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**KARACHI BUFFALO COLONY  
Value Chain Assessment Final  
Report  
for the USAID Agribusiness Project**

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## **LIST OF ACRONYMS**

ASF	Agribusiness Support Fund
EU	European Union
FAO	Food and Agricultural Organisation
FMD	Foot and Mouth Disease {USA Hoof and Mouth Disease}
HS	Haemorrhagic Septicaemia
KDFA	Karachi Dairy Farmers Association
TB	Tuberculosis
UHT	Ultra High Temperature
UK	United Kingdom
USA	United States of America
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

## **GLOSSARY OF TERMS**

Bhains	Water Buffalo <i>Bubalus Bubalis</i>
Bhoosa	Chopped Wheat Straw
Dodhi	The middle men/milk dealers in the milk marketing chain
Pekkar	The middle men/milk dealers in the milk marketing chain

## EXECUTIVE SUMMARY

In short the new English word: OMNISHAMBLES sums up the situation in the colony completely. One impediment to the preparation of this report was the short time permitted to visit the colony due to the deteriorating security situation in Karachi during the holy month of Muharram. Only two half-day visits were possible. The colony is usually referred to as a Cattle Colony even though 90% of the milking livestock are buffalo; (*Babulus bubalis*). Conditions for humans and livestock are appalling. The area is filthy, overcrowded, fetid and nasty. The colony has grown since its recognition in 1957 from 752 acres to 3,000 acres into what can only be described as an environmental disaster and the sooner it is closed the better as it will continue to grow and become even worse until closed.

The level of animal husbandry is very poor, animals are chained all day except for twice a day watering, they are forcibly milked out using chemical injections, there is no cooling system for water buffaloes which need to shed heat, feed is low quality, diseases are rife and at the end of ten months of this the great majority are slaughtered. The daily 7,200 tons of manure produced is disposed of by liquefying of the faeces and then washed down the streets to a river and out to Korangi creek leading to the sea. The shore is deep in manure, village ponds are dilute manure, the wells taste of manure (I am told), in fact, the whole place smells of manure.

Animals are brought from Sindh and Punjab to the colony; they bring in whatever diseases are present on the farm. There is no quarantine so the colony has become a hot-bed of all the diseases of Pakistan, FMD is endemic and HS the main killer, mortality is 4% at the lowest estimate. Milk from the colony is sold in Karachi city and is watered down before retail sale. Other additives are used some of which are less than healthful and in other societies would not be tolerated. The hygiene standards are poor to very poor and utensil cleaning is at best perfunctory which reduces milk shelf life.

The animal husbandry applied in the colony is virtually non-existent, animals are underfed, rations offered do not balance the milk produced, the long term use of oxytocin destroys the female reproductive system so the animal cannot be recycled and is subsequently slaughtered. There are 50 vets practicing in the colony but even so it is a home to every livestock disease of the country, there are no functioning laboratory facilities and no husbandry advice.

The main and most obvious recommendation is to close the whole expanded colony down. The longer the delay the worse the colony will become, the more farms will be involved, the manure problem will be that much larger and it will get increasingly costly to achieve a closure. A further study has been recommended as to how the closure can be realised. If this closure cannot be accomplished quickly then the next most pressing problem is the manure matter. A study has been recommended to work out how the modalities of clearing this enormous amount of manure out of the category of waste to it becoming an attribute. The study will consider the issue of moving such a vast quantity daily. It is assumed that faeces; in digester tanks producing methane is the way forward and this paper suggests pipeline technology to move the manure from the colony stream to the tanks. Unfortunately there is no ready answer for taking the used waste slurry from the tanks to the agricultural areas of Sindh, dual purpose slurry tankers/sprayers are a possibility.

Those are the two MAJOR recommendations. Other interventions are:-

### **Short term interventions**

- Equipping and staffing a training centre within the colony teaching animal husbandry.
- Establishment of a nutrition laboratory to help with providing a balanced diet to the livestock
- The manufacture and Introduction of stainless steel cans
- Extend the use of showers for buffalo, possibly owned and used communally.
- Establish, equip and staff a veterinary hospital with a high grade diagnostic facility.
- Encourage timely/bulk purchasing of feedstuffs.
- Discourage the use of Diclofenac Sodium, preferable to use Meloxin instead, and to discourage the deleterious use of oxytocin.

### **Medium term interventions**

- Assist a milk processor to install equipment to manufacture mozzarella cheese and to assist him to obtain access to the EU and/or USA markets.
- Assist a dairy equipment manufacturer to produce an affordable milking machine, either for single buffalo females or a buffalo milking parlour which could be community owned.
- Pressure the Government to remove the fixed prices on meat and milk which is holding back the development of the livestock industry.

For **long term** interventions see above regarding closing the colony and removal of 7,200 tons of manure daily.

The exchange rate in this paper US \$ 1 = Pak Rs. 95

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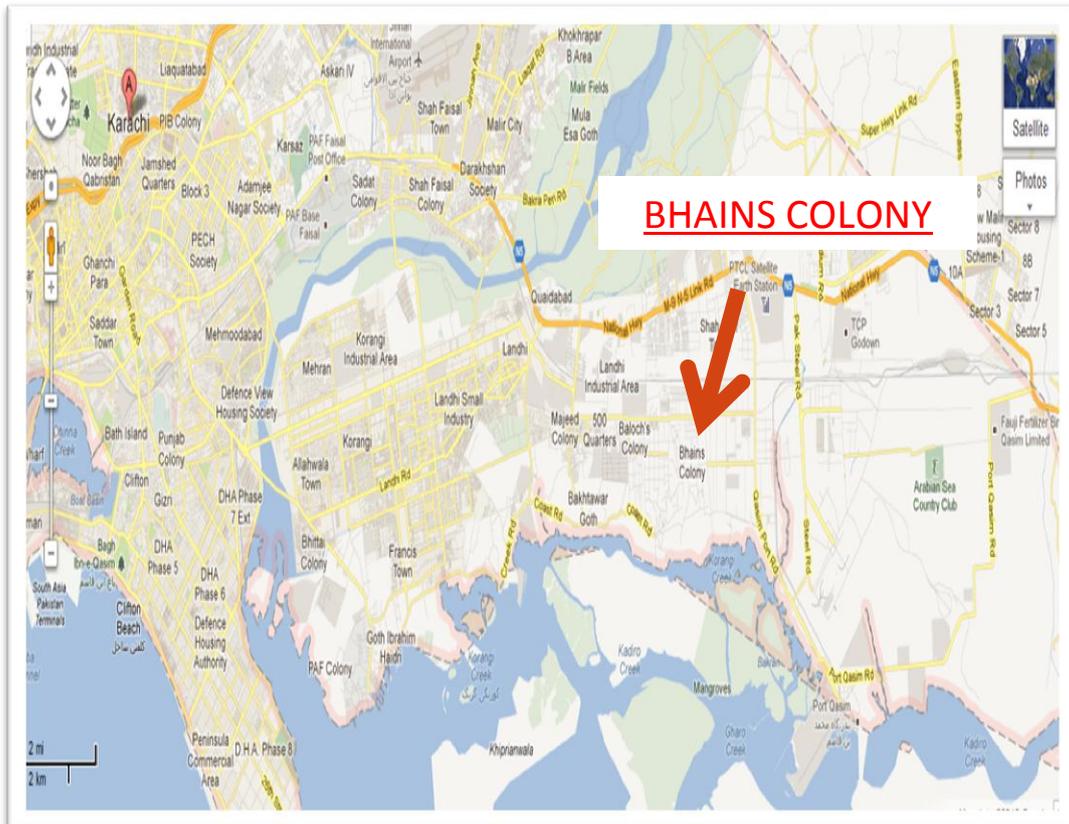
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# 1.MAPS

## The Islamic Republic of Pakistan





**Figure 1 1.1.Karachi City showing Landhi Buffalo**

## 2.POLLUTION FROM THE COLONY



### A “Waterfall” of Slurry

#### **Flowing to the Sea**

Pollution of the sea is one of numerous reasons for the need to move the colony. Living conditions for the denizens of the colony is quite unpleasant in both sight and smells. Human health matters have not been probed. Animals in the colony are kept under appalling conditions, reduced to low body condition by chemical induction to produce milk and are usually slaughtered at the end of one lactation as their reproductive system has been destroyed. The place is a breeding ground for livestock diseases; mortality is high and FMD endemic.

### **3.LANDHI BUFFALO COLONY**

#### **3.1. INTRODUCTION**

##### **3.1.1. Landhi Buffalo/Cattle Colony**

The dairy colony of 752 acres was originally ‘established’ sometime in 1957 for 500 people on land belonging to the revenue department at that time 32 km from the city. It is occupied by farmers and a population of around 20,000 animals. The first mention of the colony is around 1925 and one assumes it just grew and the recognition and designation as a cattle colony was a matter of regularising the status quo.

**The land allocation was initially for 30 years.** This has now long expired and ownership could be legally reclaimed by the revenue department and occupiers ejected. This would obviously be politically unacceptable. The original  $\pm$  500 beneficiaries of the 752 acres have mostly retired but families have sold their portion; continue to occupy or sublet the area. Some farmers are third generation.

Presently the people number  $\pm$  3,000, and land occupied by livestock is nearly 1600 acres. Although an official census has never been fully carried out it is claimed to have a population of 400,000 heads of livestock (90% buffalo and 10% bovine/cattle) in the neighbourhood among up to 3,000 individual farmers (avg. of 133 animals per farm and 250 per acre) all in about 4 km radius. Milk production is estimated to be around 3.2 million litres per day (avg. 8 litres/head). It is believed that there are around 700,000 other milking buffalo within marketing range of Karachi supplying milk to the city. These figures are mainly guesswork but based on a 2006 livestock census. The colony tends to be referred to as a ‘Cattle Colony’ but as there are only 10% cattle there, and on the map the area is referred to as ‘Bhains Colony’ preference is for the term ‘buffalo colony’.

##### **3.1.2. COLONY DESCRIPTION**

The land designated for these livestock is called a colony. In this nominal 752 acre allocation are reputed to be around 15,000 buffalo and cows but could be as high as 20,000. However, the colony is not the only part of Bin Qasim with livestock as the colony is surrounded by other farms with an estimated 400,000 cattle and buffalo. These other areas are usually considered as part of the buffalo colony but are called by different names though many of the owners are members of the Karachi Dairy Farmers Association (KDFA) but are outside the original designated area. These new areas are not legally part of the colony but the keeping of cattle/buffalo has expanded as the city has grown over time. The colony is expanding into new areas mainly to the east and north however most of the new farms are of a better standard than the older ones.

The colony is a series of livestock holdings where animals are tied in standings with little or no exercise other than being released for watering twice per day, within the same land area are the houses of owners plus feed and fodder storage, water tanks and piles of manure. Fortunately there are few zoonosis (diseases transmitted from animals to humans). The main one is tuberculosis (TB) and this can only occur when an animal has TB of the udder and the milk is drunk fresh from the cow. Other TB sites on the animal do not affect the milk. As

almost all householders boil the milk on its delivery, TB from milk is seldom a problem but for owners living in the colony who quite possibly drink the milk 'raw,' TB could be an issue.

There is one surprising aspect of this colony, despite being the largest in the world and is well known within the international livestock industry there is precious little written about it. There are a few notes on Wikipedia, and other organisations such as World Bank and FAO have some information. I have seen various dates for its establishment, one said 1925 but the rest are between 1957 and 1963. I assume that animals were kept there quite early but only formally recognised as a colony in the late '50s or early '60s. The market for virtually all the milk is, and always has been, Karachi which today has an estimated population of between 20 and 30 million inhabitants. Most of the meat from milked out animals is also consumed in the city.

On Wikipedia there is also a mention of the New Zealand proposal for the installation of a bio-digester located at Landhi to produce electricity for the city.

Located in Bin Qasim Town, a 'district' of Karachi, this 'colony' is not what one expects from contemplating such a place. Bin Qasim is a designated business section of Karachi and the Landhi sector has been designated for livestock keeping. Landhi is approximately one mile from the sea and is a low-lying area; the patch of sea, Korangi Creek, into which the effluent runs, seems to be only slightly tidal and has a screen of mangrove before one can see the open sea. It is in an area of town which is not residential in the true sense of the word but there is a high population density. Most of the population are owners or employed in the colony or the outlying 'farms'. These farms are not what one expects when you think of a 'farm'; here a farm is an area of covered floor space with standings for livestock. Also to be found are owner or staff housing, troughs, water-tanks and feed stores. A 'farm' is in reality a rather congested farm-yard. There is no grazing land or other open land in the area where buffalo can graze, exercise or wallow.

Around the original 752 acres more farmers have settled and the colony now covers some 1,600 acres. Some of these 'areas' are considered to be 'colonies' and named such as Bilal, Surjani, Al-Momin, Nagori and Baldia which is the biggest with around 300,000 head. Currently manure can be seen in heaps along the roadsides overflowing into the road, in any open spaces and piled in the 'farms'. Most of it is 'liquefied' during cleaning out the livestock standings using water that is said to come from boreholes, sunk to 120ft. or so, or from open wells and this water is saline as the site is so close to the sea. This liquefied manure is washed into storm drains from where it travels to the sea via a purpose built channel or concrete sided canal which runs at varying flow rates throughout the 24 hours. This effluent enters the Korangi Creek then the Arabian Sea. The problem of this magnitude can hardly be imagined. The team was informed by the veterinary department that there were 140,000 Cu. metres of raw human waste going into the sea daily too.



Figure 2 A street scene in the colony

Surrounding Karachi there are also said to be around 700,000 more buffalo in the nearby rural areas all supplying fresh milk to the population. Here the manure is of little problem as it is collected by farmers needing fertiliser for crops of vegetables or growing fodder, etc.

There are also many businesses to be found servicing the livestock enterprises; mainly livestock feed suppliers and veterinary pharmacies. There are said to be at least 50 veterinarians operating in the colony, many are employed by “companies” such as the major milk purchasers. When travelling through the colony, vehicles supplying the farms can be seen loaded with sacks of concentrate feed or chopped straw (*bhusa*), maize stalks etc. Roads are congested by trucks unloading and the many heaps of manure dumped at the roadsides. These dumps are eventually removed by the city council using tractors for loading and taking away.

#### 4.PROS AND CONS OF THE COLONY

Advantages	Disadvantages
3.2 million litres of milk produced daily	Location within the city
1,200 animals slaughtered daily	Short shelf life of milk
7,200 tons of natural fertiliser produced daily	Quality of milk churns/cans
Easy access to veterinary services, livestock replacements & inputs	<b>Depletion of the National Herd</b>
Cost effective input supply	<b>Environmental effect of Manure Disposal to the sea</b>
Market access in close proximity for produce	Size of the holdings/high stock concentrations
Strong association of farmers	Disease transmission
All at one location	Controlled milk price (national)
	High cost of feeds and fodder
	Apparent minimal/negative profit margins
	Use of Diclofenac sodium is killing off the vultures
	Use of Oxytocin, destroying the elite of Pakistan’s animals

## 5.THE PROPOSED NEW ZEALAND BIO-DIGESTER

The proposed New Zealand bio-digester project for the production of methane from manure to be used as a fuel to produce electricity has not yet started and seems to be a long way from being anything more concrete than a proposal. It would seem to have little chance of approval in its present format; the application has been submitted four times with no success. As it stands, it is far from being an answer to the disposal of the manure and can only be viewed as a pilot project if it is implemented. The management committee members give me the figure of 7,200 tonnes of faecal matter produced per day, which is appropriate for the number of animals; the digester would handle just over 1,000 tonnes of manure and an equal amount of water per filling. However the digester would ‘run’ for an as-yet-indeterminate number of days, but probably twenty-one, before being emptied and re-filled. The emptying would leave 2,000 tonnes of ‘used’ slurry (a 50/50 mix of manure and water) to be disposed of as (the project statement) ‘high quality fertiliser’ which would seem to be an optimistic description.

One bio-digester would be able to handle around 2% of the manure produced in 21 days and the colony would still have around 2, 000 tons of residual waste to be carried away. To handle all the waste perhaps 50 digesters of this size would be required and there is no space for them in the area currently. The team was informed by the city council that 100 acres of land would be made available for a bio-digester ‘tank farm’ to ferment the manure into methane gas and then into electricity. Unfortunately there would still be the problem of disposing of 14,000 tons of slurry daily, which local people suggest should be washed into the sea.



Figure 3 A small private bio-digester

## 6.MILK CHAIN

The milk chain for this scheme begins at the farm by twice daily milking. The milking of buffalo is not quite as simple as milking a cow. The natural let-down of milk is controlled by a natural hormone, *oxytocin*, produced by the hypothalamus. In cattle this is rapid and a cow can be milked out in a few minutes. In buffalo the let-down is much more controlled and does not respond to the usual stimuli of a milking regime, i.e. sight and sound. The buffalo requires having its calf present and under-foot; in good buffalo husbandry, a farmer will have the calf present at foot during milking and usually the calf is given one teat while the owner milks the other three. This compared to cow milking is a relatively slow process and as time is of the essence in Landhi, the milk has to be ready for collection at a certain set time, one man is assigned 12 buffalo to milk in a given short time. However, it is said that after a period of injecting oxytocin into the buffalo at milking time, the buffalo become used to this as part of the milking process and will let down milk if only injected with water, or even just the puncture effect of a needle. This could not be ascertained in the time of the consultancy.

Due to Karachi's temperatures, the milk has to be taken from the buffalo to the consumer within three hours or it goes sour. Therefore the milk HAS to be ready for collection at the set time or is left behind. Milking 12 buffalo is time consuming, much slower than a cow, and to enable one man to get the milk out rapidly, a culture of using oxytocin has grown where every animal receives an injection of 3 ml of the hormone at each milking from the herdsman. This allows rapid extraction and enables the tight schedules to be maintained. **The use of oxytocin is banned in the EU and the USA except by a veterinarian or authorised person.**

Milk is accumulated in 500 litre open tubs where often ice is added "for cooling" and then transferred into 37.5 litre (40kg) galvanized steel cans which are immediately tightly capped. Within 2 hours of the end of milking, all 40 kg cans are picked up by a network of pickup trucks twice daily. The "*pekkars*" or middlemen are usually also milk hauliers (around 300 in Landhi Cattle Colony) who deliver to an organized establishment of milk collection which is owned by a master distributor (sometimes referred to as a 'company'). The milk is then delivered via the cans to households and multiple milk selling stores throughout the entire city of Karachi and its surroundings all within the first 3 hours of milking. Pekkars negotiate the form of payment with farmers who sell their milk in advance. They maintain a constant payment schedule as agreed between them. Within 5 to 6 hours, all cans are returned to all farmers by a return visit by the pekkar. All cans are washed prior to the second daily milking and the same process is repeated a second time during the afternoon milking. The milk is normally presold for a month or even up to a year to a pekkar so the farmer is tied into a contract.

The metal used to make the cans is far from perfect and tends to rust. This adds to the speed of acidification of the milk and going 'bad'. Stainless steel cans would be preferable; the actual shape of the can does not lead to easy cleaning so residual sour milk also speeds up the souring process.



**Figure 4 Milk cans lying in the sun unwashed.**

Some milk in Karachi is imported for the upper end of the market, some from as far away as THE USA but amounts are small. Karachi does not have any large commercial dairies and reports from locals say that 98% of the milk is sold door to door or to milk shops in the city. There is little processing of local milk, and all butter and cheeses are brought in. The population of Karachi prefers a fresh milk delivery. Buffalo milk is also much more popular than bovine (cows) milk for its high butterfat, sweet taste and whiteness. Pasteurised or homogenised milk is not greatly appreciated.

## **7. LIVESTOCK MANAGEMENT**

Feeding procedures of the animals in these colonies is carried out in a structured, common manner among all farmers. Cows are tied all day with chopped wheat straw available 24/7 and let loose for a specific time period to drink water twice daily. On an average, the daily ration of feed to the buffalos and cows used for meat and milk production is approximately 8 kg per day (in two daily portions) and can include cottonseed cake, wheat bran, rice shell, broken rice, bakery waste (old/hard bread residue) molasses, bean mix, mustard oil, sunflower meal, minerals & vitamins; 8 kg daily of greens- usually maize, alfalfa or sorghum; and 7 kg of wheat straw. The above 'ration' cannot be verified and was not observed. This gives a total of 23 kg of dry food intake per animal in addition to perhaps 30/40 litres of water. There is no mention of urea/molasses feeding which enhances wheat straw. Also no mention is made of feeding according to milk production.

Livestock management is not good, reported food rations per head is inadequate for full production from a buffalo. The livestock in the colony comprise estimated, 90% buffalo and 10% bovine (cattle). It is reported that a few farmers have now introduced automatic water bowls which supply water 24 hours per day to the tied animal. The animals drink non-saline

water supplied by the city council which arrives for 12 hours per day at low pressure; this has to be pumped up to header tanks for use in water bowls. The reports from owners say the buffalo and cattle are released from their ties twice per day to drink and then re-tied. Exercise for the animals is severely limited due to the fact that the open yard is usually quite small. The owners claim that 24 hour drinking increases milk production by 10% to 20% or so. However this may mean that the animals get no exercise at all during their stay in the colony.

The logistics of getting enough feed to each animal are problematic and costly. The animals themselves are in a better condition than reported before I visited but mortality is high; put at 4 - 10%. When the KDFA secretary was asked as to the method of disposal of a dead animal he stated that, "The city council come and take the carcass away to dump them on the shore." I did not visit the site of dumping but one dead dog served as an example at the shore line.

It is reported that buffalo calves seldom live for more than one day which some farmers feel is due to the fetid air at ground level which they blame on gases emanating from the manure lying around. In a healthy environment on a well-run buffalo dairy farm, it is usual for a farmer to allow the buffalo calf to suck one teat while the milker takes from the other three. The attention of the calf produces natural oxytocin hormone, the milk let-down hormone, which releases the milk to the udder for the calf and milker. Where there is no calf, buffalo are difficult to milk without a lot of effort and good management. In this colony where there are no calves and management is less than ideal, an oxytocin injection is the norm. The cow is injected twice a day with oxytocin prior to milking. This is accepted practice in the colonies. However in Europe and THE USA the indiscriminate use of **oxytocin is banned**. Oxytocin is only to be used by a veterinarian or someone authorised by a veterinarian and limited to clinical cases of post calving milk let-down problems or to assist in parturition. It is said that buffalo can become used to these injections as part of the milking routine and react just as well to an injection of water or even to a dry needle. The continual, regular use of oxytocin damages the animal's reproductive system making it difficult to get back in calf after one lactation period in the colony, and also if a cow is pregnant, it is likely to induce abortion.

Current thinking is that if there is any residual oxytocin in the milk it is of no danger as oxytocin is a protein and as such is digested by the human stomach before it can enter the blood stream.

## **8. MINISTRY OF FOOD AGRICULTURE AND LIVESTOCK**

The Additional Secretary of Livestock was unable to provide any papers on the colony and its history. His statement was that the land was allocated in 1963 and since then the colony has mushroomed. Initially it was allocated for 15,000 animals but today their latest statistics from 2006 say that Landhi and its environs now hold 342,000 animals which quite reasonably accounts for 7,200 tons of manure daily. It was pointed out that around 130,000 Cu. metres of raw sewage is also pumped into the sea daily by Karachi city. ('Fresh' fish are on sale in the city).



**Figure 5 where the outflow goes into Korangi Cree**

The Department would like to see the colony taken out of the city and already have a proposal to move it to Bhambhore; they have calculated the cost at 2,800 million rupees, or 29 million dollars. Obviously the Department lacks the funds for this. They are also appreciative of the social aspects of such a move and accept that vigorous action would be needed to prevent the take-over of Landhi by other farmers hungry for a place to keep their buffalo. To get the farmers to move would involve strong legislation against keeping animals at Landhi and surrounding area after a set date. The new facilities would need to be seen to be more attractive than city life for them to go willingly.

The proposed site at Bhambhore of 800 acres will provide 500 acres for dairy farms and basic amenities such as roads, parks, school, mosque, veterinary hospital, feed mills etc. External development such as roads, sewage, water supply, drainage and electricity will be provided by the Government of Sindh. Other plots will be developed for biogas plants, milk processing, a livestock market, fodder market, feed mill, veterinary clinic, general stores and shops. The plan suggests 5 acres per farm which means that it will accommodate 100 farmers. There are  $\pm$  3,000 farmers at Landhi. So there is a lot more thinking required.

There are stipulations which may be less palatable to the current Landhi residents such as a minimum of 200 head of stock increasing to 400 within 3 months of entry. Animals in the colony must not be slaughtered after one year of milking but must be got into calf and used for multiple lactations. Calves cannot be sold less than three months of age. The possibility of a pilot project was mooted.

### **8.1. An alternative**

Rather than a mass movement to a site which has rules with which few occupants can comply would be a slow exodus with financial assistance to an area outside the city where farmers would carry on in a more eco-friendly manner without the strictures of Bhambhore. Their

'farms' in Landhi would be bulldozed and no resettlement permitted or allowed to be used by residents to extend the area of their farm to enable animals to get at least some exercise. How this can be controlled would be a problem as farmers used to the present situation would tend to fill the extra space with more animals which would negate any benefits of the relocation investment.

One major difference would be that manure would become an appreciable asset to be sold to crop farmers of the locality. It would become a saleable commodity rather than a liability.

## **9. LIVESTOCK HEALTH**

There is a government veterinary hospital in the colony but the place is quite run-down, lacks facilities and seems to be the office of a veterinarian who attends to a few local farmers. A veterinary hospital which charges for professional services at a sensible rate and provides farmers with a rapid diagnostic service would, in all likelihood, be self-sustaining. For it to be fully functional the Government subsidised place should close.

The livestock in the colony comprise 90% buffalo and 10% bovine (cattle). The animals drink non-saline water supplied by the city council which arrives for a set period daily. The reports from owners say the buffalo and cattle are released from their ties twice per day to drink and then re-tied. Exercise for the animals is severely limited due to the fact that the open yard is usually quite small. Management is poor.

The health of livestock in the colony is not good. The mortality rate is high at around 4 - 10%. The government veterinarian could not give any specific reason for this and says no post mortems had been carried out but the reason could be the general low level of husbandry, leading to gradual decline. Death could come from anything once the natural defences are destroyed. The only vaccines used are Foot and Mouth Disease (FMD) (or as in the U.S.A Hoof and Mouth). Foot and Mouth is sometimes said to be 8 different diseases with the same symptoms. A vaccine for one type has no effect on others. Typing is possible to ensure that the correct vaccine is used but typing costs money and this is a commodity that the farmers of the colony are loathe to use. In Pakistan a combined vaccine is now available to combat the three prevalent strains in Pakistan. There have been 444 'outbreaks' of FMD in the last 6 months. Some vaccine is made in country, and some are imported.

The only other disease which vaccination is used to control is Haemorrhagic Septicaemia (HS). Animals, particularly buffalo, do not die from FMD, but they are very susceptible to HS, and it is said that this is the main cause of mortality in the colony.

It is reported that the next major problem in health of the livestock is 'respiratory problems' which suggests viral pneumonia. This is probably due to the close confinement and poor housing conditions after rains. Due to the housing conditions, the cramped location, the malnourished condition, lack of sufficient water, the heat, pollution and general low standard of husbandry, the animals are susceptible to all sorts of ailments and have a low threshold of natural resistance. For Buffalo the lack of a wallow to help them lose heat particularly in the hot season is a problem. There are a few farmers who have reputedly installed showers to help in heat shedding for the animals, but for others in the Karachi colony, environmental heat is a serious factor.

The animals in the colony are under stress; stressful conditions are not conducive to milk production. Under a better management system, a calf would be at foot at milking time and nuzzling the udder which induces 'let down' in the udder. When an animal is under stress, the adrenaline produced cancels out the effect of oxytocin. As the animals of the colony are continuously under stress and the calves are not kept with the mother, it is difficult to stimulate the let-down hormone production. This has resulted in twice daily injections of synthetic oxytocin to become standard practice thus enabling rapid milking to go ahead. However this twice daily injection continues late into lactation despite the poor condition of the recipient animal, often until the animal is too weak to survive. The use of **oxytocin** is banned in EU and the USA except by a veterinarian or under his authorisation. In Pakistan a cow is injected by the milker twice daily usually at a rate of 3 ml per milking. There is no control on this act at all.

Another serious malpractice in the health sector is the use of *Diclofenac Sodium*. This drug is a painkiller and anti-inflammatory. It is a useful drug when used properly but it is often misused by people who are unable to identify the underlying causative problem of an animal's ill health; it appears to be a good drug as it takes the pain away; the animal becomes active again but later dies as the original problem is not treated. In Landhi, we are informed that animals which die in the colony are dumped on the shore where the carcass is consumed by scavenging animals and birds. Unfortunately the arch scavengers are vultures and the residues of Diclofenac in the meat affects the **vultures' renal system resulting in death** and also affects the reproductive system too. Consequently the skies of Pakistan and much of India are now devoid of vultures. This is a thing of sorrow particularly for the Parsees who depend on vultures to eat their dead on the Tower of Silence. It is reported that 98 to 99% of vultures have disappeared over the last 25 years. Nature's sanitary officials have been killed off by misuse of a veterinary drug. Diclofenac is banned in Pakistan but is still being manufactured and sold as 'Voren' and is believed to be produced in Karachi.

Some dead animals are sold to the 'sweepers' who sell the skins for leather. The bones are sold to makers of poultry feed, and the fat, if any, goes for soap manufacture. The selling price of a carcass is around Rs. 2,000 or often taken away free of charge.

## **10. ECONOMICS OF THE COLONY**

The economics of the colony are difficult to understand, figures provided show an evident loss. The buying in price of a buffalo is Rs. 135K to 160K, the scrap animal sold to a butcher is around Rs. 45,000 to Rs. 65,000. The price of milk is Rs. 64 per litre and a cow can produce in the 10-month stay at the colony around 2,000 litres. Reported cost of feedstuffs for bulk and concentrates is around Rs. 300 per day, i.e. 90,000 per 10 months. The farmer pays an annual rental of Rs. 5,000 and an annual fee for water of Rs. 1,500 per head. Only one cow in 20 gives birth in the colony as they are usually purchased immediately after calving and are not put to a bull so soon after parturition. Little or no breeding is carried out at the colony. If an animal dies as one of the 4 - 10% mortality, then a farmer's income can be reduced by Rs. 65,000. The figures supplied to the questionnaire cannot be verified. Farmers are notorious for both not having the figures as few weigh their milk or record their costs and even fewer keep records and, to make matters worse, almost all prefer not to disclose figures which will allow people or the authorities to calculate their income. The estimated costs and returns from information gathered can be seen below.

<b>COSTS</b>	<b>Rs.</b>	
Buying in price of a buffalo	145,000 to 160,000	
Feed Rs. 300 for 300 days	90,000	
Water/power	1,500	
Rental of space per head	5,000	
Health costs	1,000	
Labour	12,000	
<b>Total</b>	<b>254,500</b>	
<b>INCOME</b>	<b>Rs.</b>	
Selling of scrap cows per head	65,000 to 45,000	
Milk sales 2,000 L @ Rs. 64 if production is 3000 L	128,000	192,000
<b>Total</b>	<b>193,000</b>	<b>237,000</b>

A 10 litres per day average is not possible. Many buffalo will only reach 10 litres immediately after calving.

A continual loss of **Rs. 61,500** per animal is not possible; the figures supplied are obviously suspect as stated earlier. The maximum profit margin according to figures provided would be **Rs. 17,500**. The only possibility of accounting for this oddity if the figures are anywhere near accurate is that the farmers are paid for watered milk which inflates the price received, but even so it would have to be around 30% water to break even. The often stated reason for adding water is that buffalo milk is watered to 6% butter fat as though this is accepted practice and appreciated by the consumer. On the returns of the questionnaire obtained by ASF staff, some farmers were quite open about the fact that they added water. Some say that they do not add water but do use ice.

#### 10.1. Milk farm gate prices:

**The price paid to farmers in Landhi is avg. +/- Rs. 64 per litre**

**The price paid farm gate in UK is Rs. 40 per litre**

**The price paid farm gate in USA is Rs. 38 per litre**

The majority of consumers in Karachi, as in all Pakistan, prefer buffalo milk to cow milk. However it can be pointed out that the buffalo is a relatively poor milk producer in terms of volume, and the Karachi herd of 1.2 million buffalo could be replaced by 400,000 cows (bovine) which would produce 1/3 the amount of dung, require 1/3 the space, 1/3 the amount of fodder and produce just as much milk with 1/2 of % butterfat.

Buffalo milk has **58% more calcium**  
**40% more protein**  
**43% less cholesterol** than cows' milk.

Another anomaly is that milk is sold at the farm gate for Rs. 64 to the pekkar; he then sells it to a bulk buyer in Karachi for Rs. 65 who sells it on to a retail rounds-man for Rs. 66 who then sells it to the consumer for Rs. 70, which does not leave much of a margin for profit for transport and handling. One assumes it accumulates a little more water en-route.

## 11. MEAT CHAIN

The quality and quantity of meat which leaves the buffalo colony is extremely poor. The animals seem to be invariably sold to local butchers who sell retail to local people. Having been milked out for the last 10 months by the use of oxytocin they are almost devoid of fat and the amount of lean meat is negligible. Their diet is inadequate and I really fail to see how they can be traded at Rs.65, 000 which is \$685. However, meat is at a premium in Karachi and animals are brought from great distances to feed the city. It is understood that many animals are brought in from India, either legally or illegally. Since the recent serious outbreak of foot and mouth disease when it was stated (erroneously) that people were in danger when eating FMD infected meat, the consumption of beef has declined.

Given the fact that 400,000 animals stand in the colony for just 10 months, it is clear that 40,000 animals are sold off each month or 1,300 per day. Normally that would be a lot of meat but most/many of the animals are in such poor condition that they are of limited quality for the butchers market. These animals are sold to Karachi butchers or travel to urban centres such as Rawalpindi or Peshawar. Some may go through to Afghanistan but amounts cannot be ascertained.



Figure 6 Hardly quality beef??

## 12. FEED QUALITY TESTING

The colony would seem to be relatively well provided for its level of production and management. Trucks bring bulk feeds in to order which is unloaded into storage clamps. Water is supplied by Karachi city and extra requirements are pumped from both deep and shallow wells. Pekkars and their pick-up trucks come twice daily to take the milk away. The dodhi or pekkar usually pays the farmer in advance for milk which keeps the stockman happy and in effect ties him to the individual retailer. This arrangement holds well throughout Pakistan. Farmers either mix their own rations for concentrate feed or buy from millers with the colony; concentrates arrive in bulk on trucks and mixed to a ration known only to the mill owner. No feed mixer/manufacturer seems to use computerised least cost analysis for production of a balanced ration for milk production. One dairy owner who sells some feed to

the farmers claims that he does so. He volunteered the information rather than responding to a question so it is assumed to be correct

Generally the ration is not guaranteed to be of any specific quality but a degree of trust has developed between supplier and buyer. The ration varies throughout the year depending on what ingredients are available. The farmer and probably the mixer/miller possibly only have a vague idea of quality required such as protein or energy content of the ingredients and so the ration cannot be considered to be a standard or adequate quality.

It would be advantageous for the colony if there were to be a laboratory established to test feeds and advise on the current best mix given the ingredients seasonally available. This would enable the miller or mixer to be able to say that his ration for feeding to milking animals was of a specific content and the farmer would be reassured that he is buying quality feed. If there were differing charge bands the laboratory could be self-supporting, a lower charge for members of KDFA would have samples tested for a lower price than non-members.

There is a small veterinary laboratory in the colony and it is probable that a building could be made available there for a nutrition/feed analysis laboratory if the project agreed to establish such a facility. Such a laboratory would increase milk production through a more complete balanced diet for the buffalo.

### **13. MILK TESTING**

Milk testing does not seem to occur in the colony. However, farmers are able to tell you exactly what the butterfat content of their product is but as to who tests it and when is difficult to ascertain. One or two farmers said that the price of milk is dependent on butterfat content. It does seem to be accepted that the farmer will add water, most contend that they do not; however, the householder understands that the milk has been tampered with on the route to the door. Some farmers say that the milk wholesaler does test but only for butterfat on which the price is based.

From a farm survey the farmers state that the middlemen put additives in the milk before it gets to the consumer. Listed are hydrogen peroxide (increases shelf life), Sodium bicarbonate, urine, water, ice (oddly this is often not considered to be water) to keep it cool and adds to shelf life, powder unspecified but could be clothes washing detergent powder (why? not known), milk powder, oil to maintain fat levels and white paint. Simple hygiene would increase shelf-life; careful washing of utensils, buckets, tubs and churns/cans using a dairy detergent would make a lot of difference to the speed of acidification. Another factor is the metal used to make the carrying cans placed on the vehicles, this is steel which rusts and stainless steel would add to the shelf life. The present cans are flat bottomed; a rounded bottom would make for easier cleaning.

#### **13.1. PURCHASING of MILK**

If any organisation wished to purchase milk from the colony they would have stiff competition from the dodhi. The dodhi pays in advance for the milk which has become a socially accepted method and suits the farmer. The dodhi also will sometimes give extra funds to trusted suppliers for other things such as feedstuffs or non-business related purchases

such as school fees. There is a large element of trust built up over the years between buyer and seller.

If a commercial company were to try to capture this market, they would have to pay more than the current Rs.64 per litre as the company would demand undiluted milk. If the suspected figure of 30% final dilution rate is anywhere near correct a figure, then Rs. 90/litre would be asked by the farmer. However, Rs. 90 is above the government fixed price of Rs. 70 for milk and could lead to prosecution of the supplier. Additives are accepted; selling at over the fixed price is illegal.

For cheese making the milk has to be free of antibiotics; otherwise, the bacterial action required in cheese making is destroyed by the antibiotic. It will take some time before this is believed by the suppliers and would result in milk being returned to the supplier which will make an unhappy supplier. It will be a matter of education.

#### **14. COMPARATIVE ANIMAL PRODUCTION SYSTEMS**

The animal production systems practiced in the colony are all very similar. The only real variations are in hygiene levels which in reality depend on the water supplies available and the inclination of the farmer. Where there is a copious amount of the saline borehole or hand dug well water then the manure is turned into slurry using a hose and washed into the 'monsoon' type drains and eventually out to sea. A few, perhaps 15% of animals, are provided with a shower for the hotter parts of the year.

The basic production system is one where a recently calved buffalo is purchased from Sindh (35%) or more likely from Punjab (65%) and brought to the colony by a trader or farmer. Depending on visual inspection, a fee between 135 and 165 thousand rupees is paid. The animal is then taken to the owner's livestock compound and tied. Even the farmers refer to this as being in jail.

From that date on for the next ten months the buffalo is untied twice daily to drink 'sweet' water, i.e. non-saline; it is fed on whatever roughage is seasonally available which is usually "bhusa" or chopped wheat straw. Even this is expensive at Rs. 8 per kilo when supposedly balanced concentrate feed costs around Rs. 25 per kilo. Some farmers state that they feed chopped green fodder when available, such as maize stalks or even Lucerne. Throughout the next ten months this animal is underfed.

Due to the low level of feeding, the cramped environment, the proximity of other farms and other animals, the cross infection of various health issues, heat and lack of heat shedding possibilities even during the very hot periods, limited water intake, lack of exercise and so on, the animal is far from content. Milking of buffalo is problematic even under ideal conditions and is only trouble free if the calf is around. Away from the strictures of a colony the buffalo calf is usually retained to feed on one teat while the milker takes from the other three. There is an exceptionally high mortality, reportedly "almost all", among calves born in the colony and these are very few anyway. The high mortality could be caused by malnutrition of the dam, or as mentioned by farmers the noxious gasses at ground level from manure.

To overcome the lack of management, every animal owner has taken to the twice daily injections of **oxytocin** to induce milk let-down in the milking animals. This is carried out by

the milker and provided by local pharmaceutical shops. Current thinking is that there is little residue left in the milk and even if there is it is easily digested in the human stomach when drinking the milk. There would seem to be no adverse effect on consumers though some people interviewed claimed health issues from the milk and blamed the oxytocin. However the animals are forced to produce milk despite their poor diet and by the end of the ten months the animal is so weak that it dies (4-10%) or is sold off prior to death to a local butcher.

A few animals, 10 to 15%, are sent back to farms for recycling, i.e. to be fattened and put to a bull for more milking after calving. However, the fattening process between purchase by the farmer and a heat period depends on body condition and after attaining oestrous and pregnancy, there is a 10 month gestation period meaning that this type of enterprise is not overly profitable. It depends once again on feed prices. Often/usually the reproductive system of the buffalo is so damaged by oxytocin the cow fails to conceive in which case she goes for meat anyway.

As far as animal health is concerned, the regular influx of animals from various places outside Karachi means that every disease in the country comes to the colony. The only vaccinations used are Foot and Mouth Disease and occasionally HS. Other problems are treated as they appear by veterinarians local to, or within, the colony. There seems to be little variation to this theme. One worrying aspect is that there is liberal use of Diclofenac Sodium by herdsman and farmers. The uncontrolled use of this banned substance has had a seriously deleterious effect on the vulture population of South Asia. It is still being manufactured in Karachi despite a government ban. It is obviously readily available and used in the colony. Farmers mention this among the medicines they use to treat animals. This suggests that it can be purchased in local veterinary pharmacies. When animals leave the colony to be recycled or fattened they are carrying many diseases from the colony which are spread through the herds they join.

As counterpoint to the levels of mismanagement within the colony is a farm visited and owned by a big, perhaps the biggest, farmer in Sindh. He had his 4, 000 buffalo wandering loose within paddocks; they had 24 hour access to water; and the animals appeared well fed and contented. He did not use oxytocin but had a calf at foot at milking time. He had his own feed mill and his own ration mix. He was not at all mechanised, using ox carts for all transport within the farm. He raised his own replacements and sold off bull calves for fattening to neighbours at around 3 months of age. He kept bull calves from his best milkers to use for breeding, thereby improving the genetic potential of his herd. His milk is also sold in Karachi.

**One very serious effect of the present “buying in - ten months of milking - selling the spent animal to a butcher” scenario is that this colony is stripping Punjab of its best milking buffalo and sending them to slaughter. This is depleting the genetic quality of the national herd as the best animals are deprived of breeding opportunities after entry to the colony. This can be construed as buffalo genocide; it is destroying the national herd. In fact, Landhi has been likened to a Buffalo prison.**

## 15. IMPROVING THE PAKISTANI BUFFALO

There has been little attempt to improve the breeds of buffalo in South Asia; individuals often breed from their best females, but it is all on a very small scale and the improvement is lost when the herd breaks up. There needs to be a well organised co-ordinated breeding programme for buffalo. Using the techniques of embryo implants and artificial insemination (A.I.), the methods of up breeding of cattle is proven, well known and widely practiced. The improvement of buffalo through up breeding is more problematic. There are few of what could be termed elite herds. A bull is 'half the herd' but few bulls are **progeny tested** before being used for A.I., and even though they come from 'best milking dams,' they are not necessarily providing particularly good calves. Bulls are chosen on their phenotype or good 'looks,' which is not a particularly good basis for a breeding policy. The bigger the pool of available females the quicker improvement will be accomplished.

An up breeding programme should be instigated country wide utilising the good buffalo farms both private and semi-government as a breeding base and selection for elite bulls based on scientific genetic improvement. This is a long term project which will implement the tried and proven breeding practices used in the past to improve the various breeds of milk and meat of *bos taurus* cattle.

Farmers involved would benefit from their sale of improved bulls for breeding as is carried out by pedigree breeders of cattle worldwide. The programme would be managed by a geneticist with good experienced farm managers employed to supervise the day to day activities on the participating farms. Incentives should be offered to participating farmers to ensure that the results returned are genuine. It is possible that there are top performing bulls in other countries that out-perform the local bulls. Italy and Indonesia are two possibilities; these will give a good start to the up-breeding if used on top dams.

Breeds are not important and the Nili Ravi may not have the highest yielders of all.

## 16. MARKETING

This would seem to be a weak area, but a system has grown up which suits this low cost, low output milk production industry. Karachi, a city of perhaps 30 million people, the only city within perhaps 400 miles, does not have a functioning dairy. Ninety-eight percent (98%) of the milk produced by the 1.2 million animals is purchased or consumed as fresh milk. The milk is boiled on arrival with the buyer, often the cream is then skimmed off after standing a while. The cream is often used as butter or to make ghee, etc.; yoghurt is also made at the home.

There are two milk processing plants in Karachi, but as both produce UHT which is not very popular except among the wealthy, they get little business. Pasteurised milk is even less popular as Karachi residents greatly prefer fresh milk. Some flavoured milk drink is produced and packaged.

Individuals make some soft cheeses and yoghurt. Milk shakes are sold in the city, but all milk is sold untreated and usually with additives, usually water, of some sort to householders and small businesses. Householders generally make their own soft cheese and yoghurt but it can also be purchased on the street from small milk shops. A few of the larger farmers own their

own milk shop, but they are open for long hours (closing at 11.00 p.m.) to be competitive, and this means employing staff or a family member being there full time.

The Karachi Chamber of Commerce is very interested in the idea of trading mozzarella cheese but think that the USA might not be too eager to allow its import. The EU is a second option. They would hope for backing of USAID for their application if mozzarella production were to go ahead. USAID staff feels that their appeal to USDA would be enough to sway the balance in favour of Pakistan. They do not seem too interested in interfering in the marketing of milk as it stands. The local people like fresh milk delivered to the door. They like high fat milk even though the fat is often skimmed off in house saving them having to buy ghee or butter. They usually produce their own yoghurt.

One problem, which was only hinted at during the meeting, was the power of the middle-man. The dodhi or pekhar plays an important role in the marketing chain; they are a powerful force as in that they wield financial control over the producers who often will sell their milk to the middle-man for up to a year in advance. No interest is paid on this loan which is where the middleman gains over a bank in finding clients. It is a form of Islamic borrowing.

## **17. VALUE ADDITION FOR MILK**

### **17.1. COMMERCIAL DAIRIES IN KARACHI**

Currently there are no commercial dairies producing packaged milk in Karachi such as found in Lahore. Ninety-eight percent (98%) of milk produced by the 1.2 million (est.) cattle and buffalo in and surrounding Karachi is sold to householders or milk shops in the city. Milk shops tend to sell only “fresh” milk rather than enhancing it as flavoured milk or milk shakes. Skimming cream has not been mentioned as a retail trade but households will separate the cream by standing overnight to make butter. Home-made yoghurt is also produced.

Anecdotal evidence tells the story of a large company wishing to purchase milk from a VERY large farmer to produce flavoured milk drinks. However, the farmer demanded prepayment as is the norm by a supplier in Sindh. The company refused, the deal was lost and to date there is no dairy buying much milk in Southern Sindh.



**Figure 7 One of two small commercial dairies.**

Milk is sold exclusively in the city; it is carried in by middle men or 'pekkars' twice daily to be sold to consumers mainly householders, milk shops and hotels, etc. The price to producers is around Rs. 64, and the selling price to consumers is reported to be Rs. 70. The profit margin is presumably enhanced by the amount of water added. There would seem to be no excess milk for manufacturing for the domestic market unless a good profit over the raw milk price is possible and there is no shortage of milk products in Pakistan.

Ninety percent (90%) of the animals around Karachi are buffalo while only 10% are cattle. Buffalo milk is preferred for its high butter fat content, despite being watered down, for its white colour, and for its sweetness.

The pizza industry likes to use mozzarella cheese for its stringiness/elasticity and white colour. In Europe; Italy produces buffalo mozzarella cheese but other countries have few buffalo. There are a number of herds in the USA, but those are limited, and assuredly there is **a market niche there to be exploited**. Pakistan should aim for an overseas market for mozzarella, particularly in the USA, where the retail price of pure buffalo mozzarella at \$51 per kilo leaves a sizeable profit margin as milk in Pakistan is obtained for US \$0.75 per litre (Rs. 70 per litre). At 4.6 litres of milk costing Rs. 3.22, 1 Kg of mozzarella cheese can be produced with a retail value in US of Rs. 4,845.

## 18. VALUE ADDITION FOR MEAT

The idea of value chain improvements for meat is really a non-starter. Worn out animals at the end of the milking cycle are often in such poor condition that they have little meat of any quality on their bones. The regular use of oxytocin ensures that all their body reserves have been sold off as milk and the carcass is worth little. Live animals are purchased by local butchers and meat sold locally at meat shops. Skins go to the local leather industry from the butcher and bones go toward poultry feed. The leather produced from diseased, poor conditioned buffalo is of little value and hides sell locally to tanneries at Rs. 700.



Figure 8 The Landhi colony livestock market

Better quality animals are trucked out to Islamabad or Rawalpindi to enter the meat market there.

The spent animal is not suited to fattening in a feedlot, if such a commodity existed, as it is too old, and even if young (4 to 5 years would be young for an ex-colony animal) she would take months to get into condition for quality meat. There is really no 'chain' to develop. Currently any animal with meat on it at the end of the milking cycle goes to Karachi, Peshawar or Rawalpindi/Islamabad for slaughter.

## 19. RECOMMENDATIONS/INTERVENTIONS

### 19.1. Short term

- Owner and farm labour training. Establish a day release training centre for **animal husbandry** tuition covering all aspects of livestock management applicable to the system used in the colony. **The head of this training centre should be an animal husbandry specialist rather than a vet.** Courses should be arranged at times to suit the attendees, not the trainer; the courses should be tailored to the colony's requirements/shortcomings and not from a set text book or course curriculum. Hygiene is a major factor in the woes of the colony both in the colony itself and in the cleanliness of the milking utensils. Training would ensure that the colony's milk had a longer shelf life and cleaning up the environment would improve living conditions.
- Establish a nutrition laboratory in the colony for farmer and feed mixer use. A feed testing laboratory is needed which provides fast results. The existing government labs are far away (Tando Jam) so that results are a long time arriving and are usually no longer applicable to the current available feedstuffs. Training for the lab staff will be required and the **lab should be headed by a nutritionist.** The quality of the current concentrate feed is highly suspect. Rations are formulated on guesswork and which ingredients are cheap. If a scientific approach were used with ingredient testing and least cost computerised formulation practiced, top quality feed would be available every time. This would require a feed testing laboratory headed by a nutritionist at the colony with chemicals and trained operatives which should be self supporting.
- Assist in the introduction of stainless steel milk cans of approx. 38 litres and the use of dairy detergent so that cans are thoroughly cleaned to increase milk keeping quality. Stainless steel milk cans should be introduced to increase 'shelf life' of milk; the current metal cans are rusting and difficult to clean which means that the new filling starts to go bad immediately when it is put in the can. Manufacturers of cans are found in Lahore, and a change of material and can shape are needed. Buffields Ltd., the dairy company mentioned, has imported a stainless steel 40 L. can from Turkey. It is quite expensive but could probably be manufactured in Lahore without too much of a problem at a lower price as they are experienced in using stainless steel for other commodities. **This could be an ASF assisted program.**
- **Communal showers** for buffalo during the hot season to enable stress reduction by heat shedding. The large rumen of a buffalo produces a lot of heat during the fermentation process of roughages. This heat has to be dissipated particularly during the summer heat. The water buffalo enjoys water, hence its name.
- Establish a well-equipped veterinary laboratory/hospital. The current Government laboratory is in a run-down condition and is in act no more than a poor clinic. It would seem to be run almost as a private practice. Farmers from outside Karachi would also be able to use the facility. Currently samples are sent to Islamabad and the results return far too late to be of use. This laboratory would be run on commercial lines and be self-supporting once established.

- Encourage farmers in timely and bulk purchase of feedstuffs. Possibly co-operation to be able to order full loads at reduced cost. Bulk buying keeps prices down as does the bulk purchase of feeds at glut time.
- Discourage the use of diclofenac sodium, which is illegal, and where possible, the use of oxytocin, which is unethical. Both of these chemicals are anathema to anyone caring for live animals.

### 19.2. Medium term

- Assist a local processor close to Landhi Colony and who preferably already has an established client base in the colony to establish a mozzarella cheese plant and assist the company in obtaining access to international markets. There are perhaps two processing dairies in Karachi who have dairy facilities, if not cheese making knowledge/experience. Annex 1 shows the steps of cheese production.
- Introduction of an affordable milking machine. There are machines on the market but are not popular; possible further development work (agricultural engineer) needs to be carried out and perhaps a parlour system would be preferable. This could be private or community owned. The introduction of parlour milking would/should result in cleaner milk especially if coupled with correct cleaning of stainless steel cans. This is a topic for a further study.
- ASF should work toward the removal of the ‘fixed prices’ for meat and milk. These fixed prices are a disincentive for improvement in livestock farming, a disincentive for development. These prices are currently too low resulting in losses or minimal profits to farmers who then have resort to such things as adulteration of milk to increase its volume and their income. This is to the detriment of the consumer who receives adulterated milk.

### 19.3. Long term

- **Close the colony.** Move it out of the city. The system of buying in animals that are to be slaughtered within one year is **non-sustainable**. It is killing off the elite of the national buffalo stock. It is wasteful, it is **buffalo genocide**. It would seem that everyone would agree that the colony should be moved out of Karachi including some of the colony dwellers. Initially it was 32km from the city, but the city has now grown to the extent it now surrounds the colony. Not only has the city grown to extend around the colony, but the colony has now grown to exceed its original acreage of 752 acres to an estimated 1,600 acres. The livestock population has grown from 15,000 to almost 400,000.

The daily production of manure is calculated at 7,200 tonnes and is a health hazard. Currently it is flushed into the sea becoming an environmental hazard.

Even the occupants of the colony can see the benefit of moving to a rural area, but for them the cost is prohibitive and they would have to receive major financial assistance for it to be feasible.

To move the colony would be a massive operation if it were to be attempted. There would have to be sites arranged, water and electricity provided, roads, schools, veterinary and health clinics, shops, transportation, etc. for residents. In fact, all the services available in the city would need to be replicated.

There are perhaps 33,500 labourers and 3,000 livestock owners plus families in the colony making their removal a massive undertaking.

To set up a pilot project would be one possibility, where a small number of farmers are moved to a rural locality and their current location bulldozed with no-one else permitted to move onto the site in the colony. If their relocation went smoothly and they were happy, others would follow.

From this pilot project lessons would be learned about where a project to move the rest could be produced.

It is suggested that a team of consultants be tasked with providing the Sindh government with a blueprint to tackle the problem. The team would be multi-disciplinary.

- **Solve the manure disposal problem** if the colony remains in the city, the manure problem can only grow as the colony grows. The colony is expanding daily as new farms are constructed to the east and north of the Landhi area. The manure problem is such that even the residents see it as a major hazard and would like something to be done about it. The problem is so large that tractor/trolley removal daily to a bio-digester is not possible; 7,200 tons is a matter of 3,600 trolley loads, which if each tractor managed ten loads per day would require perhaps 400 tractor trailers plus another 200 tractors for fork lift loading all to be maintained and fuelled. The answer perhaps is in the use of **pipeline technology**. The slurry would be intercepted as it exits the colony on its way to the sea and pumped along pipes to the 'bio-digester farms' which the city has identified and can be sited on this area of land between the colony and Bin Qasim port.

**A possible problem** could be that as the manure is presently washed out of the farm and into a drain using saline borehole water, the residual salt would not be acceptable to farmers using the manure/slurry on their land, **non saline water** would be necessary from either the city supply, which is unlikely, or deep drilling to find a salt free water supply.

A multi-disciplinary team would be required to offer a solution to this complex manure disposal matter. Once a practical solution is found it would be up to the Sindh or National Government to come up with the funds for implementation.

## **20. PROPOSED FURTHER STUDIES**

- Feasibility study for the removal of farmers from the city
- Suggested team: Sociology, Animal Husbandry, Logistics, 'Town' planning, and Environmentalist.
- This study would provide a blueprint for the closure of the buffalo colony and return the area to city control.
- Study to resolve the effluent problem
- Suggested team: Bio-digester expertise/experience, Pipeline engineering, Effluent handling/environmentalist.
- In the event that the above study is not implemented this second study must be implemented as the living conditions for the inhabitants both people and livestock are appalling. This would turn an embarrassment into an asset; producing electricity to the city which is short of power.
- Production of a buffalo milking machine
- A milking machine experienced manufacturing engineer.
- Milking machines are currently available for buffalo so the necessity is to make machine milking available to the occupants of the colony. This means either a cheaper individual bucket system or an affordable parlour possibly for communal ownership/use.

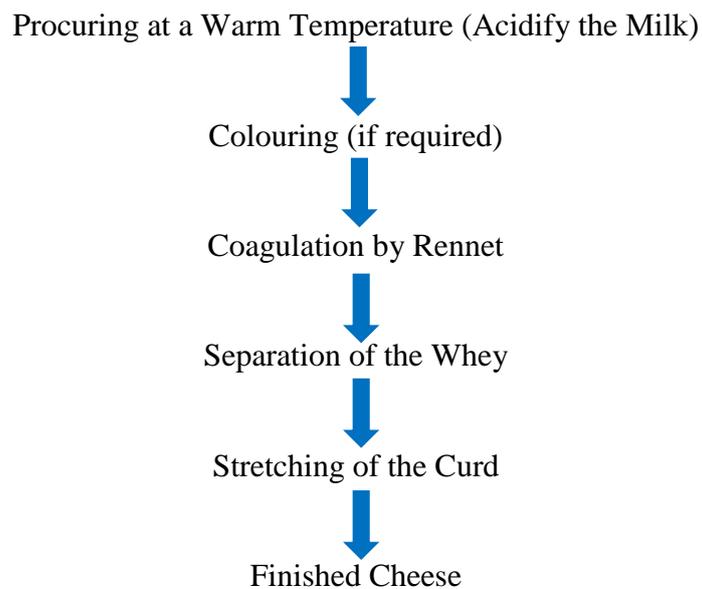
## 21. ANNEX 1

### 21.1. Production of Mozzarella Cheese

#### 21.1.1. Process Flow Chart

After the fresh milk is received, it is filtered and pumped into the dump tank. It is then chilled with help of a chiller so that the growth of bacteria is minimized. On average, fresh buffalo milk contains 7.5 to 8.0% fats. The milk will then undergo the pasteurization process. This is based on heating the milk to 70°C and holding at that temperature for at least 15-20 seconds. This heat treatment ensures the destruction of unwanted micro-organisms and all bacteria. During this process the temperature is reduced to 4°C as at this temperature ideal growth of bacteria is stopped. After the pasteurization process is completed, the following process is completed to make the cheese.

#### Steps in cheese making



## 22. ANNEX. 2

### 22.1. Landhi Buffalo Colony questionnaire

#### MILK PRODUCTION AND SALES

Is milk measured or weighed?	
Milk sold to whom? locally to householders?	
Milk Shops?	
Informal Dairy?	
Industrial Dairy e.g. Nestle	
Is milk testing carried out?	
For butter fat	
For water	
For additives	

Does the producer use any additives?	
Does he know of additives used by others If so, what?	
What price does he get per litre?	

#### OBSERVATIONS

Hygiene levels?  
Warm or cold water used  
Any chemicals used in cleaning  
Adequate rinsing

#### HEALTH COSTS

Annual cost of vet fees per cow	
Vaccinations carried out	
Treatments	
Drugs purchased by owner And used by him	
Oxytocin, used each milking, daily or occasionally?	

### FEED SUPPLIES

Bulk feeds? purchased from where at what cost?	
Dry bulk feeds	
Green feeds	
Any other feed costs	

### HOUSING COSTS

Cost of housing one animal	
Cost of water (measured)	
Cost of manure removal Per day/number of animals	
Any other costs?	

### ANIMALS BUYING AND SELLING

Purchased from traders Price per cow?	
Purchased by the owner direct from farmers, price per cow?	
Sales	
Old cows sold to who; Price?	
Calves sold to? Price	
How many calves are born in the colony? %?	

### DEATHS

Disposal of dead animal, price paid/cost?	
Disposal of dead calf, where?	
Disposal of placenta, where?	

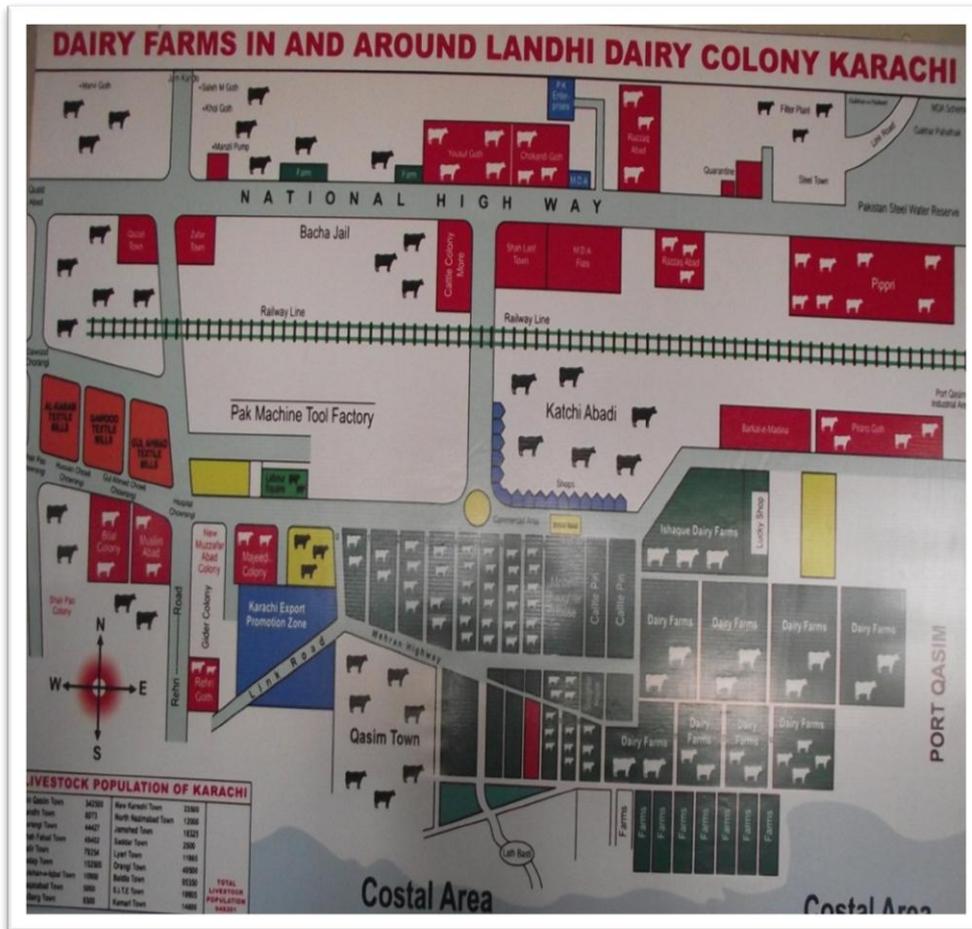


Figure 9 Comparative Analysis of existing dairy and livestock systems practiced in the Buffalo colony. Value chain assessment for milk and Meat from the colony.