Artificial Insemination and the Cattle Industry in Botswana, 1960-2011

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Abstract

Artificial Insemination (AI) is an improved and efficient method of reproduction in all living things including humans, goats and ants among others. AI in cattle production was introduced in Botswana in the early 1960s with the aim of improving the quality of the national herd, and it has been adopted by many farmers in both communal and private land across the country. This paper observes that AI has significantly improved the quantity and quality of cattle produced by Batswana farmers and has allowed Botswana beef to be competitive in the international beef market. The cattle production, which has traditionally been critical to the economy, has contributed significantly to Botswana's gross domestic product (GDP) and the general development of the country. This paper traces the government effort at better cattle breeding effort to livestock improvement centres (LICs) traceable to the colonial period in the 1920s and the bull subsidy scheme which was introduced in 1964. The discussion on AI in Botswana also considers the challenges faced by the scheme from its inception to the turn of the new millennium.

Introduction

Botswana's local and international meat market has gone through several changes since the colonial period. 'In 1910, the Bechuanaland Protectorate, Basutoland, Swaziland and South Africa entered into a customs union which provided in article two for a free interchange of products' (Kaisara 2002:20). For the most part of the agreement, Bechuanaland Protectorate or Botswana had the benefits of free trade with these countries. The customs arrangement also provided that goods could move across states with minimal constraints regarding customs. This was good news for the beef industry because Batswana cattle farmers could expand their beef market into the much bigger South African market. It should also be noted that the 1910 constitution that led to the establishment of the Union of South Africa also stipulated that Botswana, Lesotho (Basutoland) and Swaziland would be incorporated into the Union of South Africa. However, the African leadership in these territories, which were collectively known as High Commission Territories because they were under the British high commissioner in South Africa, fiercely campaigned against the planned incorporation.

In 1924, as a strategy to force Botswana into incorporation the South African authorities introduced a minimal weight restriction which reduced the number of cattle being exported to South Africa from Botswana. The embargo was also a strategy to protect South African beef producers from external competition (Tlou and Campbell 1997). Most Batswana cattle farmers produced 'lean' beef which could not meet the new South African weight requirement, hence they failed to make it into the lucrative South African market (Ettinger 1972). However, the South African cattle embargo led to some 'enterprising' Batswana in the Bakgatla reserve conniving with South Africans on the border to smuggle cattle into the South African market (Molosiwa 2003). The South African cattle embargo was lifted in 1941 during the Second World War. The campaign against incorporation by the *dikgosi* (Chiefs), introduction of apartheid in South Africa in 1948, and other factors led to the failure of South Africa's ambition of expansion (Hyam 1972).

At Independence in 1966 Botswana ranked the second poorest country after Bangladesh (Magang 2015) and there was little hope of the country emerging economically. At the time the beef sector was regarded as the engine of growth for the country. Therefore, many Batswana were encouraged to develop their stock using AI as a new scientific approach. Concerted efforts were put into the improvement of the cattle industry. According to Fidzani (1985), the farming sector was essentially split into two. First were

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the traditional farmers whose cattle grazed freely in the communal areas while the other was the commercially-oriented farmers in freehold land or private farms. The former contributed about 80% while the latter contributed just 20% to the national herd. This means that the beef industry was heavily dependent on the traditional farmers. Therefore, in the early 1960s discussions of AI (*kgodiso ka seatla*) started becoming dominant in the agricultural policy making quarters of Botswana.

By the mid-1960s, the government decided to assist communal farmers, whose stock grew slowly due to natural methods of cattle breeding. For them, AI was the answer. It should be noted that the bull subsidy scheme, which started in 1964 and was ended in the 1980s, ran parallel with the AI project. 'As a result of such efforts, the national herd increased from 1.6 million in 1966 to about 3.0 million in 1980' (Fidzani 1985:3).

AI is a scientific method of reproduction, whereby the male reproductive gametes (in this case cattle) are deposited into the reproductive tract of a female using special instruments instead of the natural mating process (Republic of Botswana nda). It involves an array of highly technical methods that require the best skilled manpower. The permanence of the AI scheme in Botswana brought hope and tangible results to many cattle farmers within the country even though it has gone through some serious challenges and overcome a few.

In the next sections we discuss the localised bull camp arrangements which started in the 1920s and coincided with the introduction of the South African cattle embargo. We also touch on the LICs and the challenges they faced, and the introduction of the abattoirs which culminated in the establishment of the Botswana Meat Commission (BMC) during the colonial period. The discussion also focuses on the bull subsidy scheme which was introduced just two years before Independence in 1964, and the era of the AI starting in 1966.

Data for this paper was collected in the Central District in 2011 and 2012 with particular attention paid to farmers in the Boteti Sub-district. Whereas the findings from this area are likely to be more or less the same to that of other parts of the country, the area was chosen because it has the highest number of AI camps in Botswana. Records from the Botswana National Archives and Records Services (BNARS) in the form of official government documents were used, and oral interviews were also held with farmers in Magodi, Rakops, Letlhakane, Molae and Serowe among other places.

Localised Bull Camps, LICs, Abattoirs and the Bull Subsidy Scheme

During the 1920s some local or tribal administrations operated 'tribal bull camps' whereby people brought their cows to be serviced by quality bulls procured by the British colonial government. In 1924 and 1926 a start was made through the establishment of bull camp schemes in the Bangwaketse and Bakwena reserves respectively (Makgala 2009). However, poor maintenance led to their failure not long after being established. In 1931, due to the South African cattle embargo, the colonial government was forced to start thinking of 'some more active policy of stock improvement' for the overseas market (Makgala 2001). Therefore, Resident Commissioner Charles Rey tried to revive the failed bull camp schemes but it was only in 1937 that active steps were taken to establish what was styled LICs. These facilities had committees which liaised with the local people while their everyday management was handled by the colonial government.

However, only the Bakgatla and tribal Bangwato administrations were successful in this respect (Makgala 2001 and Kaisara 2002). The Bakgatla obtained high quality Afrikaner bulls for improvement of their herd (Makgala 2001). In the Bakwena, Batawana and Bangwaketse reserves ecological degradation and poor management led to the folding up of the LICs (Makgala 2001). The 1920s also saw the beginning of efforts by the colonial government to assist cattle farmers to sink boreholes for provision of water to livestock particularly in the Bakgatla area (Peters 1984 and 1994). The colonial government initiative in the 1930s has been hailed by Phillip Steenkamp (1991) as having significantly contributed economic

development in the country while Pauline Peters (1984) sees the borehole project in the Bakgatla reserve as having brought about differentiation or division between poor and rich cattle owners.

In 1934 the Imperial Cold Storage Company established an abattoir in Lobatse in an effort to promote beef exports from Botswana. Nevertheless, the South African cattle embargo was so serious that it became one of the key factors in the closure of the abattoir just two years after its establishment (Tlou and Campbell 2007). Outbreaks of the foot and mouth disease (FMD) in 1933 was another major contributing factor. The occasional outbreak of the disease in the northern part of the country posed serious problems for cattle farmers. The post-Second World War period led to high demand for beef worldwide with lean beef particularly preferred (Tlou and Campbell 1997). This demand helped revive Botswana's beef industry which was also boosted by the end to the cattle embargo which had been lifted in 1941 during the war. The defunct abattoir in Lobatse was reopened by the Commonwealth Development Corporation (CDC) in 1954. However, Batswana farmers in areas far away from the railway line in the western part of the country faced serious challenges of transportation as the country's infrastructure was not developed during that time. According to Thomas Tlou and Alec Campbell:

> The colonial government leased large farms in the Molopo River area (Molopo Farms) to the CDC. They were used for fattening and breeding cattle for the abattoir. So the CDC was successful in the beef industry and new markets were opened in the 1950s, in European countries and Israel. The government further assisted the industry by building a school to train veterinary assistants in 1963. Their main tasks were to inoculate cattle against diseases and to assist in the erection and maintenance of cordon fences….
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> As a result of the activities of the veterinary department, the CDC and the drilling for new water sources, the cattle population rose from about 950 000 in 1946 to roughly 1 300 000 in 1959. By the end of the colonial period the cattle industry had developed significantly, and was the most important source of revenue for the country. However, beef exports mainly benefitted the government, the CDC, a few Batswana cattle-owners, white farmers and the white traders who bought and sold cattle. Because of transport difficulties, most Batswana could not take their cattle to the abattoir, and they continued to sell to traders at low prices. The number of Batswana who sold directly to the abattoir, however, increased from 12 in 1954 to 1 500 in 1962 (Tlou and Campbell 1997:274-275).

There was also need to improve the lean traditional Tswana cattle breed to an entity with more weight for added return at the CDC. 'Breeding methods available for improvement of animal performance are selection, crossbreeding and formation of new breeds. In Botswana, the process was carried out based on crossbreeding to make use of inherited characteristics. At the same time selection within breed types was also done' (Masilo and Madibela 2003:33). Establishing a new breed, therefore, came as a result of the evaluation of the pure and crossbreed with the aim of combining the valued characteristics found in different breeds into one superior product or hybrid. The colonial government then initiated a bull subsidy scheme in 1964 through which farmers were assisted to purchase bulls to improve their herds.

A year before Independence, the colonial administration turned the Lobatse abattoir into a parastatal organisation which was later called Botswana Meat Commission (BMC). The latter would become central to the marketing of cattle in the country. The Botswana Livestock Development Corporation (BLDC) was also formed as a BMC subsidiary focusing on purchasing young cattle for fattening before selling them to the BMC.

The expansion of the Botswana livestock industry was driven by the frequent injection of finance by the government into the livestock industry. The government also made loans accessible through the

National Development Bank (NDB) for borehole equipment, and also constructed small easily accessible dams which provided water for farmers in most communal grazing areas. As a result of these measures, the national herd rose from 1.6 million to 3.0 million in 1980' (Fidzani 1985:3).

The idea behind the bull subsidy scheme was to provide farmers with 'crossbred and where possible, purebred bulls of better quality at cheaper rates than the farmer would ordinarily be able to obtain' (*Agrinews* 1973:8). According to *Agrinews* (Ministry of Agriculture's newsletter) the bulls originated partly from 'surplus bulls from the Animal Production Research Unit (APRU) ranches, partly from weaner bulls bought from farmers. The bulls from the APRU were all performance tested and only bulls above average were made available through the scheme'. The scheme is said to have distributed 2,120 bulls between 1964 and 1973. The price of the bulls varied according to a farmer's income, the most expensive ones being sold at R150 and the most affordable at R45 (*Agrinews* 1973). The bulls available in any one year were divided between districts according to the number of cattle each district had in the national herd. What this meant is that, the region with the most cattle would get more bulls sent to their region for auction while the region with a lesser number only received what remained. This was a consistent way of distributing these bulls but it was also detrimental to the growth of some regions' herd.

However, many observers blame the bull subsidy scheme for the uncontrolled crossbreeding in the communal areas (*Agrinews* 1973). Those who bought bulls under this scheme and did not take them to private and fenced farms had the problem of uncontrolled breeding within their areas. The scheme operated continuously except for a brief period in 1971/1972 when it was decided that the bulls should reach breeding age before they could be sold to farmers through the scheme (*Agrinews* 1973).

Unfortunately, agricultural subsidies in Botswana have generally been inefficient, subject to abuse, poorly targeted, and often benefiting the better-off farmers. In essence, the government was running the bull subsidy schemes at a loss by spending large sums of money to purchase, feed, water and transport the bulls to numerous areas across the country while it was getting less or nothing back. This can be seen as the major cause of its failure in the late 1980s. Masilo and Modibela (2003) attribute the eventual collapse of the bull subsidy scheme to poor management. They argue that 'the scheme supplied bulls that were not performance tested hence their genetic superiority were never established' (Masilo and Madibela 2003:33). Despite the challenges the scheme seems to have benefited some farmers even those in far flung parts of the country.

Introduction of the AI in Botswana

In a dispatch written in late 1967 by RL Wooldridge, director of veterinary services and Tsetse control, to Dr AB La Grange of the Transvaal Artificial Insemination Cooperative Society (TAICS) in Irene (South Africa) a deal was struck between the government of Botswana and TAICS. The agreement was to have Botswana as a client for bull semen with the intention of the country opening its own AI centre in the future:

> We agree to your provisos, namely; (a) we guarantee to buy all semen requirements from or through you. (b) We accept that this special price cannot be for nominated bulls. (c) we accept that the spirit of this concession to be an understanding that with your help in developing artificial insemination in Botswana we will not, when established, look to other sources of semen except through you if you may not have the breeds required in this country. Also accepting that the long term possibility that we may one day wish to set up our own artificial insemination station for semen collection within Botswana (Woodridge to La Grance 12 December 1967, BNARS, MoA 2/1).

There was great interest on the part of farmers to benefit from the AI service and these included Vice Pres-

ident Quett Masire as official sources indicate. At that time there was no policy regarding the number of cattle that could be entered by one person. 'Dr. Masire entered 90 heifers on the 15/12/67. They had been previously examined by me [CAS Jensen] and I recommended that only 50 should be taken to the AI centre as the rest in my opinion were too small' (Republic of Botswana 1967). It was further reported that 'We will be inseminating 300 heifers belonging to the Vickerman brothers on their farm at Ramatlabama plus 100 cows for Mr. Adams at Pitsane and another 50 cows/heifers for Mr. Rhodes. There may also be some from other farmers in the vicinity'.

During that period some Batswana farmers had intentions of practicing AI on their farms since they had the wherewithal for such an undertaking. 'Stock owners wishing to do their own insemination must place their order with you for it to be obtained by you on government local purchase order at the same time as you obtain semen for out AI schemes. Stock owners cannot order directly from Irene. Government will charge them R1.20/dose to cover our handling costs', it was said (Woodridge to Jense18 December 1967, BNARS, MoA 2/1). By December 1967 Botswana had only two functioning AI stations, and the TIACS provided the necessary equipment to start AI in Botswana. This was indicated in a communication from a government's AI specialist CAS Jensen to Dr La Grange. 'As I am now organized at two AI centres, I would like to place my first definitive order of semen, Brahman: 600, Afrikander; 200, Sussex: 80, Simmentaler: 60, Charolais: 60, liquid nitrogen: 801 and equipment. I should be grateful if I could collect the above on 22 December. I should arrive at Irene on 21 December to deliver one 1500s container to be filled with liquid nitrogen and one 300s container both to be collected on 22 December together with the order' (Jensen to La Grange 19 December 1967, BNARS, MoA 2/1). Liquid nitrogen was needed to preserve semen.

There were many benefits and opportunities to Batswana that came with AI such as job creation and skills training. When the AI started in Botswana, there was a serious shortage of skilled labour to manage the stations. Therefore, courses were created to facilitate the training of certain people to enable them to assist farmers who needed their cows to be serviced. '6 Veterinary Assistants attended this course which took place at Goodhope Bull Breeding Centre during January 1967. The students held from Standard VI to Junior Certificate' (Republic of Botswana 1968). Three of the students from the course were said to have carried out AI at the various centres during 1967/1968 with very good results. Among courses offered was one specifically for technicians who were to do AI for the farmers. The same source noted that 'Students for this course are not selected according to school education but in their capacity as good stockmen, and reliability is stressed. The only condition is that they can read and write figures'. It was also mentioned that services were provided for farmers wishing to do AI on their farms with the involvement of the students.

Nonetheless, the government was spending a lot of money from its meager coffers every insemination season, and this may have led to the need for the country to have its own AI centres. For instance, estimate expenditure for the 1968 AI season was forwarded to the permanent secretary at the Ministry of Agriculture and the concern is clearly discernable. 'Our recurrent estimates excluding labour for the next AI season starting in September is as follows-: (1) purchase of 4800 doses of semen @ 25cts R 3840, (2) purchase of liquid nitrogen 3000lt @ 25cts R750, (3) air freight for semen and liquid nitrogen R500, (40) equipment, drugs, supplementary feeds and contingencies R6525 (Woodridge to Permanent Secretary, 25 July 1968 BNARS, MoA 2/1). In addition to buying the semen, live highbred bulls were also acquired and transported to areas where AI was carried out. 'As the AI season comes to a close, I hereby remind you that I need one (1) Brahman bull at Goodhope on June 1st, two (2) at Dibeeti on the June 15th and one in Ghanzi on the 15th June' (Veterinary Research Laboratory to Woodridge, May 1968). This means that there was the inevitable issue of straining bulls that were constantly taken across the country in order to service cows brought to the few AI camps across the country.

The Goodhope AI centre became operational in June 1968. Records show that around the same

time other centres were built in Ghanzi and Dibete (Republic of Botswana 1967). These were not enough as there was great need to expand the services by building more centres spread across the country.

In November 1968 Wooldridge sent a dispatch to veterinary camps throughout the country asking them to find a large area of land where AI could be suitably done. 'It is hoped that in the near future, this government will receive overseas aid to enable the expansion of our artificial insemination service to take place. This area should be reasonably accessible to road, rail or air transport services for delivery of liquid nitrogen' (Woodridge to Jensen 29 November 1968, BNRS MoA 2/1). Wooldridge's communication then goes on to mention that the land required for such a service should have water available and more land within its proximity to allow for future expansion.

Though not mentioned, it is safe to assume that the communication would eventually lead to the establishment of Ramatlabama as an AI bull station. Out of the total of 158 hectors, 96 hectares is natural grazing and 62 hectares of *cenchrus ciliaris* grass which was harvested, bailed and stored for use in times of scarcity. As shown above the authorities in Botswana needed a place that was easily accessible by road and not far from the South African border. Ramatlabama was an ideal place as it is readily accessible through the Ramatlabama border and a few hundred kilometres from Irene where the TAICS was located. The government of Botswana was to receive quite a large amount of money to establish its own AI bull station at Ramatlabama as indicated below:

> Mr. Mokama [government legal advisor] asks us to give further details of what aid is required. As shown in this, we require assistance for the whole project, capital and recurrent amounting to R237, 397.00. It is hoped that a part of this total may be received in kind, e.g. expert staff and equipment and the rest received as financial aid to the Botswana budget for the full operation of the scheme. Mr Jensen, veterinary officer experienced in AI, his contract terminates on the 28th July 1968. We would have no other veterinary officer to take over. We would appreciate it if the Danish government would consider employing Mr Jensen and seconding him to Botswana to continue to develop and operate the AI schemes he has initiated (Woodridge to Minister of Finance and Development Planning, 6 May 1968, BNARS, MOA 2/1).

In September 1968 Professor N Rasbech from the Danish Royal Academy visited Botswana and had meetings with the permanent secretary at the Ministry of Finance and Development Planning, and the head veterinary officer at the Ministry of Agriculture. He also visited Goodhope, Ghanzi, Maun, Francistown, Tuli Block, Serowe and Dibete (Jensen to Wooldridge 25 August 1968 BNARS, MOA 2/1). With the subsequent financial aid from Denmark, the government of Botswana was able to establish its own bull station at Ramatlabama in 1970. Now Botswana had her own IA centre where government was able to station quality bulls and derive from them high grade semen that would later benefit many Batswana farmers. The main objective of the Ramatlabama laboratory was to provide facilities, skills and services for the genetic improvement of cattle within the country. Technical guidance to both field officers and individual farmers was one of the services offered.

It should be noted that the earlier beneficiaries of the AI scheme seemed to be mostly elite farmers in the form of well-off white farmers and the country's ruling elite in fenced freehold farms. However, attempts were made to include communal farmers.

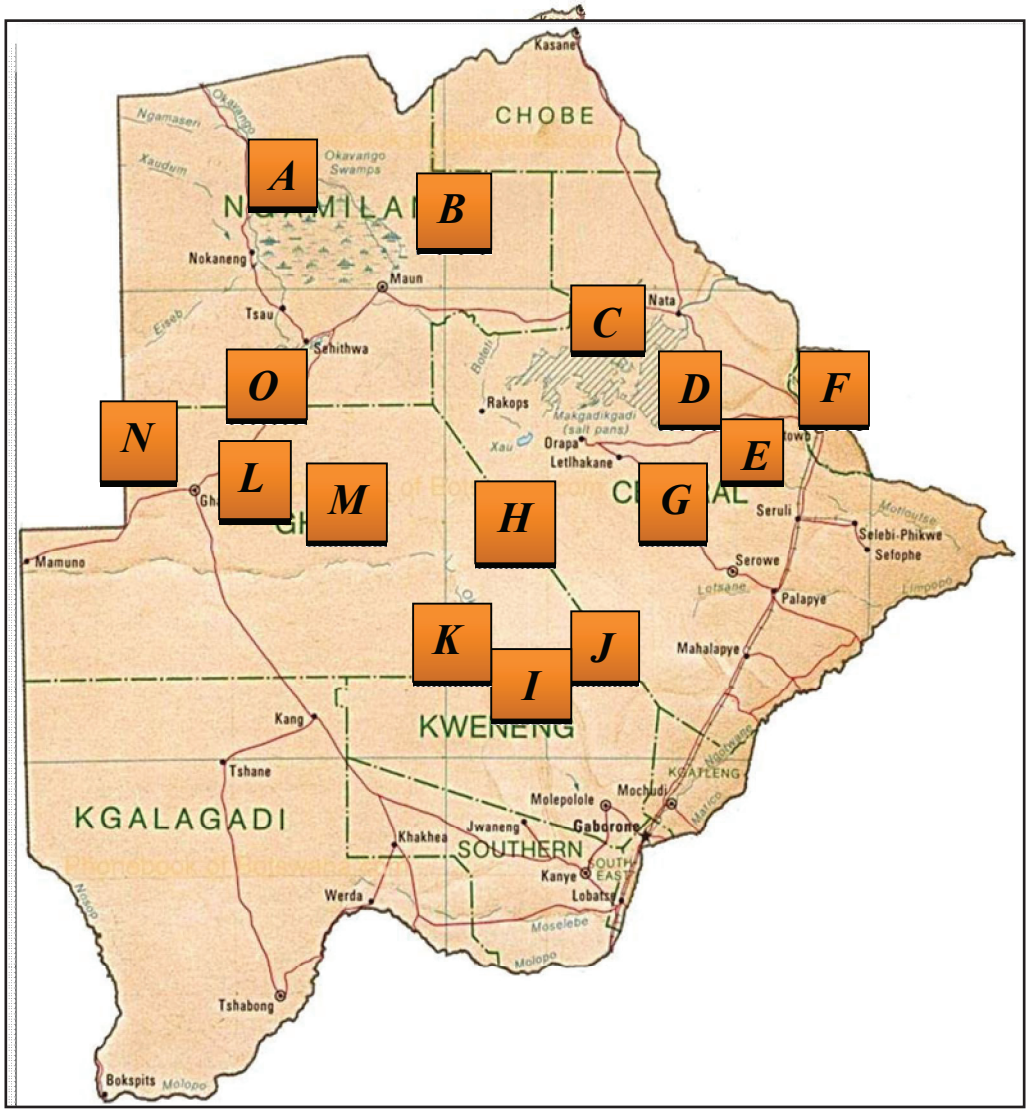
Development of AI Service Across Botswana

With the insemination lab working efficiently at Ramatlabama, the AI services rapidly spread across the country. In addition to Ramatlabama other AI stations were established in Makalamabedi, Morupule, Phuduhudu, Nokaneng, and Sefhophe in the northern part of the country. Over time the government did

extent the AI centres to various parts of the country as Map 1 and Table 1 below demonstrate. By 2011 five of these camps were found in the Central District, two in Ngamiland, two in Ghanzi, and two in Kgalagadi while four were spread between Southern and Kweneng districts.

Prices of semen varied according to the types of bulls. For instance, a single straw of semen such as that of a locally bred Brahman cost P5 while a straw of semen from exotic or foreign bulls costs anything between P70 to P400 by 2011. It was more reasonable to use this scheme as it is economically viable. AI is cheaper compared to using live bulls which could cost up to P30,000 or more, and in some unfortunate but real circumstances a bull can die before a farmer could reap its benefits.

Map 1: Map of Botswana Showing Artificial Insemination Centres[1]



Source: http://www.gov.bw/en/Citizens/Sub-Audiences/Agricultural-Sector/Artificial-Insemination/ Accessed 18 March 2012

Table 1: Locations of Static Insemination Camps in Botswana[2]

Key	AI Centre	Area Served
A	Nokaneng	Ngamiland
B	Makalamabedi	North West and part of Boteti
C	Makoba	Most of Boteti Sub-district
D	Morupule	Central District
E	Makoro	Palapye and part of Tswapong South
F	Sefophe	Bobirwa and Tswapong North
G	Dibete	Mahalapye and Kgatleng
H	Ramoalosi	Kweneng District
I	Tsatsu	Southern District
J	Goodhope	Borolong Area
K	Sekgwasentsho	Ngwaketse West
L	Kgainyane	Kgalagadi North
M	Phuduhudu	Kgalagadi South and North
N	Ncojane	Ghanzi South
O	Chobokwane	Ghanzi North

It was also noted that 'Some breed cannot survive the Botswana terrain while others can survive the conditions with ease. Some breeds such as Charolais are not meant for walking long distances in search of food. Ms Phelo affirms that farmers in that region [Kgalagadi] prefer Brahmans for their ability to survive in the area. It can walk long distances in search of food and water' (Motsaathebe 14 October 2011).

Different farmers express different views on the AI operations in the country. In an interview with one of the communal farmers in Khumaga in June 2011, Gaborone Madomo, stated that he had used the service a few times but at most he hated that he had to transport his cattle to the Makalamabedi AI centre as that was costly. He also mentioned that in the olden days he could trek his cattle as he was in his prime physically and fearless of hyenas and lions. He also noted that the AI was a good practice, and that the veterinarians at Makalamabedi had brought the service closer to the local farmers. Regarding the policy of limiting the number of cows an individual farmer could bring to a camp he said, 'It is only sad that one can bring only five cows for insemination at a time, that is not fair because by the time our cattle get there, they would be tired....we can only purchase local semen as it is cheaper' (Interview with Madomo 11 June 2011).

However, many communal cattle owners in the Rakops to Khumaga area know of the AI service but do not take full advantage of its availability. In another interview with Oboletse Babotseng, a farmer and former Debswana diamond company employee, he said that he was a sporadic user of the AI. His major gripe was that on occasions he had taken his cows to Makalamabedi AI camp he was dispirited by the shortage of veterinary staff on the ground as one officer had to attend to far too many cows. 'I had to wait and even spend a night in my van' (Interview with Oboletse Babotseng 13 June 2011). Nevertheless, unlike most cattle owners in that area Babotseng had a van and a trailer which he used to transport his cattle to the camp despite the staffing challenges.

Thuso Mosweu, a farmer at Molae farms in the area of Mmashoro village says he and his sons benefit greatly from the use of AI. Since he started using the service for his cattle, he has had the pleasure of witnessing his herd diversifying and multiplying. Preferring the Brahman and Simmental breeds, he now has a large number of Brahman and Simmental calves. 'Comparing an artificial insemination bred calf to

a normal offspring, the former performs better. It grows faster and has more milk' (Interview with Thuso Mosweu 22 December 2011).

Gabonamong Paul, a female farmer in Morupule, between Serowe and Palapye, could not help but mention repeatedly how she was a loyal user of the service, and how it had diversified her herd. 'I am in the business of selling bulls that I get from artificial insemination and it is a very lucrative business. I have sent my cattle for insemination three times looking for Brahman breed and now I am looking for Brown Swiss breed. Artificial insemination has given me a lot of Brahman bulls that I sell to people either in exchange for cash or some heifers that in turn I take to the camp for insemination' (Interview with Gabonamong Paul 24 December 2011). Paul is one of the highly satisfied and proud clients of the AI. It is safe to conclude the scheme has improved Paul's economic situation as a communal farmer who rears within range of the Morupule AI camp and is, therefore, able to access the service with ease.

On-farm Artificial Insemination Service

Aimed at assisting farmers with fenced ranches the Ministry of Agriculture introduced a scheme to run parallel to the static AI camps. Known as On-farm AI Scheme it was introduced in 1994. This scheme provided services to private farmers at highly subsidised rates. This section of the paper discusses the introduction of this scheme and how it benefitted the farmers who used it. The section ends with a discussion on how the AI generally helped farmers using the service with a few examples of farmers interviewed.

In 2009 Mothusi Rakgatla, a farmer near Jwaneng diamond mine, stated how he preferred to use AI in his ranch (*polase*) as opposed to a live bull because it gave him options of which bull semen to use. He told *Agrinews* magazine of the Ministry of Agriculture that:

> He prefers artificial insemination to a bull because sometimes the climatic conditions negatively affect the bull's production more especially those imported. Sometimes they are easily affected by diseases and that they take longer to acclimatize to the new environment. Artificial insemination also gives one a variety or choice of breed one wants to use as opposed to a bull. He said that one can buy semen from different bulls and keep it for as long as he wishes as opposed to a bull which might die. He added that with artificial insemination it is very easy to control cows as one would know with which semen to use and when (*Agrinews* April 2009).

Rakgatla said he used semen from different exotic bulls, some as far as the Americas, Germany and England. He bought the semen through the Ministry of Agriculture. As a farmer with a fenced ranch to practice on-farm AI, he also needs some skills in rangeland management. This involves practices such as rotational grazing, feed rationing, paddocking and many more. 'It is very important to maintain the highest hygienic standards. He says that dirt might kill the much needed sperms' (*Agrinews* April 2009).
Thomas Holzenger, a farmer in Serowe, greatly appreciates the on-farm service and AI generally. 'We were the first farmers in Serowe to use artificial insemination between late 1968 and early 1969. The veterinary department helped a great deal in distributing nitrogen tanks' (Interview with Holzenger 17 March 2012). He further explained that at the time he wanted semen from a dairy breed because he was an aspiring milk and dairy producer. There are other farmers using the AI that the researcher talked to and they gave similar views to those of the successful IA clients mentioned above.

The Challenges faced by AI in Botswana

From its humble beginnings in 1966 the AI has encountered many challenges some of which were devastating. The programme depends entirely on the Ministry of Agriculture for everything from funding to the manpower needed. When budgets are reduced, the programme like other government programmes suffers

and so does the cattle industry, and by extension the economy of the country. There are other hurdles that occur naturally that also contribute to the immense reduction of numbers of cattle sent to the AI camps. For instance, the country's arid climate characterised by very little annual rainfall in most areas is a major debilitating factor. Consequently, the country's cattle industry is affected by periodic and sometimes severe droughts. The early 1980s experienced a spell of devastating drought that decimated large numbers of cattle throughout the country. The poorest of the poor were the hardest hit by the drought (Jacques 1995). Whereas the government did implement some mitigating measures such as provision of subsidised stockfeed most of the time these were not enough.

There are other factors limiting the AI in Botswana. For instance, by 2011 there were 15 camps around the country with a total carrying capacity of 10,000 cattle. This number is far too low for a country with a national herd of '2.5 million cattle whose value increased from P5.4 billion in 2006 to P10.4 billion currently [2011]'[1]. Many Batswana cattle farmers were unable to enter their cattle because these camps were small in number and carrying capacity. Ironically, in each AI season, the camps' carrying capacity never reaches the maximum level because of the reasons I now turn to.

Limited or no access to the AI camps is also a significant impediment. Although the AI services are made available to the 15 camps throughout the country, there are still a few areas of Botswana that do not have the privilege of accessing the service. There are parts of Botswana that still experience cattle movement restrictions. For instance, Owen Pansiri, who rears his cattle in the Nata/Gweta area in northern Botswana, says that he could not take his cattle to the nearest camp in Makalamabedi because of veterinary restrictions meant to prevent the spread of cattle diseases such as FMD. He finds it difficult to praise the service because he himself has never benefited from it (Interview with Owen Pansiri 20 March 2012). Matsiloje and surrounding areas, which are FMD-prone, are deprived of the AI service as well. This is because when there is an outbreak of FMD, which is relatively frequent, all the cattle in that area have to be exterminated rendering the AI useless.

Trekking cows over very long distances is another serious challenge. In an interview with Thuso Mosweu, a farmer in Molae farms in the Central District (16 kilometres from Mmashoro village and some 96 kilometres from the Makoba AI camp), he said that he treks his cattle for two nights from his farm to the camp. He said this was both good and bad at the same time (Interview with Thuso Mosweu 22 December 2011). According to him it was affordable to trek the cattle with the help of his sons. He also said that it was better to drive the cows at night as they tire less than during the daytime. The main problem with this method was that when the cattle arrived at the AI centre, they would be exhausted from the long walk and were likely to perform less than those transported by vehicles. Mosweu further said that transporting cattle at P300 per head was an exorbitant price that he could not afford.

Veld fires and ignorance about AI are other stumbling blocks to the success of the scheme in Botswana. There have been cases of uncontrolled veld fires that engulfed more than half of the Makoba camp. These fires came twice in recent years, one in 2008 and another in 2010. Contingencies such as the construction of fire breakers are usually carried out annually to prevent fires. However, these are not always reliable because the implements needed may not be available and bushes grow in the fire breakers. We are told that the inferno that gutted the Makoba camp in November 2008 was too strong and took two days to put out with the assistance of the Forestry and Range Resources from Letlhakane and the Letlhakane police officers. However, about 90% of the farm was damaged with some of the 1,025 cattle at the camp perishing in the inferno. According to Kealeboga Kgosi, a field assistant at Makoba camp the 2010 fire was so strong that it even crossed the tarred road (Interview with Kealeboga Kgosi 22 December 2011).

Despite the serious challenges faced by the AI service in Botswana the project has been a success and a significant development in the country's agricultural sector in the past 50 years of Independence.

[1] http://www.gov.bw/en/Business/Business-News/Cattle-value-rises/, accessed 09 February 2012.

Conclusion

Though AI was a separate entity from the tribal bulls, the LICs and the bull subsidy scheme, this paper has explained that AI owes its origins to the use of these programmes in the different tribal areas. From its inception in the 1960s, the AI was aimed at several significant improvements. The first was to better the lives of the Tswana cattle farmers which would then get Botswana's beef to compete at an international level. Beef returns played a significant part in the development of the country. All of this was necessary because at the time of Independence Botswana was one of the poorest countries in the world with nothing but the already struggling beef industry.

Although it can be argued that the AI service has been successful, it has not been easy owing to several issues such as the ecological disasters, drought and famine, FMD as well as transportation or developmental constraints. Many farmers would have benefitted had the country had a railway network across the country. This would have made accessing external markets even easier for farmers out in the west. Another important obstacle that AI has faced is largely due to the lack of information about it being disseminated to the most remote farmers. At times some AI camps, particularly in the north were under-utilised mostly due the lack of knowledge. However, most of the cattle farmers who have used the service usually spread the word about its benefits and are generally satisfied with their returns.

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