognized and implemented in the pre and early post-independence period when the dairy sector was accorded high priority through heavy Government involvement in service provision.

However, with the advent of reforms and subsequent liberalization of the economy, the Government could not continue to engage in the provision of services that were, at the time, clearly considered the domain of the private sector. Efforts by the government to off-load livestock improvement services to the private sector have produced extremely varied outcomes in different parts of the country. Some areas have developed a reliable private sector driven livestock improvement service since the withdrawal of government whereas in other areas, the services have just but collapsed. The collapse of livestock improvement services in such areas has occasioned reversion to previously abandoned and inferior services resulting in reduced productivity and loss of genetic diversity.

The mixed results obtained from the liberalization efforts have brought forth new challenges and the need for a re-examination of the livestock improvement services industry. This will provide for a consolidation of gains in the areas where the private sector has taken off. On the other hand, it is equally significant to re-asses and slow down the rapid decline in areas where the private sector has encountered constraints in taking

up livestock improvement services by identifying and pursuing successful models to stem the tendency for policy reversal in view of privatization of services.

As a result of these experiences, the Strategy for revitalizing Agriculture (SRA) recognizes the need for improved access to quality inputs among which is Livestock improvement services. Accordingly, this study had the following objectives:

- Examine the state of livestock improvement services with respect to dairy and beef cattle
- Examine the prospects for re-aligning livestock improvement services and the necessary adjustments for a competitive livestock industry
- Explore viable options in livestock improvement service provision that are consistent with a liberalized market economy.

# METHODOLOGY AND DATA

This study utilizes primary and secondary data in addition to key informant interviews. The primary data was collected for two periods covering a span of one year (August 2003-July 2004) under the REPEAT collaborative programme[1].

There were 846 respondents spread in Western, Nyanza, Rift Valley, Eastern and Central provinces of Kenya. The data collection instrument was not confined to livestock improvement but probed other rural household aspects such as income generating activities, assets, expenditure and demographic characteristics.

Given that REPEAT was more inclined towards dairy cattle, secondary data and key informant interviews were used to elicit information on beef cattle improvement. In this regard, interviews were conducted with livestock producers, traders and institutional experts. Livestock producers and traders from the arid and semi-arid regions specifically Garissa, Isiolo, Baringo and Pokot were approached to shed light on beef cattle improvement and marketing.

# LITERATURE REVIEW

Initial studies in livestock improvement focused on crossbreeding initiatives that attempted to exploit the considerable flexibility inherent in matching complimentary breed types to local environmental resources and constraints (Gregory and Cundiff, 1980).

However, the smallholder practice of upgrading indigenous breeds has mainly targeted improvement to higher exotic grades without a defined breeding programme and disregarding the ecological and socio-economic characteristics of the production system.

[1] Research on Poverty, Environment and Agricultural Technologies (REPEAT) is a collaborative programme of the Foundation for Advanced Studies on International Development (FASID), National Graduate Research Institute for Policy Studies (GRIPS), the World Agro-Forestry center and Tegemeo Institute of Egerton University.

Whereas results from several studies have been used to discourage the use of larger breeds, the contrary has continued to be observed (Syrstad, 1996; Rege, 1998; Wakhungu, 2000). For instance, Bebe et al (2003), noted that farmers most frequently preferred attributes that included high milk yield and butterfat content. This is generally influenced by the milk payment system that only lays emphasis on volume deliveries (Rege, 1998).

Sustainable agriculture also demands recognition and conservation of the valuable traits in indigenous animal genetic resources e.g. adaptation to harsh environments and ability to utilize poor quality feeds and should therefore be at the core of an animal-improvement programme (FAO, 2000). The Zebu for instance is mostly suited to lowland areas with higher disease incidence and reduced feed availability because of its tolerance to drought, disease resistance, low feed intake, better traction ability and preferred coat colour.

Prior to liberalization in 1991, cheap and accessible AI services existed in Kenya, which increased adoption of dairy technologies. However over time major changes have taken place making some of the services inaccessible to the producers. As a result of the government withdrawal from AI service provision, dairy co-operatives and private firms provide most AI to smallholders. However, unsubsidized AI is expensive relative to natural service, mainly because of the poor state of rural roads and other transport costs. Although private firms have emerged to take up AI service provision they do not offer it in the manner previously used by government such as runs, most of them are concentrated in the developed centers and accessing the services for those in the remote areas is restricted due to poor infrastructure (Bebe et al, 2003).

Bebe et al, (2003) further shows that the risk of reaching high levels of inbreeding in smallholder herds is quite high given the lack of record keeping, levels of misinformation on the dangers and where there are a limited number of bulls within a community. Some studies (Oluoch-Kosura et al, 2000 and Gitau et al, 1994) observed that most farmers bred their cows to bulls owned within the community and the fact that few farmers owned bulls mostly of unknown pedigree, these would be used to mate close relatives, potentially increasing the inbreeding levels in the population. The indication is that

systematic selective breeding is lacking. All these factors further lead to unfavorable long-term effect on productivity through the degradation of the herd genotype unless stringent associated health services are put in place to control breeding diseases and minimize exposure to e.g. tick-borne diseases. It is expected that natural mating will continue to predominate on smallholder farms unless bull schemes are introduced. Bull schemes can be successful if bull centers are established within a reasonable distance for farmers to walk their cows for service (Njoroge et al, 2004).

A survey conducted in Western, Central and Rift Valley (Njoroge et al, 2004) showed that there is less adoption of AI in Western Kenya compared to other areas in Central and Rift Valley provinces even among high grade cattle keepers. For a long time the focus in cattle has been on dairy production and yet about 80% of Kenya comprises of arid and semi arid lands supporting about 6 million beef cattle and accounting for about 70% of total beef consumed in the country. The demand for beef is higher compared to all other meats because most communities keep cattle and beef prices are stable (MOLFD, 2006).

Studies conducted by KARI, (1999) revealed that improvement in beef cattle production can be enhanced by appropriately combining environmental factors like season of breeding and parity in the management system to increase productivity also inclusion of appropriate sire selection in the breeding plan and mating type can be suitably combined to yield optimal beef output. It further alluded to the fact that selection pressure on commercially important traits can reduce disease resistance. The study further revealed that there are seasonal differences in disease occurrence with July to September having the highest incidence while April to June, the least. Moreover female stock was more susceptible to disease than males.

According to Trivedi, (1998) animal recording is necessary to provide information that enables a farmer to compare performance of his/her own herd with those of his/her community in order to stimulate competition and provide incentives to improve production. Trivedi (1998) also emphasized that village co-operatives may be a suitable starting point for basic recording.

# BEEF AND DAIRY CATTLE DISTRIBUTION

### Beef and dairy cattle breeds distribution in selected areas

The distribution of cattle breeds within the provinces shows a wide variation with similar breeds being found within each province (table 1).

**Table 1: Cattle breed Distribution across Provinces (%)**

| Breed | Nyanza | Western | Eastern | Rift Valley | Central |
|---|---|---|---|---|---|
| Local Zebu | 41.52 | 21.64 | 20.47 | 15.20 | 1.17 |
| Cross breed (< 50%) | 18.79 | 8.05 | 3.36 | 46.98 | 22.82 |
| Cross breed (50%) | 17.72 | 8.23 | 3.80 | 37.97 | 32.28 |
| Cross breed (> 50%) | 11.91 | 5.42 | 2.17 | 31.77 | 48.74 |
| Pure Friesian | 3.55 | 0.71 | 4.96 | 24.82 | 65.96 |
| Pure Ayrshire | 5.26 | 4.21 | 3.16 | 16.84 | 70.53 |
| Pure Sahiwal | - | - | - | 50.00 | 50.00 |
| Pure Jersey | - | 9.09 | 18.18 | 27.27 | 45.45 |
| Pure Guernsey | 9.09 | - | 4.55 | 13.64 | 72.73 |
| Pure Boran (local) | 14.71 | 47.06 | 2.94 | 35.29 | - |
| Other pure exotic | - | - | - | - | 100.00 |
| **Total** | **16.68** | **9.33** | **6.22** | **29.59** | **38.17** |

Source: Tegemeo Household Survey 2004

A large proportion of the cattle breeds kept are composed of various degrees of cross breeds. These were classified according to whether they were less than 50%, 50% and greater than 50% cross breeds respectively. The tendency is to upgrade indigenous breeds towards higher levels of exotic breeds. However, due to the absence of a coordinated upgrading programme and a well-designed national cross breeding strategy, several problems have emerged.

Kahi et al (2000) observed that low adaptation to tropical stress such as poor nutrition, disease and heat stress presents major challenges to the increasing use of cross breeds. It is apparent that the lack of documented evaluation of cross breeding strategies and cross breeds cannot permit the establishment of corresponding benefits. Similarly, indigenous breeds (local zebu and Boran) are found in all the provinces with Nyanza, Western and Rift Valley having the highest concentration whereas Central has the least concentration.

This is a reflection of disease, feed and heat stress challenges in these areas. Pure breeds (Friesian, Ayrshire, jersey and Guernsey) are mainly concentrated in Central and Rift Valley provinces and are indicative of the emphasis on the dairy enterprise in these areas. The distribution of cattle breeds within the provinces follows a similar pattern presented by the mean proportion of household income derived from the livestock enterprise. Nyanza, Western and Eastern provinces derive 22%, 19% and 15% of their total household income from livestock while Rift Valley and Central provinces obtain 32% and 28% respectively.

**Beef and dairy cattle breed distribution within grazing systems**

Grazing systems were classified into Zero, semi-zero and open grazing categories and the distribution of breeds within them examined as shown in table 2. The cattle grazing system is a reflection of increasing land pressure and appears to have a direct influence on the cattle breeds kept. The pure breeds (Friesian, Jersey, Ayrshire and Guernsey) are mainly kept under Zero grazing while the indigenous breeds (local Zebu and Boran) are under open grazing.

**Table 2: Cattle breed distribution within grazing systems**

| Breed | Grazing System | | | |
|---|---|---|---|---|
| | Zero grazing | Semi zero grazing | Open Grazing | Total |
| Local zebu | 3.87 | 17.24 | 24.76 | 16.48 |
| Cross breed (<50 %) | 7.42 | 13.30 | 18.87 | 13.76 |
| Cross breed (50%) | 10.65 | 14.04 | 16.98 | 14.20 |
| Cross breed (>50%) | 30.65 | 30.79 | 20.99 | 27.08 |
| Pure Friesian | 24.52 | 11.33 | 6.84 | 13.23 |
| Pure Ayrshire | 17.10 | 6.90 | 5.19 | 9.03 |
| Pure Sahiwal | - | 0.25 | - | 0.09 |
| Pure Jersey | 1.94 | 0.99 | 0.47 | 1.05 |
| Pure Guernsey | 2.90 | 2.22 | 1.18 | 2.02 |
| Pure Boran (local) | 0.65 | 2.96 | 4.72 | 2.98 |
| Other pure exotic | 0.32 | - | - | 0.09 |
| **Total** | **100.00** | **100.00** | **100.00** | **100.00** |

Source: Tegemeo Household Survey 2004

However, a significant proportion of Jersey and Guernsey Breeds are kept under semi-zero grazing system indicating their adaptability to tropical conditions.

# SOME FACTORS INFLUENCING BREEDS KEPT

## Income Categories and cattle breeds

To facilitate an examination of the relationship between rural household Income and cattle breeds, the rural household income was categorized into five beginning from the lowest (1) to the highest (5) quintile (table 3).

**Table 3: Distribution of Cattle breeds within income categories**

| Breeds | Income Quintiles | | | | | Total |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Local Zebu | 43.04 | 27.61 | 12.34 | 10.62 | 10.97 | 16.12 |
| Cross breed (> 50%) | 15.19 | 17.18 | 31.72 | 31.50 | 24.77 | 26.11 |
| Cross breed (50%) | 15.19 | 14.11 | 16.74 | 16.85 | 12.23 | 14.89 |
| Cross breed (< 50 %) | 6.33 | 19.02 | 17.62 | 12.09 | 12.54 | 14.04 |
| Pure Friesian | 3.80 | 7.36 | 11.01 | 12.82 | 20.69 | 13.29 |
| Pure Ayrshire | 3.80 | 7.98 | 7.05 | 10.26 | 10.97 | 8.95 |
| Pure Sahiwal | - | - | - | 0.37 | 0.31 | 0.19 |
| Pure Jersey | - | 0.61 | 0.88 | 1.47 | 1.25 | 1.04 |
| Pure Guernsey | 1.27 | 1.84 | 0.88 | 2.93 | 2.51 | 2.07 |
| Pure Boran (local) | 11.39 | 4.29 | 1.76 | 0.73 | 3.76 | 3.21 |
| Other pure exotic | - | - | - | 0.37 | - | 0.09 |

Source: Tegemeo Household Survey 2004

The lowest rural household incomes (quintiles 1&2) herd is largely composed of local breeds (greater than 44%), whereas the middle-income rural household (quintiles 3&4) posses mainly cross breeds. The highest income households (quintile 5) keep mainly pure breeds and higher-level exotic upgrades. This is an indication of the demanding financial burden placed on producers by pure breeds with respect to production costs.

Cattle breeds are nonetheless not confined to specific income quintiles and are distributed across all the categories. Given that different breeds place varying financial burdens that are reflective of the corresponding production cost, the presence of all breeds across the income spread and in all the provinces indicates an inappropriate or lack of a breeding strategy. This phenomenon may however be desirable for genetic diversity.

**Education levels and cattle breed distribution**

The highest education levels of the household heads were examined in relation to the type of cattle breed kept. The cattle breed type was expressed as local (indigenous), improved (pure-bred exotic and upgrades or a mixture of indigenous and exotic). This relationship is shown in table 4 below.

**Table 4: Highest Education Level of Household head and type of breed kept**

| | Local | Improved | Mixed |
|---|---|---|---|
| Nyanza | 6 | 8 | 7 |
| Western | 6 | 8 | 10 |
| Rift Valley | 7 | 7 | 7 |
| Central | 2 | 7 | 8 |
| Eastern | 6 | 9 | 9 |
| **Total** | **6** | **7** | **8** |

Source: Tegemeo Household Survey 2004

Results for Central and Nyanza provinces show that local breeds are generally kept by households whose education levels are lower as compared to those keeping improved or mixed breeds. However, results for Rift valley province indicate that education level does not seem to influence the breed of cattle kept.

**Influence of age on type of breed kept**

Mean ages of household heads were computed for the different categories of cattle breed kept according to the provinces as is shown in table 5.

**Table 5: Age of Household head and type of breed kept**

| | Local | Improved | Mixed |
|---|---|---|---|
| Nyanza | 53 | 49 | 49 |
| Western | 60 | 54 | 52 |
| Rift Valley | 48 | 54 | 55 |
| Central | 68 | 56 | 47 |
| Eastern | 63 | 57 | 59 |
| **Table Total** | **57** | **55** | **52** |

Source: Tegemeo Household Survey 2004

It is evident from the table that local breeds are mostly kept by households headed by older producers all across the provinces except for Rift valley province that shows the contrary.

# BEEF CATTLE IMPROVEMENT

## Indigenous breeds and beef cattle improvement

Beef cattle in Kenya have received relatively little attention from an improvement perspective over the years. While recognizing that the indigenous (local) breeds constitute the major beef cattle genetic resource and that its propagation and maintenance has been left to pastoralists and traditional knowledge base, it is imperative to examine the impact.

Information obtained through interviews with pastoralists and traders in Garissa, Baringo and West Pokot emphasize that genetic vigour is declining as observed from the diminishing size of beef cattle in these areas. Since beef cattle improvement is mainly through free natural service in open pastures, the selection process has to be carefully organized. However, with the little attention accorded to beef cattle improvement and minimal participation in animal recording, the selection process is not well coordinated resulting in inbreeding.

Pastoralists breeding objectives were found to be at variance with market requirements thus making it difficult to extract premium prices for their cattle. Pastoralists breed for survival traits that include drought resistance, hardiness and disease resistance while market requirements demand fast growth and high live weight.

## Beef cattle improvement and food security

Pastoralist attempts to retain selected animals for re-stocking after severe droughts form the basis of their reluctance to dispose of their animals in time to avoid or minimize losses. This tendency exacerbates the effect of drought on these communities. At the moment, government programmes and relief efforts focus on off-take activities and generally provide funds for the purchase of beef cattle destined for fattening and eventually slaughter. The net effect of such off-take programmes is a conflict of objectives given that buyers wish to purchase the best of the surviving animals whereas the same animals are precious to the pastoralists as they are intended to be the -

foundation of their re-stocking initiatives. The absence of a coordinated and transparent re-stocking initiative or buy-back facility within the off-take programme is a major constraint to minimization of cattle losses during drought and consequently contributes to increased food insecurity in these areas.

**Beef cattle improvement research**

The Kenya Agricultural Research Institute (KARI) has centers dealing with beef cattle breeding located in Naivasha, Lanet and Kiboko. While the KARI centers were established for research on beef cattle improvement including breeding, the high cost of research on breeding has altered their operations significantly. These research centers have directed their efforts toward breed maintenance functions with KARI Naivasha focusing on the Sahiwal stud, KARI Lanet the Boran stud and KARI Kiboko the zebu stud. The three centers keep a herd of up to 1000 animals at any given time and cannot cope with the demand for beef cattle breeding stock even under normal circumstances for they are all capable of providing only one hundred and eighty (180) bulls per year to producers.

Private farms complement the beef breeding stock supply but information on their transactions is rather limited. A recent arrangement between private farms and KARI Naivasha in which the private farms are incorporated in an open nucleus breeding programme is set to confer increased capacity in the supply of beef breeding stock.

Agricultural Development Corporation (ADC) farms that were originally charged with the responsibility of providing beef cattle breeding stock have not performed well in the last few years and is just beginning to turn around. This role should be dully recognized and given prominence in efforts to restructure ADC.

**Status of Registered Beef Breeding Stock**

The Kenya Stud Book (KSB), a farmers' organization under the Kenya Livestock Breeders Organization (KLBO) provides the overall livestock registration services including beef cattle. Table 6 shows the trend in beef cattle registration over the last eleven years.

**Table 6: Registered Beef animals (pedigree)**

| Year | Sahiwal | Boran | Red Poll | Hereford | Brown Swiss | Charolais | Aberdeen Angus |
|---|---|---|---|---|---|---|---|
| 1995 | 38 | 55 | 15 | 34 | 0 | 77 | 13 |
| 1996 | 0 | 30 | 20 | 0 | 24 | 17 | 24 |
| 1997 | 3 | 52 | 40 | 0 | 5 | 37 | 21 |
| 1998 | 9 | 42 | 22 | 0 | 9 | 33 | 10 |
| 1999 | 22 | 36 | 27 | 0 | 0 | 36 | 27 |
| 2000 | 7 | 25 | 18 | 0 | 24 | 20 | 24 |
| 2001 | 24 | 44 | 6 | 73 | 0 | 42 | 21 |
| 2002 | 9 | 60 | 24 | 9 | 0 | 6 | 21 |
| 2003 | 22 | 35 | 29 | 20 | 7 | 22 | 12 |
| 2004 | 1 | 60 | 25 | 0 | 4 | 93 | 16 |
| 2005 | 13 | 78 | 0 | 13 | 14 | 117 | 28 |

Source: KSB 2005

Despite the large numbers of beef cattle in the country, a very small proportion is registered and is of known parentage. The absence of Zebus in the beef cattle register is of exceptional concern especially recognizing that it is the more commonly kept indigenous beef cattle. The case of the Sahiwal and Boran show a declining trend especially with the large populations of these breeds. The lack of registration and consequently unknown parentage increases significantly the possibilities of inbreeding.

**Provision of beef cattle genetic material**

The Central Artificial Insemination Station (CAIS) under the Director of veterinary Services (DVS) is responsible for the production and distribution of genetic material. CAIS therefore keeps and maintains pedigree bulls for the extraction of semen. As of 2004, there were only eight beef cattle bulls, which is an indication of either low priority or low demand for beef cattle genetic material. This may be explained by the low use of Artificial Insemination (AI) in the multiplication of beef cattle.

**Table 7: Breeds of CAIS Beef Bulls (2004) by age groups**

| Breed | Sahiwal | Boran | Zebu | Total |
|---|---|---|---|---|
| 1m-1yr | - | - | - | - |
| 1yr-3yrs | - | - | - | - |
| 3yrs-6yrs | - | 2 | - | 2 |
| 6yrs-10yrs | 1 | 2 | - | 3 |
| 10yrs & over | 3 | 0 | - | 3 |
| **Total** | **4** | **4** | **-** | **8** |

Source: CAIS 2004

# DAIRY CATTLE IMPROVEMENT

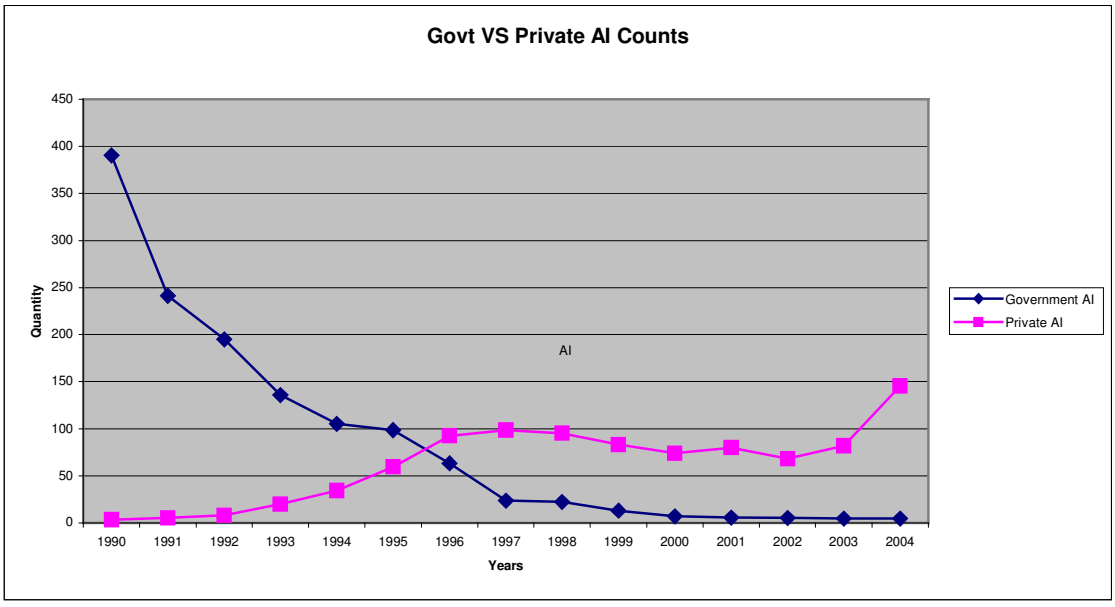
## Status of dairy cattle improvement

Dairy cattle improvement has received relatively more attention beginning from the colonial period due to its historical origins that dates back to the settler period. Consequently there was heavy government involvement in dairy cattle improvement prior to the dairy industry liberalization in 1991.

Current dairy cattle improvement practically reflects a desire to maximize the proportion of exotic genes in their herds to increase milk yield potential. This phenomenon can be observed through the wide adoption of Friesian and Ayrshire breeds, their corresponding upgrades and crosses. At the opposite end dairy cattle improvement research findings appear to lay emphasis on a strategy that takes account of environmental concerns as well as the farmers' knowledge base and resource endowment.

After the liberalization of the dairy industry and government withdrawal from AI service provision, there were major adjustments in the sub-sector. The initial effect was the immediate and sharp decline in AI services.

**Figure 1: Government Vs Private Artificial Insemination counts**




Source: CAIS 2004

The sharp decline in AI services was further aggravated by the shift from daily runs to spot provision, simultaneous liberalization of the milk market, veterinary clinical services and animal feed industry as well as the absence of a capable private sector. It is argued that the government did not provide a transition period for the private sector to develop a capacity for successfully taking over AI service provision. The net effect of liberalization actions in inter-related sub-sectors as observed in the dairy industry, brings to the fore the importance of a sound basis for adopting piece-meal or simultaneous liberalization. It also emphasizes the need for proper and coordinated sequencing of liberalization efforts. The preferred sequence of interrelated sub-sectors liberalization should be based on a critical analysis of the expected market and industry player's response. It would therefore appear inappropriate to entirely attribute the sharp decline in AI service provision to only its liberalization.

As can be observed from figure 1 above, private AI service has begun to develop and is slowly edging upwards. However, concerns are arising as to the distribution of private AI services. While it is known that Central and Rift Valley Provinces register the highest private AI use there are still patches within these provinces and others that have been unable to develop a vibrant private AI service despite the existence of facilitating conditions.

From Table 8, some districts such as Kiambu and Nakuru have witnessed a major private sector take-over of AI service provision. The low AI service provision in Siaya and Kakamega districts is attributed to the correspondingly low adoption of dairy cattle breeds resulting in extremely low dairy cattle population densities and therefore thin AI markets. It is nonetheless noteworthy that even in these harsh environments, there is still to be found pure exotic breeds including Friesian, Ayrshire and Jerseys.

**Table 8: Comparison of GoK and private provision of A.I in selected districts**

| | Nakuru | | Kiambu | | Siaya | | Bomet | | Kakamega | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | GoK | Private | GoK | Private | GoK | Private | GoK | Private | GoK | Private |
| 2000 | 1458 | 9921 | | | 33 | 19 | 83 | 166 | 735 | - |
| 2001 | 1243 | 14501 | | | 32 | 27 | 79 | 144 | 665 | 121 |
| 2002 | 622 | 12302 | - | 15588 | 29 | 33 | 55 | 161 | 362 | 304 |
| 2003 | 710 | 12303 | - | 22099 | 28 | 15 | 64 | 210 | 318 | 78 |
| 2004 | 757 | 11154 | - | 20817 | 26 | 17 | 79 | 136 | 229 | 249 |
| 2005 | 78 | 12553 | - | 29582 | 35 | 0 | 76 | 106 | 133 | 666 |

Source: District Veterinary Reports

The rapid development of private AI service is highly dependent on the existence of a high density of exotic dairy cattle breeds, stable milk markets, low spatial distances, veterinary clinical services, functional co-operatives and rural infrastructure. The disturbing trend concerns areas that exhibit attributes which, ordinarily would promote the development of private AI service provision but has failed. One such area is Bomet district as seen from table 8.

The ideal response in such areas would not be for a policy reversion to government service provision but a consideration and support of effective and functioning private dairy cattle improvement models.

**Grazing system and dairy cattle improvement**

It is normally expected that AI service would be more widespread in Zero and Semi Zero grazing systems that have high concentrations of exotic breeds, crossbreeds and upgrades.

**Table 9: Sources of Last Breeding Service by Grazing System**

| Grazing System | Source of last service | | | | |
|---|---|---|---|---|---|
| | Own bull | Other farmer's bull | Govt. AI | Agro-vet AI | Cooperative AI |
| Zero grazing | 2.92 | 42.53 | 9.09 | 34.42 | 11.03 |
| Semi zero grazing | 8.27 | 67.42 | 4.01 | 15.79 | 4.51 |
| Grazing | 15.68 | 68.41 | 2.38 | 9.74 | 3.8 |
| **Total** | **9.57** | **60.99** | **4.79** | **18.62** | **6.03** |

Source: Tegemeo Household Survey 2004

However table 9 shows that this is not the case and that natural service from other farmers' bulls is predominant even in zero and semi-zero grazing systems thereby increasing the chances for inbreeding.

**Models of private AI service provision**

Private AI service provision has evolved into two major models. The first model involves practicing veterinarians and Agrovet shops that link AI service provision to their veterinary practices and/or farm input stores.

The second model consists of co-operative run AI services that seem to be having an upper hand in their areas of operation. This trend may be explained by the patronage the dairy co-operatives exercise on their members through the provision of auxiliary services and the ability to extract payment at source.

Despite the cogent issues on co-operative management, this model presents a viable option even for areas where Private AI Service provision appears to be faltering. This assertion is consistent with other studies such as Njoroge et al, (2003).

## Supply of Dairy Genetic Material

### Domestic supply of genetic material

CAIS provides the bulk of dairy cattle genetic material in the country and has developed a network of agents and distributors.

**Table 10: Domestic Monthly Semen Distribution**

| | KNAIS | | Private Farms | | Cooperatives | | Private Vets | | Sub Centres | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **DF** | **RT** | **DF** | **RT** | **DF** | **RT** | **DF** | **RT** | **DF** | **DF** | **RT** |
| JAN | 629 | 130 | 360 | 155 | 1990 | 250 | 656 | 0 | 9455 | 13090 | 535 |
| FEB | 785 | 130 | 1953 | 202 | 1815 | 314 | 1049 | 0 | 4075 | 9677 | 646 |
| MAR | 1840 | 260 | 2599 | 335 | 1760 | 203 | 472 | 49 | 4995 | 11666 | 847 |
| APR | 575 | 327 | 1164 | 236 | 1400 | 234 | 1127 | 176 | 4610 | 8876 | 973 |
| MAY | 1980 | 211 | 1386 | 354 | 540 | 223 | 65 | 161 | 13881 | 17852 | 949 |
| JUNE | 2845 | 350 | 4783 | 390 | 3533 | 210 | 1600 | 50 | 3050 | 15811 | 1000 |
| JULY | 2420 | 340 | 5300 | 351 | 3500 | 123 | 3162 | 142 | 3050 | 17432 | 956 |
| AUG | 4183 | 513 | 3100 | 277 | 1227 | 210 | 1135 | 0 | 4900 | 14545 | 1000 |
| SEPT | 3400 | 285 | 3951 | 377 | 750 | 258 | 730 | 0 | 7900 | 16731 | 920 |
| OCT | 3725 | 160 | 3725 | 165 | 2460 | 113 | 1200 | 60 | 4905 | 16015 | 498 |
| NOV | 677 | 243 | 5400 | 161 | 4070 | 135 | 3590 | 23 | 9972 | 29802 | 462 |
| DEC | 7700 | 160 | 3830 | 167 | 5595 | 177 | 8567 | 3 | 4210 | 29902 | 547 |
| **TOTAL** | **36852** | **3009** | **37551** | **3170** | **28640** | **2450** | **23353** | **704** | **75003** | **201399** | **9333** |

Source: CAIS 2004

**Key:** DF: Deep frozen

RT: Room temperature

Table 10, shows the semen doses supplied by CAIS to various agents. Prior to liberalization CAIS operated through the KNAIS whose functions have since been scaled down with the exit of government from AI service provision. Whereas CAIS is capable of producing up to 500,000 doses of semen, its semen production and distribution has remained steady at around 200,000 doses annually.

CAIS obtains its dairy genetic material from domestically reared bulls. The dairy bull stud is made up of adapted exotic breeds.

**Table 11: Ages and Breeds of CAIS dairy bulls-2004 by Age groups**

| Breed | Ayrshire | Friesian | Guernsey | Jersey | Total |
|---|---|---|---|---|---|
| 1m-1yr | 5 | 7 | 1 | 2 | 15 |
| 1yr-3yrs | 7 | 5 | 0 | 5 | 17 |
| 3yrs-6yrs | 7 | 5 | 0 | 5 | 19 |
| 6yrs-10yrs | 8 | 8 | 4 | 4 | 27 |
| 10yrs & over | 4 | 6 | 2 | 4 | 19 |
| **Total** | **31** | **31** | **7** | **20** | **97** |

Source: CAIS 2004

Table 11, shows the ages and breeds of CAIS dairy bulls in 2004. Nearly 45% of the dairy breed bulls at CAIS are six years and older which presents a concern on the recruitment. The issues that arise from CAIS operations involve its dairy bull recruitment pool, the bull breeding value evaluation system and semen quality.

CAIS dairy bull recruitment pool is too narrow and requires diversification to include institutions such as university/college farms in addition to strengthening ADC farms. Stringent controls are required for semen quality especially with respect to disease free status and breeding value establishment in the evaluation system. The system of establishing breeding values for CAIS bulls is currently in transition from the old Contemporary Comparison Method (CCM) to the universally accepted Best Linear Unbiased Prediction (BLUP) method.

**Genetic material imports**

Genetic base diversification requires the infusion of foreign genetic material to allow for the introduction of superior sires into a herd.

Semen constitutes the largest proportion of genetic material imports in addition to small amounts of embryos. Similarly, the bulk of genetic material imports consist of semen for dairy cattle. The USA is the major source of genetic material imports with little amounts coming from Canada, New Zealand, South Africa and some parts of Europe.

Imported semen accounts for about 20% of the domestic genetics market and is distributed by four firms.

**Figure: 2. Semen imports from USA**

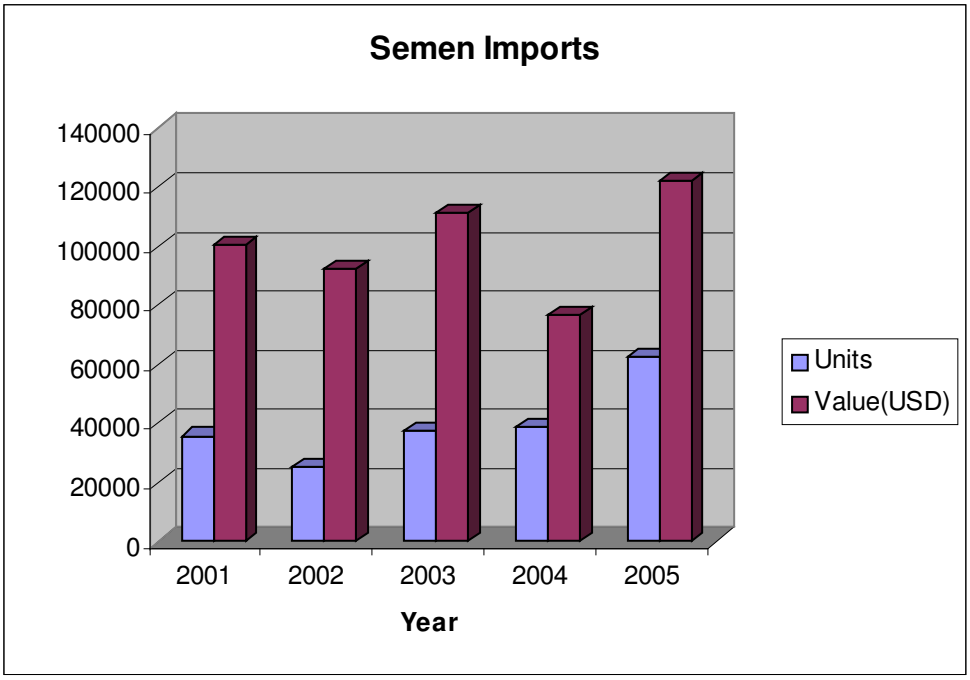



Figure 2 shows the units and the value (USD) of semen imports from the USA over the period 2001/05. The import quantities average 40,000 annually and appear to be responding to the evolving milk market.

**Dairy cattle registration and recording**

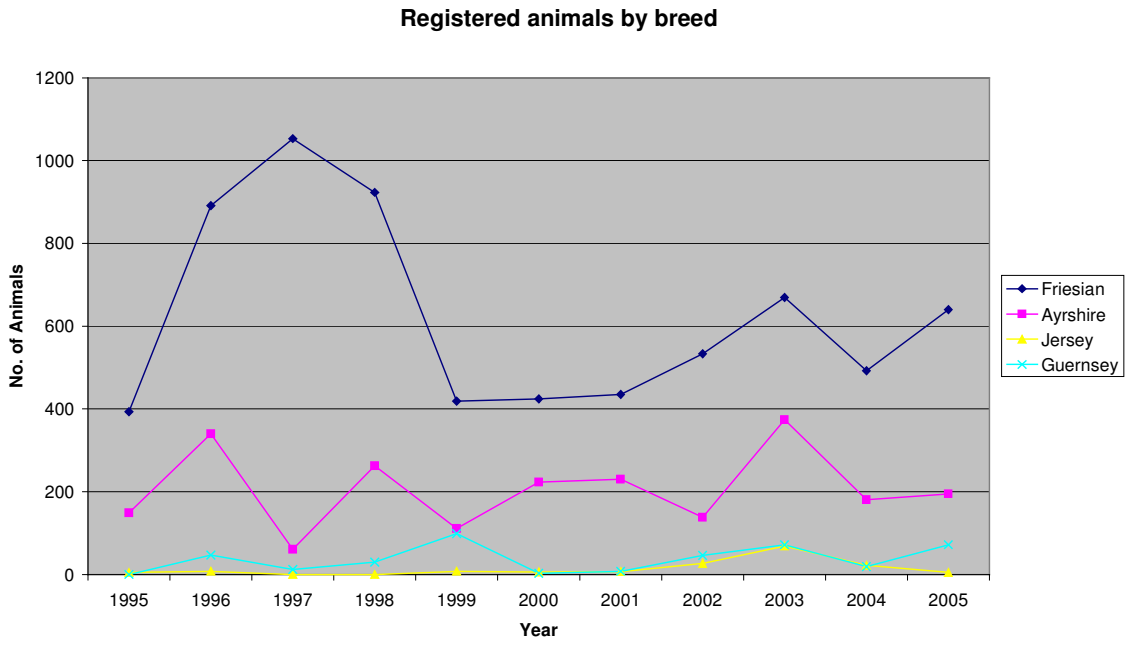
Dairy cattle registration and recording is critical for increased productivity through the identification and use of superior progenies.

Kenya Stud Book (KSB) and Dairy Recording Services of Kenya (DRSK) under Kenya Livestock Breeders Organization (KLBO), conducts dairy registration and recording. This is done with the input from Livestock Recording Centre (LRC) of the MOLFD that is responsible for contract mating, progeny testing and ultimately breeding value prediction. The dairy cattle breeding stock at CAIS are presently confined to only four breeds (Friesian, Ayrshire, Guernsey and Jersey).

The performance of dairy cattle registration and recording has been dismal given the large dairy herd in Kenya. Fig 3 shows the performance in registration and recording at

the foundation level that determines pedigree achievement.

**Figure 3: Foundation Dairy Herd Registration**




Source: KSB 2005

While the returns to registration and recording are well known to dairy producers the poor performance of the milk market reversed the gains previously made to the extent that very few animals are registered and recorded. This is reflected in the inability of dairy producers to exploit the export market particularly in the region.

# BEEF AND DAIRY CATTLE IMPROVEMENT INSTITUTIONAL STRUCTURE

The Ministry of Livestock and Fisheries Development (MOLFD) through its Livestock Breeding Services Branch (LBSB) is responsible for dairy and beef cattle improvement programmes.

Regulatory functions are vested on the Director of Veterinary Services (DVS), a matter that complicates the operation of CAIS. From field observations, the regulatory functions performed by DVS are mostly confined to provision of dairy genetic material particularly AI services. It was noted that the DVS regulatory functions as currently constituted faces serious challenges.

The first major challenge is that the DVS regulatory function involving AI services and others do not have a sound legal instrument. At the present time, efforts are being directed to operationalising these regulatory functions through appending subsidiary rules and regulations to the Veterinary Surgeons Act (CAP 366).

Another major challenge to the DVS regulatory functions with respect to AI services involves lack of resources and capacity ranging from skilled personnel to operational issues. This is much more glaring when it is recognized that DVS is still in transition from service provision to regulation while maintaining its role of containing animal diseases that threaten the public good.

The only AI service regulatory functions that are enforced by DVS are those involving licensing of AI providers and export/import of genetic materials, including breeding stock and embryos. The supervision of the operations of AI service providers is limited to filing of insemination reports with the DVOs'.

The commercialization of CAIS complicates its role in the genetic material arena. While it may house the genetic material testing facilities, this is a regulatory function that should be ceded to the regulatory authority.

In recognition of the large and increasing dairy herd in Kenya and inherent risks encapsulated in having only one AI station it would be prudent to license new AI stations or decentralize CAIS.

# BEEF AND DAIRY CATTLE GENETIC POOL MAINTENANCE

The country's genetic pool is under the management of individual producers, institutions and private farms that keep different breeds according to their own preferences rather than through a coordinated effort. This implies that the custody of the genetic pool as a public good is not confined to any institution.

ADC farms maintain various beef cattle breeds but do not have a responsibility as to the maintenance of the genetic pool but perceive their role as that of supplying superior breeding stock to producers.

In the case of beef cattle for instance, the zebu, sahiwal and Boran studs under KARI research centers are more out of the research mandate accorded to KARI rather than a custodial responsibility. On the whole, private farms have been at the forefront of beef cattle breeding, especially the Boran.

Whereas CAIS maintains bulls for semen extraction, it does not have a clear mandate with respect to animal genetic resources maintenance.

Apart from concerns in respect of the custody of beef and dairy cattle genetic resources, a more recent issue involves the safeguard of intellectual property rights especially in view of emerging genetic engineering products and technologies.

Animal breeders (producers and scientists) and communities do not currently have the facilities nor the legal instruments to stake their claims to beef and dairy genetic material.

The Kenya Intellectual Property Organization (KIPO) that is responsible for intellectual property rights in the country has given little attention and developed few structures to accommodate property rights in beef and dairy cattle genetic resources.

While the whole concept of livestock keepers' rights, animal treaty and patentable aspects of beef and dairy cattle genetic material is under global scrutiny and debate, the country needs a clear focus in the matter.

# CONCLUSION AND POLICY IMPLICATIONS

Beef and dairy cattle breeds are distributed all over the country irrespective of suitability. This observation reveals that the breeding objectives being pursued by dairy and beef cattle producers are inconsistent and do not have a coordinated background. While beef producers lay emphasis on survival traits for improvement, dairy producers are attempting to maximize exotic genes and output. It is imperative that breeding objectives and strategies are harmonized and made consistent with the environment, market requirements and producer resource endowments. Increased productivity and improved competitiveness cannot be achieved without well defined breeding objectives. A breeding policy that clearly designates the mandate for coordination of national breeding objectives is therefore essential.

The development of a sustainable breeding stock requires the willing participation of producers in livestock registration and recording supported by effective producer owned and operated breeding institutions. The operations of KSB, DRSK, KLBO, LRC and primary breed societies need to be consolidated and supported for an assured stream of breeding stock.

Beef cattle improvement is mainly through natural service but a high proportion of dairy cattle producers also make use of the same service. Despite the challenges presented by natural service and its's inferiority to AI, it should be well coordinated to avoid the attendant inbreeding and breeding diseases.

Private AI services are likely to take off in areas characterized by high density of exotic dairy cattle breeds, stable milk markets, low spatial distances, veterinary clinical services, functional co-operatives and rural infrastructure. Nonetheless there are areas that exhibit characteristics that define successful private AI service but have failed to experience the same. While such areas present opportunities for government policy reversal, it is critical that replication of successful models is first considered. Co-operative and Agrovet shops based models offer viable alternatives for such areas that are faltering in developing

private AI services.

A liberalized market environment with minimal government involvement requires the existence of a strong and functional regulatory service with sufficient legislative authority to ensure compliance. The DVS is currently charged with the regulatory responsibilities for the livestock improvement industry but it does not seem to have the essential legal authority nor the resources required to effectively exercise this mandate. Due to this constraint some services under it's jurisdiction such as semen testing are still carried out by CAIS. The commercialization of CAIS's services and the establishment of other AI stations that should be subject to the same regulations may result in conflicts of interest. These services and others of similar nature need to be ceded to the livestock improvement regulatory authority.

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