

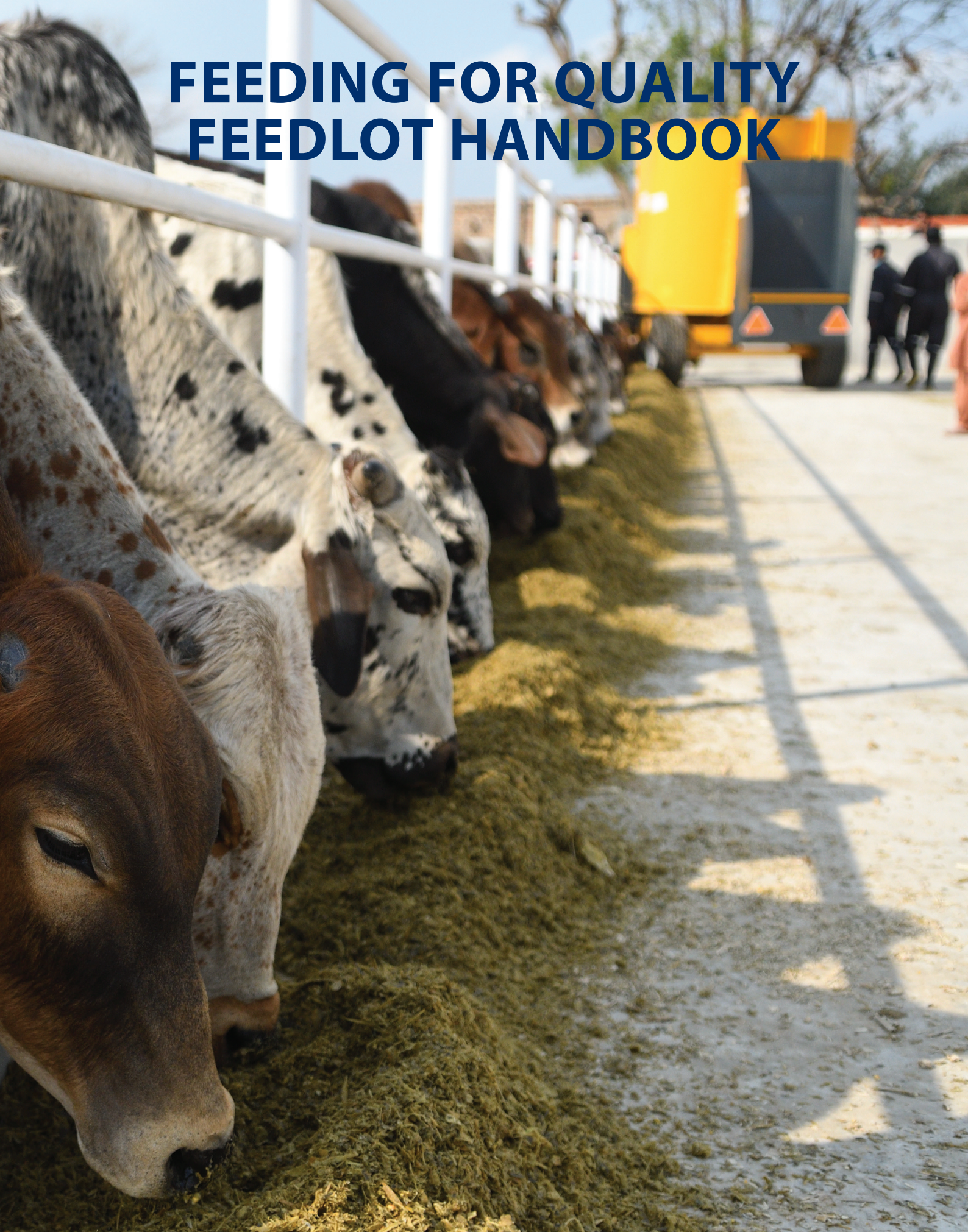


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**U.S.-PAKISTAN PARTNERSHIP FOR AGRICULTURAL MARKET DEVELOPMENT**

# **FEEDING FOR QUALITY FEEDLOT HANDBOOK**





## DATA PAGE

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## Acronyms

- AMD** U.S. Pakistan Partnership for Agricultural Market Development.
- CNFA** Cultivating New Frontiers in Agriculture.
- ISTTA** International Short-Term Technical Assistance.
- USAID** United States Agency for International Development.



## I. INTRODUCTION

The export beef from the cattle resources in Pakistan must meet the quality requirements of importing countries. Meat quality ultimately is determined by consumer acceptance with quality preference weighted by cost considerations.

Meat quality from the consumer aspect is made up of various components:

- Taste
- Tenderness
- Juiciness
- Palatability

The beef for export should be of consistent quality to satisfy the market requirements. Quality is measured in many countries by third party evaluation. Countries that feed bos Indus cattle only three have a quality grading system. United States of America and Australia use a grading system based on marbling plus age and sex of slaughter animal whereas; South Africa grading system is based on external fat covering and age of the animal. Countries have established these systems that best allows consistency of product for their consumers. Presently there is not a grading system in Pakistan.

This Handbook will present guidelines for Dairy Beef, Purchasing and Feeding Market Cattle to Improve Meat Quality, Cattle Feeding Guidelines and Feedlot Design: Requirements and Recommendations.

## II PURCHASING AND FEEDING MARKET CATTLE TO IMPROVE MEAT QUALITY

Beef quality and composition is important to cattle producers, meat packers and retailers, and consumers. Consumers desire cuts of beef that are lean, nutritious, and possess desirable eating characteristics. Quality indicates the factors related to the sensory characteristics of tenderness, flavor, color, texture and juiciness. The quality reflects the cooked product's overall acceptability. Finishing cattle in a feedlot to weights that have minimum of 28%, body compositional fat is necessary to produce higher quality beef compared to older grass fed and older cattle direct from the market. Cattle direct from the market depending on weight and age will require fattening from 90 to 120 plus days.

### A. PAKISTAN CATTLE MARKETS FOR QUALITY BEEF

#### Qurbani Cattle Purchased

1. Highest value cattle are bulls fed for 1 year or longer and become bulls weighing more than 600 to 800 kg.
2. Bulls purchased at 250 to 300 kg are customarily fed for 120 to 140 days after arrival with a finish weight 400 to 500 kg
3. Cows are 24 months of age or older are fed for shorter periods for Qurbani only.

#### Feed lot cattle for export

1. Bulls should be purchased consistently over the year for export market
2. Bulls should be purchased as young as possible for best growth and efficiency

The Qurbani cattle were estimated to be 3 million cattle in Pakistan and are marketed over a short period.

The Qurbani cattle were estimated to be 3 million cattle in Pakistan and are marketed over a short period.

The marketing of cattle in Pakistan is a 2-phase market system. The Qurbani cattle are one group of cattle that is market over a short period. The export market needs cattle harvested for Qurbani to export to ex pats and to establish an export market of Halal harvested cattle needs a uniform supply for every week of the year. Feedlots producing export beef have to plan how they will develop for the two programs, Qurbani and Halal cattle for export market.

## **B.PURCHASING CATTLE FROM LOCAL MARKETS**

Issues when purchasing cattle from local markets:

1. Heavily infected with internal parasites
2. Parasites decrease average daily gain and increase dry matter Feed to Gain
3. Age is not known (teeth is an estimate)
4. Previous nutritional history is not known

A deworming program is essential when arriving at the feedlot. The internal parasites have been a major deterrent for average daily gains along with improper nutrition prior to entering feedlots for high quality beef. The parasites are throughout the gastro-intestinal tract from cattle purchased at the local markets. The parasites consume the feed (nutrients) for their growth and reproduction not allowing absorption of nutrients to the host cattle. The physiological effect of parasites is anti nutrition.

Major Limitations success of feeding cattle in Pakistan heavily Infested cattle with parasites at arrival at the feeding facility

1. Gastro intestinal parasites
2. Liver Flukes
3. Coccidiosis

### **Proper nutrition starting market cattle**

Processing and starting cattle on feed is important first step in producing beef cost effectively. This begins with arrival the first day with processing and teaching cattle to consume a nutritional adequate diet. This occurs during the first 21 to 28 days after arrival for efficient utilization of the feed.

### **Management Newly Arrived Market cattle**

1. Purchase cattle as quick as possible.
  - a. When cattle are purchased over a 2 to 4 week period
  - b. The cattle that come in over that period will re-infect the cattle with FMD and respiratory disease and parasites, if not process properly
2. Each individual group arriving daily should be processed as a cohort
3. Another alternative have quarantine pens separate from cattle previously processed.
4. After cattle arrive, the cattle have to learn how to eat from a feed trough and drink from a water trough.

5. Need pens that have fence line feed troughs so workers can feed cattle without entering the pen. See Feedlot design publication. Tie facilities follows same procedures but require different modifications of feeding and water availability
6. Water should be available free choice at all times to all cattle. See Feedlot design publication.
7. Market purchased cattle handled as Stressed Cattle

Table 1 shows data from the USA a long-term study from cattle after weaning through a pasture grazing and entering the feedlot. The data below show the impact of parasites and the effect of deworming cattle. The immune system becomes immunodeficiency (or immune deficiency) is a state in which the immune system's ability to fight infectious disease is reduced. The health data comparison shows the immune deficiency because of internal parasites. This study used albendazole as the dewormer. Note less animals treated for sickness and death.

*Table 1 Performance Difference between Dewormed Cattle and Cattle Non-dewormed*

Items	Non-dewormed Cattle (Kg/day)	Dewormed Cattle (Kg/day)	Deworming Cattle Advantage (Kg/day)	Deworming Advantage %
Cattle Prior to Entering the Feedlot	0.42	0.61	0.19	45.2
Average Daily Gain in Feedlot	1.75	2.0	0.25	14.3
Feed Efficiency Feed to Gain	5.75	5.42	0.33	5.7
Number of Animals Treated for Disease	22	4	18	Greater than 100% Improvement
Number of Animals Died	4	0	4	Greater than 100% Improvement

There are many dewormers in the market place and all work but most kill adults parasite and have to be used twice albendazole kills both mature and immature parasites.

The cattle from local markets will be underdeveloped according to weight age. Cattle severely affected with underdevelopment (weight) with age are in a survival mode and may not develop their genetic potential for gain. After deworming develops in some feces may contain parasites and lining from the intestines where parasites were heavily infected parasitism Figure 3. This is mostly common in heavily parasitism in the animal and not from, the feed. The cattle have damage throughout the entire gastro-intestinal tract and the absorption of nutrients in the lower tract is impaired severely. The lining will recover slowly and feed intake dry matter is reduced as intestinal lining repairs.



*Figure 1 Feces from Heavily Parasite Infection*

## Feedlot Considerations Receiving Market Purchased Cattle

1. Purchase cattle as quick as possible.
  - a. When cattle are purchased over a 2 to 4 week period
  - b. The cattle that come in over that period will re-infect the cattle with respiratory and parasites
2. Suggest having pens that contain 50 to 75 head and have cattle numbers filled in less than a week preferable with 2 to 3 days.
3. Another alternative have quarantine pens are areas separate from cattle already process.
4. After cattle arrive, the cattle have to learn how to eat from a feed trough and drink from a water trough. Need pens that have fence line feed troughs so workers can feed cattle without entering the pen. See Feedlot design publication.
5. Water should be available at all times inside the pen. (See Feedlot Design in this Handbook.)
6. Market purchased cattle handled as Stressed Cattle
7. Feed TMR Feedlot Starter ration with Hay at arrival Daily recommendation (see Feed Management and Operational Handbook).

Example Feedlot Starter rations without silage and with silage (Table 2).

Ingredients	Silage		No Silage	
Rice Polishings	20.0		24.0	
Maize Gluten 30	19.0		24.0	
Wheat Bran	9.0		6.0	
Maize Cracked	19.0		22.0	
Cane Molasses	8.0		12.0	
Wheat Straw	4.0		9.0	
Urea	0.5		0.5	
Salt	0.5		0.5	
Milkovate (Mineral Vitamin Mix)	0.5		0.5	
Finely Ground Marble	1.5		1.5	
Maize Silage	18.0		0	
Total	100.0		100.0	
	As Fed	Dry Matter	As Fed	Dry Matter
Dry Matter %	79.0	100.0	88.5	100.0
NEM MCAL/kg	1.41	1.78	1.57	1.77
NEG MCAL/kg	0.92	1.61	1.02	1.15
Crude Protein %	12.7	16.1	14.3	16.1
NPN Protein %	1.43	1.8	1.43	1.6



Crude Fiber %	5.9	7.42	6.5	7.39
Crude Fat	4.69	5.93	5.31	5.99
Calcium %	0.73	0.93	0.76	0.86
Phosphorus %	0.54	0.68	0.59	0.67

**Note:** Dry matter cost is the essential the same. Dry matter directly relates to gain. Used last cost information. Remember it is the dry matter cost that is important.

### C. SUMMARY

Issues to solve:

1. Parasites are the one biggest issues for getting better gains.
2. The issue of age and weight determines where cattle are on the growth curve. Need to feed cattle less than 2 years old.
3. The third issue need to feed to appetite to allow the cattle to reach genetic potential.
4. The TMR should be consistent and ingredients should not be changed during the feeding system, this requires a change in rumen flora and little or no gain is accomplished during this time.
5. The two rations proposed have the same dry matter cost and that is the cost to calculate cost of gain.
6. Dry matter intake is the most important variable.
7. Recommend to have a mixing center and all rations is mixed.

## II. CATTLE FEEDING GUIDELINES

Cattle coming directly from mandies or backgrounding operations have neither the size nor finish (fattening) to adequately supply the market with quality beef demanded to the consumer either export or domestic. Consequently, these cattle must be placed in feedlots to complete the growing-finishing (fattening) phase. Cattle feedlots are a growing industry and are become a specialized to produce high quality beef. The challenges in Pakistan are efficient cattle feeding facilities in subtropical climate and modern feedlots. Beef farming could be a high value alternative for the Agriculture, livestock farmers and an investors. This manual explores the viability of backgrounding and feedlot fattening and aimed to provide a guideline on site selection, layout and construction options for the agriculture and livestock farmer. This Handbook is aimed for the Feedlot operators and farmers. The phases of quality beef begins with the cow production unit small share holder and commercial production of weaned calves, after weaning a growing phase to develop the genetic potential for muscle and the final phase feeding in a feedlot to produce the desired finish.

### A. MINERAL AND VITAMINS REQUIREMENTS FOR FEEDLOT CATTLE

The requirements for minerals and Vitamins for Growing and Finishing cattle Rations are in Table 3.

Table 3 Requirements for Minerals and Vitamins for both Growing and Finishing Cattle

Dry Matter Basis		Comments
Macro Minerals		
Sodium, %	0.06 – 0.15	0.5 Salt meets the requirements
Calcium, %	1.0 – 2.0	Calcium to phosphorus ratio 1.4 to 2.0 is important to maintain
Phosphorus, %	0.25 – 0.50	
Magnesium, %	0.10 – 0.15	
Potassium, %	0.70 -1.50	
Sulfur, %	0.10 – 0.20	
Trace Minerals		
Iodine, PPM	0.5- 1.0	0.5 Iodized salt can meet requirement MTL 50
Iron, PPM	100 -300	
Copper, PPM	10 - 20	Maximum Tolerable level (MTL) 100 PPM
Zinc, PPM	100 -300	Maximum Tolerable level (MTL) 500 PPM
Selenium, PPM	0.10 – 0.30	Maximum Tolerable level (MTL) 2 PPM
Vitamins		
Vitamin A IU/kg	4500 - 6500	
Vitamin D IU/kg	400	Necessary for animals not exposed to sun
Vitamin E IU/kg	100 - 125	

Comments are precautions and guidelines for the minerals and vitamins added to the rations. These guidelines are for all feedlot rations in this report. Beef trace mineral and vitamin or dairy trace mineral and vitamins can be adapted.

## B. FEEDLOT CATTLE FEEDING GUIDELINES

Cattle purchased directly from the local markets could be Sahiwal, Red Sindhi, Cholistani, Local cattle Crossbreds and Non Descript cattle; however they are all based Bos Indicus breeds. The weights purchased for finishing recommended from 230 kg to 250 kg for finishing and final weight of 340 kg to 400 kg. Finish weight depends on the specification of the export abattoirs. Days on feed are not a criteria but finish weight is the major criteria. The cost effective ration is a ration that cost less per kg of gain than the sell price per kg of live weight at finish.

Nutrient Guidelines for finishing cattle from 230 kg to 250 kg finishing weight 340 kg to 360 kg. However, if a weight desired is greater than 340 to 400 are required. These guideline can be used to reach desired weights.

Starter ration is important and should be used in Feedlot cattle however Dairy Beef should use a different starter ration, grower and finisher see Dairy Beef requirements in this manual. Starter Ration should be fed between 75 - 90% dry matters. Guidelines for feedlot starter ration are in Table 4 (dry matter basis).

Table 4 Nutrient Requirements Dry Matter Basis Starter

Nutrient	Dry Matter Basis %
Protein, %	14.0 – 15.0
Net Energy of Maintenance, MCAL/kg	1.6 – 1.7
Net Energy of Gain, MCAL/kg	1.0 -1.1

The Intermediate or Grower ration should be fed until 75 kg prior to target finish weight. The Grower ration can be used as a Background ration. Guidelines for feedlot Intermediate or Grower ration are in Table 5 (dry matter basis).

Table 5 Nutrient Requirements Dry Matter Basis Finisher Cattle

Nutrient	Dry Matter Basis %
Protein, %	14.0 – 15.0
Net Energy of Maintenance, MCAL/kg	1.7-1.8
Net Energy of Gain, MCAL/kg	1.1-1.2

Finishing ration is fed the last 75 kg prior to finish weight. Grower ration are in Table 6 (dry matter basis).

Table 6 Nutrient Requirements Dry Matter Basis Finisher Cattle

Nutrient	Dry Matter Basis %
Protein, %	14.0 – 15.0
Net Energy of Maintenance, MCAL/kg	1.8-2.0
Net Energy of Gain, MCAL/kg	1.2-1.4

These values are Guidelines for the different ration however, feed to gain and gain is based on dry matter intake. As the animal grows and finishes dry matter intake increases and the amount of energy, protein, minerals and vitamins increase in amounts to support growth and finishing of cattle. The starter ration should be fed until all animals in a group been process and no sickness is evident. The Intermediate or growing rations are programmed as step up rations and a growing ration and may be fed short days or long days depending on starting weight and finish weight, however as a step up ration should be fed 5 to 7 days minimum as a transition ration to the higher energy finishing ration. This scheme of feeding cattle allows cattle to grow muscle and finish the last 50 to 75 kg before target finish weight.

### C. BACKGROUNDING (GROWING CATTLE)

Backgrounding is the time allowed for the calf to grow and develop muscle, marbling, improved health and immunity on low cost feed and rations on forages and fodder or a TMR ration in a feedlot. Backgrounding cattle should include processing with deworming, FMD and other vaccinations. Backgrounding beginning weights are 150 -200kg to 250-300kg final weight. If cattle are Backgrounded cattle can come to the feedlot for finishing and adapt easily starter ration will only need to be fed during processing for 5 to 7 days and the Intermediate ration for 5 to 7 days depending on the weight from Backgrounding. Backing to accomplish the best results should produce gains of 0.9 – 1.2kg per day. Nutrient guidelines for Backgrounding are guidelines are in Table 7

Table 7 Nutrient Requirements Dry Matter Basis Background or Grower

Nutrient	Dry Matter Basis %
Protein, %	15-16
Net Energy of Maintenance, MCAL/kg	1.6-1.7
Net Energy of Gain, MCAL/kg	0.9-1.0

The feedlot should develop a daily yard sheet with daily information feed intakes, predicting growth and feed to gain for management. Record keeping can be found in the Feed Management and Operational Handbook.

### D. SUMMARY

Formulate ingredients available to give best cost or gain rations or least cost rations.

1. Rations should be between 20 and 30 percent moisture for finishing rations.
2. Rations should meet energy requirements and protein requirements, if protein is more than requirement that is ok.
3. Formulate ingredients dry matter fat not to exceed more that 7-8%.
4. Do not Formulate feedlot finishing Ration over 1.4 net energy of gain (NEG).
5. Feed cattle to appetite twice a day.
6. Efficient cattle feed should be fed to appetite for best efficiency (Details in Feed Management and Operational Handbook).



## IV. Feedlot Design

Construction of a new feedlot or expansion of an existing feedlot requires adequate planning. The goals of planning cattle feedlots are to:

- Minimize animal and worker stress during handling,
  - Feed cattle in an adequate and efficient manner,
  - Provide well drained cattle space,
  - Maintain efficiency and profitability of feeding operations, and
- Protect the surrounding environment.

Feedlots in Pakistan was mostly tied Feedlots with intense labor requirements and have been develop over many years as small numbers of cattle feeding facilities Commercial feedlots of 500 head or larger are more efficient as open space with free access to free feed and water with shades for sub tropical and tropical climate. Figures in this section are figures from feedlots used as examples to illustrate the proper design.

### A. SITE EVALUATION

Consideration for site for a new Feedlot:

1. Available water supply for the cattle.
2. Land topography, present and future cattle numbers and accessibility.
3. A soil with 25 percent or more clay is preferred to sand or fractured rock structures.
4. A 2 to 6 percent land slope is recommended or the land has to be shaped for the feedlot. Mounds can be used in the pens to aid drainage in flat land.
5. Annual rainfall as rain fall increases the slopes for drainage increases.
  - a. Below 20 inches annual rain fall slopes 2 to 4%.
  - b. 20 inches 35 inches annual rain fall slopes 3 to 5%.
  - c. Greater than 35 inches annual rain fall slopes 4 to 6%.
6. All extraneous runoff needs to be diverted away from the feedlots and roads.
7. For new sites, this is most easily accomplished by sitting the feedlots on a ridge or elevating the feed road to construct a diversion channel.
8. Terrain and drainage determines bunk orientation, but it is preferred to orient the bunks in the north-south direction.
9. Site evaluation also includes development and location of the working facilities.
10. Most operations are better suited to move cattle out the lower side of the pens rather than onto the higher side.
11. Additional space may be needed for sick or receiving pens.
12. Trucks and stock trailers must have easy access to the working facilities.
13. A circular turning area is preferred to the backing of trucks and trailers.
14. Location to abattoir (slaughter house).
15. Location of available feedstuffs.

## B. PLANNING

### 1. Layout of the feedlot.

#### I. Space Requirement.

1. Approximately acres of land is necessary to accommodate 500 head of cattle, which includes pen space, alleys and feed roads.
2. One acre to 1.5 acres is necessary per head of cattle for a farming operation. This would be enough land for manure disposal and to supply feedlot with a portion of the feedlot feed needs depending on irrigation or not and crops produced.

#### II. Water Requirement.

1. The amount of water varies with weight of the animal and temperature. Table 8 shows the needs for the cattle.

Table 8 Water needs for feedlot cattle.

Beef Cattle Weight (kg)	Air Temperature		
	10°C	20°C	30°C
180	9-16 liters	11-22 liters	18-36 liter
270	11-22 liters	15-30 liters	23-45 liter
360	14-29 liters	18-39 liters	29-64 liter
450	17-36 liters	23-50 liters	36-82 liter

Water requirements are affected by many factors, and it is impossible to list specific requirements with accuracy. Water intake equation for feedlot cattle has been developed:

$$\text{Water intake (liters/day)} = -18.67 + (0.3937 * MT) + (2.432 * DMI) - (1.52 * PP) - (4.437 * DS).$$

MT is the weekly mean maximum temperature in degrees Fahrenheit

DMI is dry matter intake in pounds fed daily.

PP is precipitation in inches per day.

DS is the percent of dietary salt in % in the dry matter of the ration.

2. Avoid salty water.
3. He water needs to be of good quality. Water quality guidelines can be found in the Feed Management and Operational Handbook.

### 2. Pen Size

- I. 50 animals in a pen
- II. 75 feet<sup>2</sup> to 150 feet<sup>2</sup> per animal
- III. 50 head pens would be 50 feet by 125 feet (125 feet<sup>2</sup> per animal)
- IV. The more annual rainfall the more square feet required per animal
  1. Below 20 inches annual rain fall 1002 per animal
  2. 20 to 35 inches annual rain fall 1502 feet per animal
  3. Greater than 35 inches annual rain fall 1752 feet per animal

### 3. Pen Arrangement

1. Single row.
2. Double rows.



Figure 2 Example of single row



Figure 3 Example of a Double Row

1. Pens can be built out of any available material wood, trees, cable, pipe or fencing of different types.
2. Pens can be built out of any available material wood, trees, cable, pipe or fencing of different types.
3. Other arrangements can be done around a hillside or an area with slope. Plan how the water will flow out of the pen. Water should flow away from the feed troughs and out to a retaining pond.
4. Shade can be place over the feed trough but if over the feed trough should have shade in the pens for the cattle.

The design below shows a good gate structure to move cattle out of the pens to the cattle working alley and shows how the water drains from the pen into the cattle alley and to a retention pond.

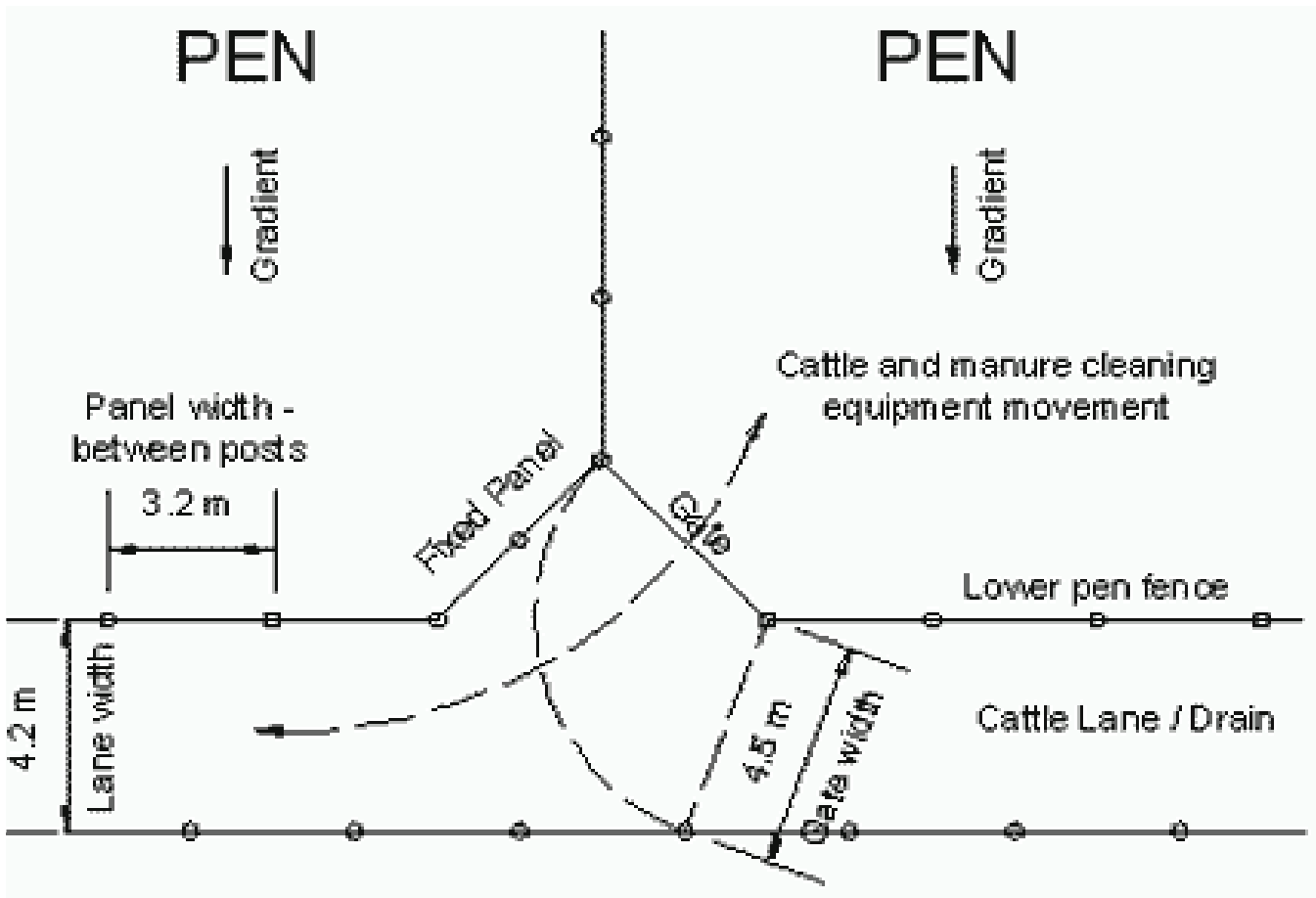


Figure 4 Designs of Pen Gates and Drovers (Cattle Lane) and Drainage

#### 4. Working Facility and Load Out

1. The working facility should have a squeeze chute to handle cattle
2. Cattle in the crowd pen can see a minimum of 2 body lengths up the chute
3. Cattle make a 180° turn through the crowd pen



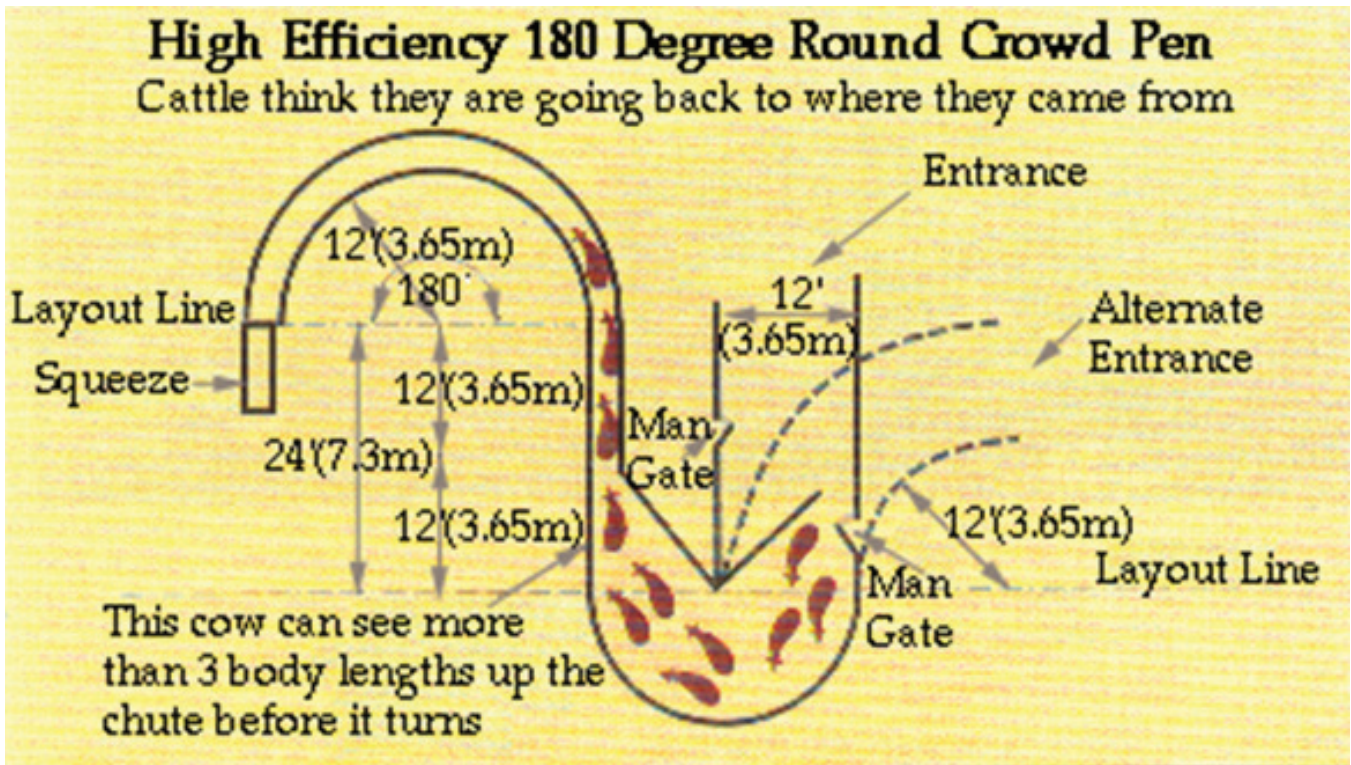


Figure 5 Working Facility



Figure 6 Squeeze Chute

Load out or Unload should have raised ramp that adjustable for different trucks height off the ground.

## 5. Shade

1. Benefits of shade
  - a. The size of the shadow cast by the shade
  - b. The location of the shade
  - c. The orientation of the shade
  - d. The type of shade material
2. Shade should be placed on an east west axis for the most coverage
3. Shades should maximize ventilation
4. Shades should be 5 meters high or higher for proper ventilation
5. Shade material can be any type material from metal to cloth.

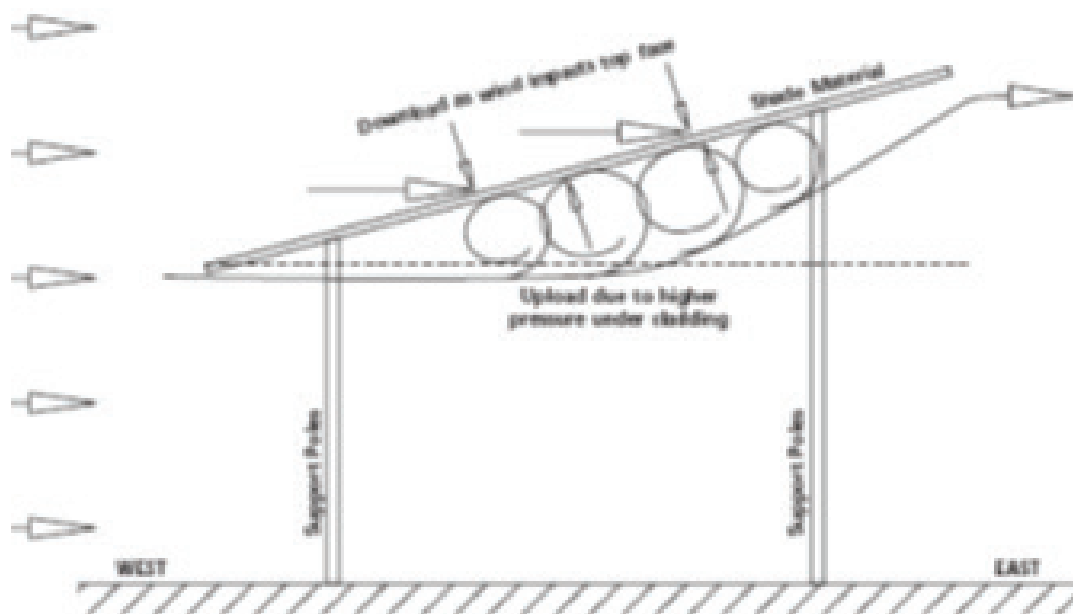


Figure 7 Properly Built Shades in Pens



*Figure 8 Shades over Double Row Feeding Alley*

## 6. Aprons

1. Aprons should be at least 10 to 15 feet wide.
2. Aprons should have a slope of 8% so that water will move off of the feeding area and be removed from the pen.
3. The slope needs to be greater than the pen slope so the manure and water will move easily off the apron and away from the feed trough.
4. Aprons should be attached to trough so that rats cannot get under feed trough.

## 7. Water Troughs.

1. 2 to 3 inches per head available space.
2. Water pressure.
  - a. Rate of flow 10 liters per hour.
  - b. More flow maybe required in hot weather.





Figure 9 Water Trough in Middle of Pen

## 8. Feed troughs

1. 12 to 18 inches of feed trough length for twice a day feeding.
2. Feed troughs with rounded bottoms are less likely to have feed build up in the bottom corners
3. Feed troughs should be easy to clean if needed.
4. Feed troughs can be made of metal, wood or concrete

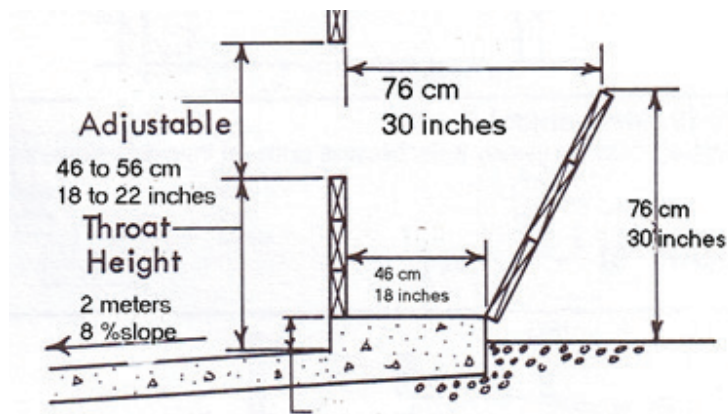


Figure 10 Cross Section of a Feed Trough



Figure 11 Feed Troughs in a Double Row

C. SUMMARY

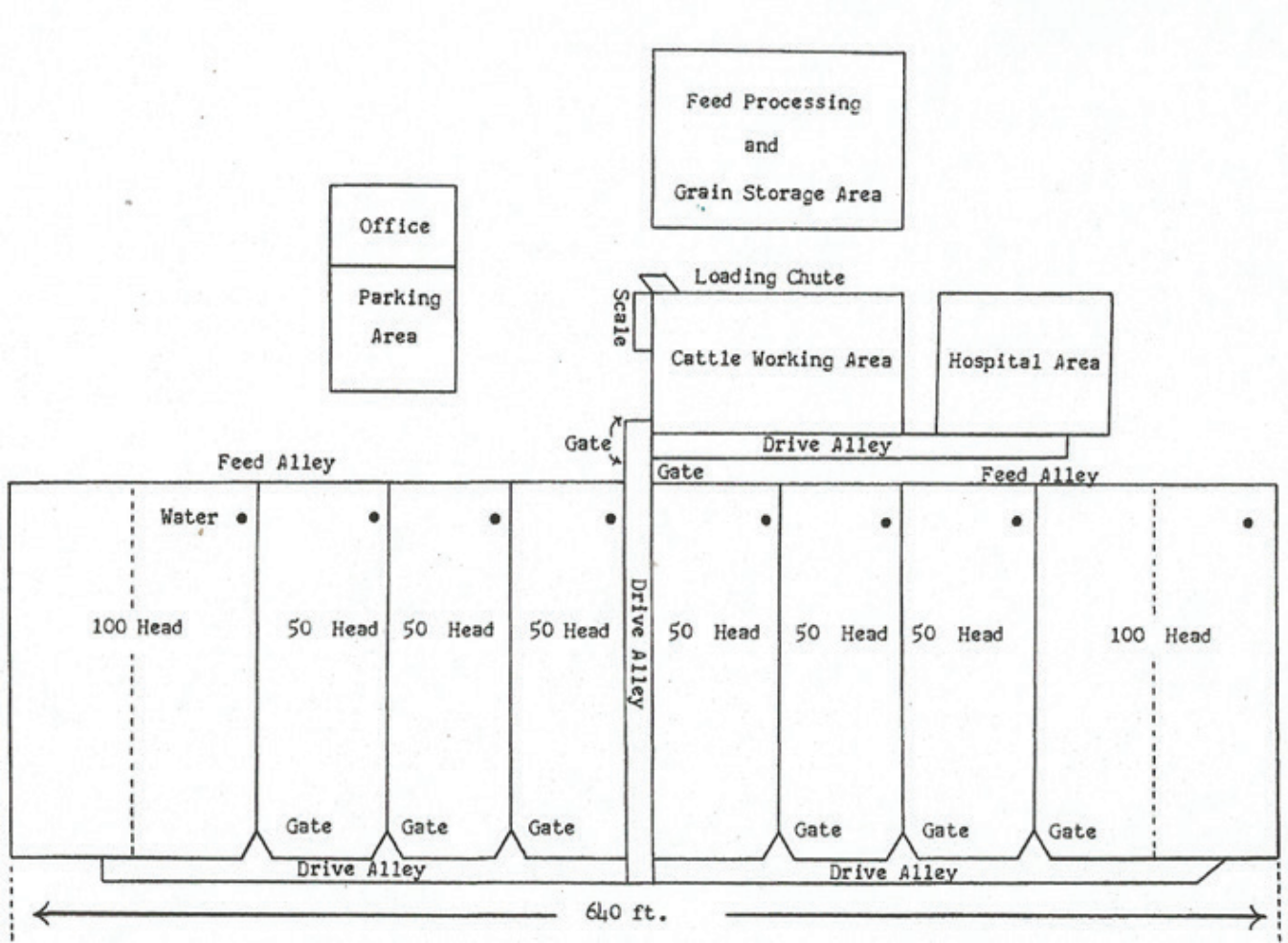


Figure 12 Five Hundred Head Cattle Feedlot

