The Agribusiness Project (TAP)

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Breeding program for the large animal livestock sector and business plan model for the cattle fattening farms for the Agribusiness Project

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1 LISTS OF ACRONYMS

ADG	Average Daily Gain
AI	Artificial Insemination
ASF	Agribusiness Support Fund
FAO	Food and Agricultural Organization
FCR	Food Conversion Ratio
Mandi	Pakistani markets where animal are bought and sold
PAMCO	Punjab Agriculture and Meat Company
MVCA	Meat Value Chain Assessment
Red Meat	Meat from animals such as cows, sheep and buffalo
Rs	Pakistani Rupees
UAP	US Aid's Agribusiness Project
USAID	United States Agency for International Development
USDA	Unites States Department of Agriculture

2 EXECUTIVE SUMMARY

Despite being considered an important part of the diet, Pakistan's consumption of meat has declined from a very modest 14kg's per person to 12 kg's per person in the last five years. This consumption is far less compared to the international average of over 50kg's and less than nearly all other developing countries. At the same time Pakistan is experiencing a very high population growth that is expected to double from the current 160 million people to over 300 million people by the year 2050.

The challenge for the Meat Sector is that it is essentially a bi-product of the dairy sector. The dairy sector is now becoming a separate value chain and the large infusion of over 200,000 Holstein cattle mainly from the USA and Australia will further exacerbate the lack of meat as a source of food because Holstein cattle are not bred for meat production.

At the same time meat is a valuable earner of foreign currency, especially in the Middle Eastern markets. Pakistan is well placed to benefit from the burgeoning demand for the supply of fresh meat and meat products. Pakistan is located close to these markets and has a more competitive product than the frozen buffalo being exported from India who are the main suppliers. The Australian meat products are a lot more expensive.

<u>The take home message is that the Pakistani industry will urgently need to implement a turn-around strategy and at the very least double its current production to meet the current and future demand.</u>

Cattle breeds used in Pakistan are mainly the Sahiwal and Cholistani breeds. Whilst a breed such as the Sahiwal were at one stage widely used in many countries including Australia and Kenya for beef production, the lack of well-structured breeding programs and progeny test schemes has meant that indigenous breeds of cattle (and sheep) in Pakistan have not kept up with the performance required for both meat and milk.

CONSTRAINTS

From the various industry meetings conducted there are a number of major constraints in the Meat Production part of the Value Chain:

- Cows are used as dual purpose breeds and a significant portion of the milk is used for household consumption. The calves that suckle from their mothers are stunted from the onset of birth and lack the required growth and immunity for protection against disease.

- Whilst the indigenous breed types are ideally suited to extensive, climatically hot areas on natural forage with limited resources, the cattle types being used are not suitable for cattle fattening because they lack the inherent genetic potential to grow at the rate

required to be economically viable. The Sahiwal breed, for example, is considered to be a "Bos Indicus" breed of animal. In developed countries the Zebu cattle, including Sahiwal, are mainly used in crossbreeding programs for beef production only if the progeny are expected to be fed in cattle fattening facilities (feedlots).

- The cattle coming into the fattening facilities in Pakistan weigh on average 80-120 kg's at one year old and are often diseased and undernourished. Most of the cattle entering cattle fattening facilities in developed countries will weigh over 200 kg's at weaning (i.e. 200 days).

- The animals are fed poor quality diets that are largely a byproduct of the wheat industry. Wheat straw is a poor base for animal feeds.

- Feed makes up 70% of the total cost of a cattle feeding enterprise. When corn silage is used in a cattle fattening program, for example, it is purchased in bale form. This is twice as expensive as silage grown on farm.

- Nearly eight million mainly buffalo calves are discarded at a very young age. If suitable milk replacers were found, these calves could add substantially to the value chain.

RECOMMENDATIONS

The Dairy industry in Pakistan has progressed strongly over the last decade because it has reached an economy of scale where many producers now have a few hundred or even thousands of dairy cows. The reality is that with only 5-6 animals small scale producers do not have the economy of scale to run a profitable cattle enterprise. If however fattening farms are established in Pakistan, small holder producers will benefit immensely because there will be an established market for their product and value addition will occur that will essentially double the output of meat.

- At least two farms should be targeted to become model Seedstock and cattle fattening enterprises. Both farms should be properly supported by technical experts for the duration of the project and a delegation of local industry consultants with the farm owners should be given the opportunity to travel to a developed country to learn about cattle fattening and silage making.

- The first farm should become a nucleus farm for the dual purpose Simmental breed. After the Holstein, the Simmental is the second largest breed in the world and is specifically bred for increased milk production and weight gain. The Fleckvieh type of Simmental is specifically bred for production under extensive production environments such as is found in Pakistan. The production of the Simmental breed should be benchmarked

against the local breeds in a similar environment in Pakistan and the inputs/costs and weight gains in the fattening facilities compared to one another as well as gains in profitability.

- On the second farm, the meat breeds of Angus and Brangus should be compared to the local breeds. Once again, a nucleus facility should be developed and both farms should have training facilities. According to Pakistani scientists, it should be possible to grow silage twice, or even three times a year, on the same piece of land. If this were demonstrated to be economically feasible it could revolutionize the whole agricultural industry in Pakistan.

- A separate recommendation is that Pakistan needs to preserve the genetic base of its main breeds, i.e. the Cholistani and Sahiwal. Separate reports (Value Chain of Dairy and Meat Value Chain) have suggested that a herd book and genetic evaluation program be supported in Pakistan.

BREEDING PROGRAM DESIGN

A) Embryo program to form the nucleus herd

A nucleus herd of 50 cattle will be created. An artificial insemination (AI) company will be identified to provide at least 150 embryos for the program. These embryos will be impregnated in three cycles.

B) AI program

A further 100 cows of average quality will need to be purchased to be part of the AI program. On these cows, the semen of the bulls that are bred from the embryo program will be used in the second generation.

The program should be developed to demonstrate the success of a cross breeding program and the potential for animals in a cattle fattening facility when managed to acceptable norms.

The community needs to be comfortable with the ideal model for conception, birth, growth, and fattening as well as adaptation to local climate and diseases. These cross-bred animals also need to be benchmarked against a few of the purebred males from the embryo program.

C) Seedstock bulls for local market

After the first cycle (two years), a number of bulls will be made available for the market. In the second round these bulls will be made available to the smallholder producers, once it has been demonstrated that a cross-breeding enterprise adds value and the value of using the purebred animals is appreciated.

The management of both these herds will require a significant amount of training, and the herds can be used as training facilities for the broader community. They will also be encouraged to become part of PAMCO in Punjab province. PAMCO is a semi government organization that has been tasked by government to run a “save the calf” scheme and a cattle fattening program. At the same time, the two Seedstock farms will be encouraged to be part of an international breed registry program, producing bulls that are certified as Registered Pure Bred cattle.

3 OBJECTIVES

The objectives of this study are to perform the market research on the current production of animals entering the meat value chain. Required recommendations on breeds and management practices that should be implemented will be examined and a business model for the cattle fattening industry should be developed.

4 ACKNOWLEDGMENT

The time spent in Lahore proved invaluable. We were able to have meetings at the PAMCO offices and visited PAMCO fattening facilities. However, it was the design of the model breeding program and business model that forms the backbone of this report. It was truly a team effort by a number of producers and industry role players and it essentially took two full days to put in place the structure of the breeding and business model.

Mr. Shamsher Khan organized the initial itinerary and ensured that the visit to Pakistan and the arrangements went smoothly. Mr. Imran Bashir from ASF gave very valuable input on the retail chain report and some good advice on the structure of this report.

Finally, the day to day activities, reports and pictures have been made available on the web using "evernote".

5 BACKGROUND

In his previous report on the Meat Value Chain (Bradfield: The Meat Value Chain), it was shown that the Meat Sector is essentially a bi-product of the dairy sector. Currently Pakistan is importing over 200 000 Holstein cattle, mainly from the USA and Australia. Holstein cattle are not bred for meat production and this will mean that meat as a valuable resource will become even scarcer.

Pakistan's consumption of meat has declined from a very modest 14kg's per person to 12 kg's per person in the last five years. This consumption is far less compared to the international average of over 50kg's and less than nearly all other developing countries. China, for example, has increased its consumption of meat from 20kg's per person to nearly 50kg's per person over the last 30 years.

Pakistan is also experiencing a very high population growth that is expected to double from the current 160 million people to over 300 million people by the year 2050.

Meat is a valuable earner of foreign currency for Pakistan, especially in the Middle Eastern markets. Pakistan is also well placed to benefit from the burgeoning demand, especially for the supply of fresh meat and meat products. Pakistan is located close to these markets and has a competitive product compared to the frozen buffalo being exported from India, while the Australian meat products are a lot more expensive.

It was clear from the research done in this and the previous Value Chain Assessment that the Pakistani industry will, as a matter of urgency, need to implement a turn-around strategy and at the very least double its current production to meet the current and future demand.

However, to achieve this will require some specific interventions in the production side of the value chain by developing the seedstock and cattle fattening farm sector.

5.1 Performance of indigenous Cattle breeds in Pakistan

The main breeds of cattle used in Pakistan are given in Table 1. Most of the breeds being used in Pakistan are essentially dairy breeds with the largest breed being the Red Sindhi that has an estimated population size of 3 million animals, followed by the Sahiwal with 2.8 million purebred animals. It is estimated that 43% of the population are purebred, 13% are crossbred and the others are considered to be non-descript.

Table 1: Cattle breeds of Pakistan, their utility, distribution and population size

No.	Breed	Synonym	Utility	Distribution	Pop. size*	Other countries
1.	Achai	-	Dairy & light draught	NWFP	684	Afghanistan
2.	Bhagnari	Nari	Heavy draught	Balochistan	1027	Endemic
3.	Cholistani	-	Dairy	Punjab	537	Endemic
4.	Dajal	-	Medium draught	Punjab	72	Endemic
5.	Desi	Non-descript	Draught, dairy	All over Pakistan	11752	India, Bangladesh
6.	Dhanni	Pothwari	Medium draught	Punjab	1483	Endemic
7.	Gabrali	-	Dairy & light draught	NWFP	231	Afghanistan
8.	Hariana	-	Draught	Punjab	<1	India
9.	Hissar	-	Draught	Punjab	<1	India
10.	Kankraj	-	Medium draught	Sindh & Punjab	273	India
11.	Lohani	-	Light draught	NWFP & Punjab	560	Endemic
12.	Red Sindhi	Malir, Sindhi	Dairy	Sindh & Balochistan	3032	Endemic
13.	Rojhan	-	Light draught	Punjab	376	Endemic
14.	Sahiwal	Lola, Montgomery	Dairy	Punjab	2753	India, Kenya, Australia and others
15.	Thari	Tharparkar, Grey Sindhi	Dairy & medium draught	Sindh	1783	India

*Thousand heads according to GOP (2006), if not available, estimates are given.

Table 1 above is taken from the document titled "Genetic Resources and diversity in Pakistani Cattle, 2008 (Sajjad Khan et al).

In the absence of a fully-fledged dairy or beef industry, the indigenous cattle breeds are used as dual purpose animals. At birth, the cows are milked and a certain portion of milk is allocated to the calf. This management practice makes it very difficult to compare the performance of different breeds. In most instances, the cow is expected to provide milk to the household and at the same time raise a healthy calf. The challenge for the meat industry is that mortality rates of the calves are estimated to be between 40-50%, and many industry role players believe that the mortality is so high largely because the calves are undernourished and stunted from birth.

Table 2 Productive and reproductive performance of the four major breeds in Pakistan

Performance trait	Sahiwal[1]	Red Sindhi[2]	Cholistani[3]	Thari[4]
1. Lactation milk yield (litres)	1550	1350	1235	1140
2. Average lactation length (days)	235	265	200	220
3. Age at first calving (months)	45	45	50	-
4. Service period (days)	155	210	140	-
5. Dry period (days)	205	230	225	-
6. Calving interval (days)	440	495	425	-
7. Gestation period (days)	285	-	285	-

*adapted from [1]Rehman (2006), [2]Aslam *et al.* (2002), [3]Ashfaq (2000), [2]Mustafa *et al.* (2003), [2]Sarwar (1991), [4]Ahmad *et al.* (1984)

Another challenge for the industry is the lack of breed improvement and progeny test programs to ensure that the indigenous breeds are competitive internationally. If we estimate that breed improvement occurs at a rate of 1% per trait per annum and that this rate of genetic improvement is cumulative, then it does not take long for the rate of genetic gain to double. It is for this reason that most European and British breeds have managed to double their production in the last two-three decades with the same level of input.

Breed comparisons should only be made if animals can be compared to one another in the same environmental conditions. For this report no published result that compares the indigenous breeds to European or British breeds in the same environment could be found. Because Pakistan has no beef breeds, it would be unfair to compare the production of local dairy cattle to European and British beef cattle.

Studies by Makhdoom Jabar et al (2009) has documented the performance of thirty cattle representing six groups of indigenous breeds in terms of Average Daily Gain (ADG), Feed Conversion Ratio (FCR) and various carcass attributes. Buffalo, Sahiwal, Dajal, Cholistani and non-descript breeds were compared using a feedlot ration (Table 3). Cattle entering the feedlot weighed an average of 160kg's at 15-18 months of age. The ADG for the different breeds were 0.85, 0.91, 0.89, 0.89, 0.90, 0.93 kg's respectively for Sahiwal, Dajal, Cholistani and non-descript, crossbred and Buffalo. The FCR was 8.65, 8.11, 7.66, 8.50, 8.43 and 7.07 respectively.

Table 3 Feed rations used to compare the performance of different breeds of Pakistani cattle

Name of Feed Ingredient	Percentage
Cotton seed sake	9.0
Wheat bran	21.0
Corn gluten feed (20%)	8.0
Rice polish	15.0
Wheat straw	27.0
Cane molasses	17.0
Urea	1.0
Mineral mixture+	2.0
Total	100.0
Crude protein	12.70
Total digestible nutrients	63.90
ME (M Cal/Kg)	2.24
NDF %	35
ADF %	21.4

+100 kg Mineral mixture includes DCP 70.81Kg, NaCl 18.91Kg, $MgSO_4$ 8.64Kg, $FeSO_4$ 0.89Kg, $MnSO_4$ 0.49Kg, $ZnSO_4$ 0.22Kg, $CuSO_4$ 0.03Kg, KI 8.77gm, $CoCl_2$ 0.89gm and $NaSiO_3$ 1.50gm.

European breeds such as the Angus or Simmental will typically have an ADG of 1.7-2.1 and a FCR of 5.4-6.4 in a standardized growth test. The Simmental will, for example, produce 5500-6500kg's of milk in a pasture grazing system. Sajjad Khan et al published a milk production average of the Sahiwal and Cholistani of 1150 and 1235kg's respectively. As mentioned above, production can only be compared if animals are given the same feed regimen and are run under exactly the same environmental conditions. Table 4 gives the ADG and FCR of Simmental, Brown Swiss and the Daial indigenous breed. Unfortunately the production of the purebreds was not measured in this trial. What the trial does show, however, is a marked increase in ADG and an improvement in FCR when the indigenous Daial is crossed with European breeds. The ADG is at least a half to one kg heavier per day.

Table 4 Comparison between Simmental, Brown Swiss and Daial crosses

Parameters	Simmental x Dajal		Brown Swiss x Dajal	
	Male(1)	Female (2)	Male(3)	Female(4)
Average initial weight (Kg).	215	229	162	156
Average final weight (Kg).	360	369	272	270
Average daily weight gain (Kg).	1.21±0.10	1.17±0.10	0.92±0.10	0.95±0.10
Average daily ration intake (Kg).	8.56±0.60	8.58±0.67	7.22±0.60	6.67±0.60
Feed conversion ratio.	7.14±0.46	7.36±0.52	7.80±0.46	7.02±0.46
Meat bone ratio.	62:38	61:39	64:36	63:37

5.2 Recommended Breeds

Whilst each breed usually markets the strengths of their breed, the reality is that there is usually as much variation within a breed as between breeds.

Breed types can usually be divided into three distinct types, i.e. the European breeds (for example Limousin, Charolais, Simmental), British breeds (for example Angus Hereford, Sussex) and Bos Indicus (Brahman, Sahiwal, Nguni).

The Angus breed is the largest beef breed in the world and has a very large, pedigreed and performance database. As mentioned previously, the Simmental is the second largest breed and is considered a dual purpose breed. Breeds such as the Brangus combine the attributes of the Angus (bred for growth) and the Brahman (bred to perform in environments with high temperatures and inadequate feed). Photo 1 gives some examples of typical cattle types found in cattle fattening facilities in Pakistan. Photo 2 shows pictures of Simmental and Angus animals in a cattle fattening facility in Africa.

Photo 1 The typical phenotype of animals in a cattle fattening facility

Photo 2 The typical phenotype of Simmental and Angus cattle in a fattening facility

5.3 Numbers of animals per household and cattle fattening facilities

Table 5, shows the number of animals per household and the percentages of households represented. Over 80% of households have less than 6 animals whilst only less than 3 percent of the households have over 15 animals. It was not possible to obtain the number of cattle fattening enterprises that are operational in Pakistan. From the various workshops it is however estimated that there are between 3000 to 5000 fattening farms with between 10-100 animals.

The Punjab Agriculture and Meat Company (PAMCO) is currently embarking on three projects.

The first is the "save the calf" scheme. An estimated 8 million bull calves from both beef and buffalo are slaughtered every year. The "save the calf" scheme will vaccinate and tag all animals

on a database, provide milk replacers and subsidize each producer Rs 3 200 per calf to be part of the project. Over 1000 producers are part of the project.

The second project is the "Cattle fattening" project. This project is for both beef and buffalo. Producers are subsidized Rs 1 500 per animal being fattened. Animals enter the fattening facility at approximately one year of age and weigh approximately 150 kg's. They are fed to nearly 300kg's over a four month period.

The third project is a cross breeding project with Simmental, Braford, Angus, Charolais and Hereford bulls. In our discussions with PAMCO it is clear that there is a need to develop "nucleus breeding farms" in Pakistan.

Table 5 Numbers of households with herd sizes.
In parenthesis, the percentages of households represented: Dr. M Afzal (2006)

Herd Size	Cattle	Buffalo	Flock Size	Sheep	Goat
1-6	5.204 (84.1)	5.001 (83.4)	1-30	1.390 (88.9)	6.576 (96.7)
7-15	0.826 (13.3)	0.843 (14.1)	31-75	0.119 (7.6)	0.173 (2.5)
16-50	0.140 (2.3)	0.140 (2.3)	76-350	0.050 (3.2)	0.049 (0.7)
> 50	0.018 (0.3)	0.012 (0.2)	> 350	0.005 (0.3)	0.004 (0.1)
Total	6.188 (100)	5.996 (100)	Total	1.564 (100)	6.802 (100)

6 CONSTRAINTS

From the various industry meetings conducted there are a number of major constraints identified in the Meat Production part of the Value Chain.

It is difficult to define indigenous breeds in Pakistan as being dairy breeds. The Sahiwal for example, though considered to be a dairy animal in Pakistan, is considered to be a beef animal in countries such as Australia and Kenya. Sahiwal are used as dual purpose breeds in Pakistan and a significant portion of the milk is used for household consumption. The calves that suckle from their mothers are stunted from birth and lack the required growth and immunity for protection against disease.

Whilst the breed types are ideally suited to extensive, hot areas on natural forage with limited resources, the cattle types being used are not suitable for cattle fattening because they lack the inherent genetic potential to grow at the rate required to be economically viable. The Sahiwal breed for example is considered to be a “Bos Indicus” breed of animal. In developed countries the Zebu cattle including Sahiwal are largely used in crossbreeding programs if the progeny are expected to be fed in feedlots.

The cattle coming into the fattening facilities weigh on average 80-120 kg’s at one year old. This is markedly lower than most of the cattle entering cattle fattening facilities in developed countries that will weigh over 200 kg’s at weaning (i.e. 200 days).

The animals are fed poor quality diets that are largely a byproduct of the wheat industry. Wheat straw is a poor base for animal feeds.

Feed makes up 70% of the total cost of a cattle feeding enterprise. When corn silage is used in a cattle fattening program, for example, it is purchased in bale form. This is twice as expensive as the silage grown on farm. In western countries cattle fattening farms are profitable because of economy of scale, i.e., they have tight margins but huge turnovers. If feed is overly expensive it will be impossible for cattle fattening farms to be profitable enterprises.

Nearly five-eight million, mainly buffalo, calves are discarded at a very young age. If suitable milk replacers were found these calves could add substantially to the value chain.

7 RECOMMENDATIONS

The Dairy industry in Pakistan has progressed strongly over the last decade because it has reached an economy of scale where many producers now have a few hundred or even thousands of dairy cows. The reality is similar with the beef sector in that small scale producers with 5-6 animals do not have the economy of scale to run a profitable cattle fattening enterprise. However, if fattening farms are established in Pakistan, small holder producers will benefit immensely because there will be an established market for their product and a value addition will occur that will essentially double the output of meat.

It is suggested that two farms be targeted to become model Seedstock and cattle fattening enterprises using both purebred and crossbreed animals. Both farms should be properly supported by technical experts over the duration of the project and the owners and delegation of local industry consultants should be given the opportunity to travel to a developed country to learn about cattle fattening and silage making.

It is further suggested that the first farm should become a nucleus farm for the dual purpose Simmental breed. After the Holstein, the Simmental is the second largest breed in the world and is specifically bred for increased milk production and weight gain. The Fleckvieh type of Simmental is specifically bred for production under extensive production environments in the USA, Brazil, Africa and Australia. The production of the Simmental breed should be benchmarked against the local breeds in a similar environment in Pakistan, and the inputs/costs and weight gains in the fattening facilities compared to one another.

On the second farm, the meat breeds of Angus and Brangus should be compared to the local breeds. Once again a nucleus facility should be developed. Both farms should have training facilities. According to Pakistani scientists, it should be possible to grow silage twice a year (or even three times) on the same piece of land. If this were demonstrated, it could revolutionize the whole agricultural industry in Pakistan.

A separate recommendation that should form part of a separate report is that Pakistan needs to preserve the genetic base of its main breeds, i.e. the Cholistani and Sahiwal. The value chain reports (CNFA Value Chain of Dairy and CNFA Meat Value Chain) have suggested that a herd book and genetic evaluation program be supported in Pakistan.

8 BREEDING PROGRAM DESIGN

The breeding program should have three components, a seedstock component, a crossbreeding component and a cattle fattening component.

A Seedstock enterprise can follow different routes to establish itself, and each will have its advantages and disadvantages:

- The first route that can be followed is to import live animals. This allows the herd to be established immediately. Shipping animals can however be difficult and costly.
- The second route is to use embryos and transplant these into surrogate cows. Embryo transfer can be successful if experienced reproductive technologists or veterinary officers are used.
- The third route would be to upgrade an existing herd by using AI (Artificial Insemination) over at least four generations. In my visit to Lahore, Dr's Muhammed Frooq and Malik Ali gave examples of embryo programs that have been successfully implemented in Pakistan.

Given that the Agribusiness Project only has a lifespan left of four years, it is not an option to upgrade an existing herd, and the importation of live animals is logistically challenging. It would be easiest to establish a Seedstock herd using an embryo program. In the business plan below, the budget is to establish a nucleus herd of 50 female animals. As mentioned previously, two farms should be identified, each with a nucleus herd of 50 cattle. It is thus recommended that on the first farm the dual purpose Simmental cattle are used. On the second farm, it is recommended that an Angus and Brangus herd of 25 animals each be established. At the same time a crossbreeding program should be run to validate the performance of the crossbred progeny and to compare it to the purebreds.

8.1 Establishing the facilities

ASF will need to put out an expression of interest proposal to prospective clients of which two will be chosen. The clients expressing interest will need to meet the following requirements:

- Have an existing farm that is at least 7-10 hectares in size
- Have some experience in cattle fattening
- Show an interest in developing a seedstock enterprise, AI program and possibly expand their current cattle fattening facility
- Have experience in working with ASF on a prospective financial plan
- Be prepared to make the results from the project public
- Have the required potential in term of irrigation and soil to produce high yielding crops

- Be prepared to travel internationally to learn how a cattle fattening facility is run and how the required feed for the program is grown
- Have a very basic training facility on the farm to educate the broader community
- Be prepared to engage with the local community to market the value of good genetic material

Once at least five clients have been identified, an audit should be done on their properties and the final two chosen.

8.2 Seedstock herd

The Graphic below (Figure 1) and Annexure A give an outline and timeline respectively of the components of the program. In the first component, the Seedstock enterprise is established by implanting purebred embryos, obtained from an AI-Embryo company, into 70 cows in two cycles following each other, i.e. cows that are not pregnant in the first cycle will again be impregnated.

There is an opportunity to used sexed semen and create a complete female herd but the program would probably be best served if the performance of at least 10 of the resulting male progeny are tested in the cattle fattening facility and directly compared with the crossbred animals. This will visually illustrate the performance and costs of the different cattle types to the local community.

In the second year (2014) the heifer calves resulting from the embryo program should again be artificially inseminated with purebred bulls to grow the herd. The long term intention of the Seedstock producers should ultimately be to have a herd of at least 100 purebred cattle.

8.3 AI and crossbred program

In conjunction with an embryo program, an AI program will allow the performance of crossbred progeny to be evaluated. The industry will ultimately need to move from its current state to an industry where the peak producers are seedstock producers (a mix of indigenous and European/British breeds) and then producers who multiply the genetics. At the moment the smallholder producers do not understand the monetary value that genetics and genetic improvement brings to the industry.

For the AI and crossbred program, 100 cows of average genetic merit will need to be purchased. These cows should then be artificially inseminated with purebred bulls. The resulting progeny will be put into the cattle fattening facility and their performance and the costs related to feeding them directly compared to the purebred cattle. This would be a very good illustration to the industry of the value of genetic improvement in the herds.

8.4 Cattle fattening phase

Animals will only enter the cattle fattening phase nearly two years after the implementation of the program. It is a truism that animal breeding and improvement is a long term project. However, after two years the industry will start to see the results of the program and be able to objectively compare local breeds, cross bred cattle and the performance of the purebreds.

It is very important for the program that the feeding regimen is properly assessed and formulated. In my discussions with industry role players, it was clear that the Punjab province has the required rainfall and soils to produce high yielding crops such as corn silage. Mr. Hamid Jalil (Ex CEO of PAMCO) is of the opinion that silage making should form the basis of the livestock production in Pakistan. He mentions that in his opinion two or possibly at least three crops of silage per annum could be harvested. This would revolutionize the industry.

Whilst the Seedstock enterprise is being developed, animals can continue to be purchased from local suppliers to enter the cattle fattening facility from the first year and to run the cattle fattening facility as a viable business. The cattle fattening facility should have at least three intakes of animals per annum for the first two years. The size of the intake will depend on the viability. For this report we have assumed a facility of 120 animals.

Figure 1 Graphic Illustration of the Breeding program including target dates

	Comments	Start and end Dates
1) Facilities and feed		
Audit required on current facilities		1 July 13 - 15 July 13
Contruct facilities		1 August 13 - 15 August 13
Plant 5 ha of maize silage		1 August 13 - 15 August 13
2) Embryo program		
Purchase 70 donor cows	Assume 50 calves from 70 cows in two cycles	1 August 13 - 15 August 13
Synchorinization of donor cows	First cycle	01-Sep-13
	Second cycle for open cows	01-Oct-13
Implant Embryos		01 October 13-31Novermber 13
Calves give birth	Expect 25 males + 25 females	1 July 14 - 31 October 14
Calves weaned (1st weaning)		1 January 15 - 30 April 15
10 Surplus bulls enter Cattle fattening	Rest of bulls grown out to be Seedstock and AI Sires	
15 yearling bulls and females mated to	(yearling bulls can be mated to 20 cows)	01-Sep-15
either purbreds or crossbreds		
3) AI Program		
(runs in conjuction with embryo program)		
Purchase cows 100	100 cows of average performance	01-Aug-13
Syncronization of cows		01-Sep-13
Insemination	Assume 50% AI success	01-Oct-13
Calves give birth	Expect 40 male + 40 female progeny	01-Jul-14
Calves weaned (1st weaning)		01-Jan-15
Crossbred bulls and some cows enter cattle		01-Jan-15
fattening		
Mate yearling embryo bulls on best 70 cows		01-Sep-15
and 30 heifers		
Create AI bulls from embryos		01-Sep-15
Insemination (2nd round)		01-Oct-14
4) Cattle fattening Phase		
100 Animals enter cattle fattening facility	10 Simmental bulls, 40 crossbred bulls, 60 cows	01-Jan-15

Rations/diet

What was clear from the visits to Pakistan is that most of the cattle fattening farms purchase their corn in bales at twice the price compared to those producers whom grow it themselves (Photo 3).

Photo 3 Silage is often purchased in bale form rather than grown on-farm

Given that feed makes up nearly 70-80 percent of the costs of a cattle fattening farm, it is clear that a fattening farm in Pakistan should be in a position to produce its own feed for it to be financially viable. The cost per kilo produced is estimated to be Rs 4.5 per kilogram if grown on the farm and Rs 8.5 per kilogram if purchased from the open market.

Cattle fattening rations will depend on the availability of feedstuff and this can include amongst others wheat straw, sorghum, alfalfa or clover. A cattle ration will differ for cows, calves and animals in the fattening phase. An example of a fattening ration is given below (Table 6 and 7) given the following assumptions http://www.omafra.gov.on.ca/english/livestock/beef/facts/06-017.htm (this website provides a good overview of different diets at different phases).

- ADG of approximately 1kg per day
- Average starting weight of 225kg's and an end weight of 410 kg's
- 200 days of feed

Table 6 Example of a background diet for calves

	Kg/per day
Dry Hay -15% protein	2.5
Corn Silage	8.5
Corn Screenings	2.5
Supplement	0.5
Premix	0.03

Table 7 Example of a diet for bulls in feedlot

	Kg/per day
Dry Hay -15% protein	.5
Corn Silage	7.5
Corn Screenings	4.0
Supplement	0.2
Premix	.03

8.5 Providing bulls to smallholder producers/villages

By the end of the first cycle (two years), a number of bulls will be made available for the market. In the second round, these bulls will be made available to the smallholder producers, once it has been demonstrated that a cross-breeding enterprise adds value and the value of using the purebred animals is appreciated.

Both these herds will require a significant amount of training, and be used as training facilities for the broader community. They will also be encouraged to become part of the PAMCO, a semi

government organization that has been tasked by government to run a “save the calf” scheme and cattle fattening program. At the same time they will be encouraged to be part of an international breed registry program producing bulls that are certified as Registered Pure Bred cattle.

9 BUSINESS PLAN

An audit on the prospective Seedstock and cattle fattening farms will reveal the extent of the equipment required. Included in this business plan budget are the costs of a feedmill, seed, chemicals, fertilizer and sale of animals from the fattening farm and the sale of Seedstock bulls.

Because the infrastructure of the two farms is unknown, it is impossible to provide a complete cash flow and statement of the financial position that shows the current assets and liabilities. It is however possible to give an indication of the projected income and expenses over a five year period that includes an indicative projection of the bulls sold into the market as well as the animals from the fattening facility. This income and expense statement is provided in Annexure's E. Annexure B provides the costs associated with planting 5 hectares of silage. Annexure C provides the indicative costs of the embryo's and feedmill and Annexure D provides a rough calculation of the hectares of maize required. Annexure F gives the value of the animals sold. Annexure G gives the value of the depreciation on the feedmill.

The costs of sales in Annexure E have been calculated using an example of the costs in a typical feedlot. Such an example can also be found on the following webpage http://ohioline.osu.edu/as-fact/pdf/0015_1.pdf.

As was mentioned previously in this report it is highly recommended that the two candidates chosen to start the Seedstock farm and fattening facility be exposed and learn from farms that already run successful Seedstock units. Such farms can be found in a multitude of countries including the USA, Europe, Australasia or Southern Africa. Included in such a visit should be some of the advisors/scientists or veterinarians who will be involved in the project. Below is a budget for a visit of 10 people (Table 8).

Table 8 Budget for visit to Seedstock farm and cattle fattening facility

	Number of people	Target per person	USAID share	Total cost	Total cost USAID	Grant Mechanism
Send a delegation to visit Seedstock and cattle fattening facilities	10	$5 000	$2 500	$50 000	$25 000	Research and Development Support program

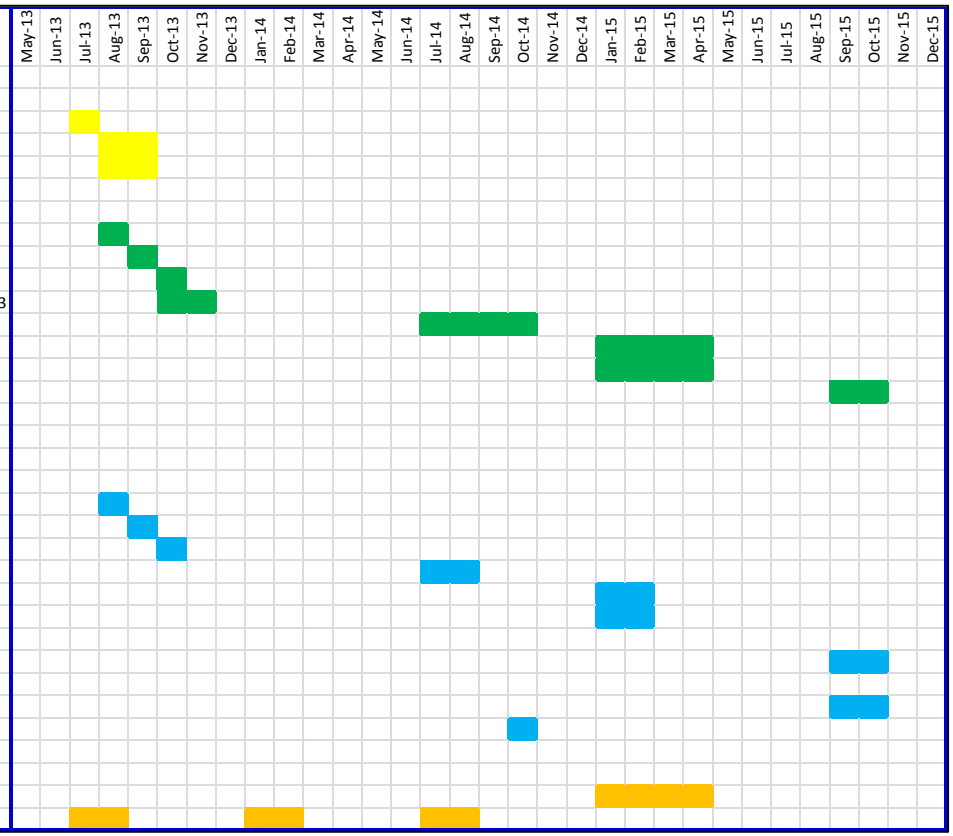
Table 9 provides the budget for the development of a Seedstock herd using Embryo's and the purchase of a feed mill, and cattle for the embryo and crossbreeding program.

Table 9 Budget for development of Seedstock herd from embryos and purchase of feedmill

	Number of farms	Target per farm	USAID share	Total cost	Total cost USAID	Grant Mechanism
Variable costs to establish 5 ha of maize	2	$6000	$3 000	$12 000	$6 000	Challenge grant program
Embryo program	2	$76 000	$38000	$152 000	$76 000	Challenge grant program
Feedmill	2	$7 000	$3500	$14000	$7000	Challenge grant program
Purchase cattle for Embryo and Crossbreeding	2	$60 000	$30 000	$120 000	$60 000	Challenge grant program

ANNEXURE A Timeline of the proposed program

	Comments	Start and end Dates
1) Facilities and feed		
Audit required on current facilities		1 July 13 - 15 July 13
Contruct facilities		1 August 13 - 15 August 13
Plant 5 ha of maize silage	2 crops per annum	1 August 13 - 15 August 13
2) Embryo program		
Purchase 70 donor cows	Assume 50 calves from 70 cows in two cycles	1 August 13 - 15 August 13
Synchorinization of donor cows	First cycle	01-Sep-13
	Second cycle for open cows	01-Oct-13
Implant Embryos		01 October 13-31Novermber 13
Calves give birth	Expect 25 males + 25 females	1 July 14 - 31 October 14
Calves weaned (1st weaning)		1 January 15 - 30 April 15
10 Surplus bulls enter Cattle fattening	Rest of bulls grown out to be Seedstock and AI Sires	
15 yearling bulls and females mated to either purbreds or crossbreds	(yearling bulls can be mated to 20 cows)	01-Sep-15
3) AI Program		
(runs in conjuction with embryo program)		
Purchase cows 100	100 cows of average performance	01-Aug-13
Syncronization of cows		01-Sep-13
Insemination	Assume 50% AI success	01-Oct-13
Calves give birth	Expect 40 male + 40 female progeny	01-Jul-14
Calves weaned (1st weaning)		01-Jan-15
Crossbred bulls and some cows enter cattle fattening		01-Jan-15
Mate yearling embryo bulls on best 70 cows and 30 heifers		01-Sep-15
Create AI bulls from embryos		01-Sep-15
Insemination (2nd round)		01-Oct-14
4) Cattle fattening Phase		
50 animals enter cattle fattening facility from pr	10 Simmental bulls, 40 crossbred bulls	01-Jan-15
360 indigenous cattle in fattening facility (120 per cycle)		



ANNEXURE B Costs associated with planting 5 hectares of silage

Silage				
	Hactares			
Variable costs	5	Item	Unit Cost/ha (Rs)	Total (Rs)
		Seed (per bag)	15 600.00	78 000.00
		Fertilizer N	25 298.00	126 490.00
		Fertilizer P	5 917.60	29 588.00
		Fertilizer K	3 380.00	16 900.00
		Micro-elements Mancozin	985.40	4 927.00
		Micro-elements Boor	328.25	1 641.25
		Micro-elements Zink chelate	845.00	4 225.00
		Micro-elements BMX	495.69	2 478.45
		Diesel (Soil Preperation, planting)	4 500.00	22 500.00
		Diesel (Local vehicle transport)	7 000.00	35 000.00
		Weed Control Galisto	2 903.94	14 519.70
		Weed Control Metagan Gold	951.60	4 758.00
		Insecticide Endosufan	510.90	2 554.50
		Harvest Costs	5 850.00	29 250.00
		Transport	6 240.00	31 200.00
		Irrigation Costs	4 799.60	23 998.00
		Electricity	6 370.00	31 850.00
		Mechanization	1 469.00	7 345.00
		Irrigation Maintanance	2 255.50	11 277.50
		Labour	20 000.00	100 000.00
			115 700.48	**578 502.40**

ANNEXURE C Indicative costs of the embryos and feedmill

Embryo's	Number	Comments		
Embryos	130	Implanted into 50 cows		6 500 000.00
Synchronization and AI cost	130	per cow/round	1 500.00	195 000.00
Insemination Equipment		AI tank and equipment		600 000.00
Registry of pure bred cattle	50	Certified	70.00	3 500.00
AI for second round	150	per cow/round (includes semen)	2 000.00	300 000.00
				7 598 500.00
Feedmill		FOR TMR wagon for silage		500 000.00
Scale		Complete		200 000.00
				700 000.00
Cows	150		40 000.00	**6 000 000.00**

ANNEXURE D Calculation of the hectares of maize required for produce silage

Silage required	Per day					
Cattle	KG	KG's per Animal	Total for animals		P/Ha KG's	
170	4.5	1642.5	279225		45000	6.205
100	7.5	1500	150000		45000	3.333333

ANNEXURE E Income and expense statement

ASSUMPTIONS

1) Assumes that farm has its own tractor, plough and planter

2) 120 cattle bought on open market; weigh 100 kg's. Fed to 250kg's

3) In year 3 animals from crossbred and seedstock program enter fattening facility

4) Assuming a 10% inflation

PROJECTED INCOME/EXPENSE STATEMENT					
	2013	**2014**	**2015**	**2016**	**2017**
Total Sales Revenue	**3 420 000**	**3 762 000**	**9 326 438**	**10 259 082**	**11 284 990**
CATTLE SOLD					
360 cattle from fattening farm at 250 kg's	3 420 000	3 762 000	4 138 200	4 552 020	5 007 222
Sale of 12 Seedstock bulls pa	0	0	4356000	4 791 600	5 270 760
Sale of cattle from crossbred program	0	0	832238	915 462	1 007 008
Total	3 420 000	3 762 000	9 326 438	10 259 082	11 284 990
COSTS OF GOODS SOLD					
Direct Cost of Sales	2 200 000	2 257 200	5 595 863	6 155 449	6 770 994
Gross Profit	1 220 000	1 504 800	3 730 575	4 103 633	4 513 996
Gross Margin %	36	40	40	40	40
OPERATING EXPENSES					
Seed (per bag)	78 000	85 800	94 380	103 818	114 200
Fertilizer	172 978	190 276	209 303	230 234	253 257
Micro-elements	13 272	14 599	16 059	17 665	19 431
Fuel	57 500	63 250	69 575	76 533	84 186
Weed Control Galisto	19 278	21 205	23 326	25 659	28 224
Insecticide Endosufan	2 555	2 810	3 091	3 400	3 740
Harvest Costs	29 250	32 175	35 393	38 932	42 825
Transport	31 200	34 320	37 752	41 527	45 680
Irrigation Costs	23 998	26 398	29 038	31 941	35 135
Electricity	31 850	35 035	38 539	42 392	46 632
Mechanization	7 345	8 080	8 887	9 776	10 754
Irrigation Maintanance	11 278	12 405	13 646	15 010	16 511
Labour	100 000	110 000	121 000	133 100	146 410
Pre-Mix	120 000	132 000	145 200	159 720	175 692
Total	264 250	290 675	319 742	351 716	386 888
Operating Profit	**955 750**	**1 214 125**	**3 410 833**	**3 751 916**	**4 127 108**
NON-OPERATING EXPENSE					
Depreciation (Equipment)	45 500	42 543	39 777	37 192	34 774
Total	45 500	42 543	39 777	37 192	34 774
PROFIT BEFORE TAX	**910 250**	**1 171 583**	**3 371 056**	**3 714 725**	**4 092 334**
Tax	318 588	410 054	1 179 870	1 300 154	1 432 317
PROFIT AFTER TAX	**591 663**	**761 529**	**2 191 186**	**2 414 571**	**2 660 017**
Net Margin %	17	20	23	24	24

ANNEXURE F Value of the animals sold

		Animal weight	Rs/kilo	Total per animal	Per 100 Animals
Buying price	360	100	11	1100	396000
Selling price	360	250	38	9500	3420000
Seedstock cattle	10	410	38	15580	155800
Crossbred cattle bulls	40	350	38	13300	532000
					687800

ANNXURE G Value of the depreciation on the feedmill

DEPRECIATION INFORMATION				DEPRECIATION CALCULATION			
Item Name	:	Vehicle		**End of Year**	**Debet**	**Total**	**Book Value**
Category	:	Vehicle		0	-	-	700 000.00
Cost	:	700 000.00	PRs	1	45 500.00	45 500.00	654 500.00
Salvage	:	500 000.00	PRs	2	42 542.50	88 042.50	611 957.50
Life	:	5	year(s)	3	39 777.24	127 819.74	572 180.26
Method	○	Straight Line Depreciation		4	37 191.72	165 011.45	534 988.55
	○	Sum of Years Digits Depreciation		5	34 774.26	199 785.71	500 214.29
	○	Declining Balance					

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