

# Minerals for Beef Cattle



TEXAS AGRICULTURAL EXTENSION SERVICE  
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# Minerals for Beef Cattle

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Beef cattle need minerals.\* The ones most likely to be needed are sodium, chlorine, phosphorus and calcium. Small amounts of magnesium, manganese, iron, copper, cobalt, iodine, boron, sulphur and zinc are required and are generally spoken of as "trace" elements or minerals. Sufficient amounts of these are usually supplied in natural forage and balanced rations. The first two—sodium and chlorine—are supplied by feeding common salt. The other two—phosphorus and calcium—quite frequently require special measures.

Good pasturage, depending on the soil and climate, may supply all of the minerals needed by beef cattle. If minerals are present in the soil, they pass from the soil through pasture forage to the animals.

Adequate amounts of the essential minerals are not always supplied from natural sources. Soils become worn out. Certain minerals may have been lacking in the soil in the first place. When plant growth is stopped by drouth or cold, the forages weather, losing much of their feed value. In such cases, additional minerals are needed to make up the difference.

Mineral supplements are no cure-all, but at times they are necessary for successful grassland and feedlot cattle production. Minerals will not make up the deficiency in production caused by a shortage of feed.

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\*For simplicity this publication refers to mineral nutrients, mineral compounds or elements, as "minerals."

## *Phosphorus Deficiency*

Phosphorus is the mineral lacking most commonly in Texas pastures. A deficiency of phosphorus can be damaging and expensive, but the deficiency may be prevented by supplying phosphorus supplements or feeds (Table 1) which are rich in phosphorus.

TABLE 1. CALCIUM AND PHOSPHORUS COMPOSITION OF CERTAIN FEEDS

	Calcium		Phosphorus	
	Percent	Ounces Per Pound	Percent	Ounces Per Pound
Alfalfa hay	1.04	.16	.21	.03
Bone meal, raw, feeding	22.70	3.60	10.10	1.61
Bone meal, special steamed	28.70	4.60	13.90	2.22
Bone meal, steamed	30.00	4.80	13.90	2.22
Cotton seed meal — 43% Protein	.19	.03	.96	.15
Defluorinated superphosphate	28.30	4.50	12.30	1.96
Dicalcium phosphate	26.50	4.20	20.50	3.28
Disodium phosphate (crystalline)	.00	.00	8.60	1.37
Johnsongrass, dried, bloom	.58	.09	.21	.03
Limestone	38.30	6.10	.00	.00
Meat and Bone Scraps — 50% Protein	9.65	1.5	4.81	.76
Monocalcium phosphate	16.00	2.50	24.00	3.84
Monosodium phosphate (anhydrous)	.00	.00	25.00	4.00
Oyster shell flour	36.90	5.90	.00	.00
Peanut meal — 43% Protein	.17	.03	.44	.07
Sorghum hay	.46	.07	.14	.02
Soybean oil meal	.26	.04	.61	.09
Spent bone black	22.00	3.50	13.10	2.09
Tankage — 60% Protein	5.88	.94	3.14	.50

About one ounce each of calcium and phosphorus meets the daily requirements of bulls and wet cows. Dry cattle need about three-fifths ounce of each. Mineral requirements vary with the age, sex and purpose of the animal. Table 2 shows the daily requirements for dry feed, calcium and phosphorus for beef cattle.

TABLE 2. RECOMMENDED DAILY DRY FEED, CALCIUM AND PHOSPHORUS ALLOWANCES FOR BEEF CATTLE\*

	Weight in lbs.	Daily feed lbs.	Calcium Ca ounces	Phosphorus P ounces
Wintering weaned calves.....	400	11	.56	.42
	500	13	.56	.42
	600	15	.56	.42
Wintering yearlings.....	600	16	.56	.42
	700	17	.56	.42
	800	18	.56	.42
Wintering bred heifers.....	700	20	.63	.56
	800	20	.63	.56
	900	18	.56	.53
Wintering mature bred cows.....	800	22	.78	.63
	900	20	.63	.56
	1000	18	.56	.53
	1100	18	.56	.53
Cows nursing calves.....	1200	18	.56	.53
	900—			
Bulls, growth and maintenance.....	1000	28	1.06	.85
	600	16	.85	.63
	800	18	.81	.63
	1000	22	.78	.63
	1200	24	.74	.63
	1400	26	.71	.63
Fattening calves finished as short yearlings.....	1600	26	.63	.63
	400	12	.71	.53
	500	14	.71	.56
	600	16	.71	.60
	700	18	.71	.63
	800	20	.71	.63
Fattening yearlings.....	600	18	.71	.60
	700	21	.71	.63
	800	22	.71	.67
	900	24	.71	.71
	1000	26	.71	.71
	1100	27	.71	.71
Fattening two-year olds.....	800	24	.71	.71
	900	26	.71	.71
	1000	27	.71	.71
	1100	29	.71	.71

\*Reprinted in part from TAES Bulletin 461 Revised 1947.

The cow in Fig. 1 tells one part of the story; the cattle on the cover tell the other. The cow in Fig. 1 shows the effects of a phosphorus deficiency, known as "creeps." Those on the cover are being fed a phosphorus supplement through a mineral box. They also receive feeds high in phosphorus.



**Fig. 1. This cow did not receive a phosphorus supplement and shows the effects of a phosphorus deficiency.**

Behind that “creepy” condition lies a series of contributing factors:  
Deficiency of phosphorus in the *soil* results in a  
Deficiency of phosphorus in the *grasses*, and this leads to a  
Deficiency of phosphorus in the *animal*.

An early symptom of phosphorus deficiency in cattle noticeable to stockmen will be depraved appetite. This condition may lead to the chewing of bones, sticks, stones and dead animal materials. The depraved appetite caused by a phosphorus deficiency may result in a secondary disease characterized by paralytic symptoms. It is called “loin disease” and is caused by toxins produced by micro-organisms of the botulinus type formed in dead animal material.

Phosphorus deficiency results in loss of appetite and weight, decline in milk production and failure to breed. With long continued phosphorus deficiency, cows become lame and stiff at the joints, or “creepy.”

On pasturage deficient in phosphorus, cows fed phosphorus supplements may average as much as 200 pounds heavier than cows not fed the supplements. Calves may be from 50 to 70 pounds heavier

at weaning age. It is possible to increase the calf crop as much as 30 percent. Breeding dates are more stabilized.

### ***When and Where Deficiencies Occur***

Phosphorus deficiency may occur at times in all sections of Texas. In some sections the deficiency is always present. Where deficiencies are always present, year-round use of mineral supplements will increase production.

In regions where rainfall is less than 30 inches a year, the young growing grasses are usually rich in phosphorus. But the phosphorus content diminishes with maturity. Dry and mature grasses are very low in the mineral and do not contain enough phosphorus for cattle of any age. Therefore, a phosphorus supplement should be made available at certain times of the year. However, the deficiency in such areas seldom become serious because of the excellent forage during part of the year. Also, stockmen in those areas usually feed concentrates containing phosphorus during the winter. Cottonseed cake and cottonseed long have been known as good feeds for "creepy" cows. In areas where the soils are most deficient in phosphorus, the phosphorus deficiency becomes much worse when the forage matures, when cold or drouth stops forage growth, or when the old forage leaches.

### ***Cattle Will Consume Bone Meal and Disodium***

#### ***Phosphate (Crystalline)***

Cattle will consume appreciable amounts of bone meal and disodium phosphate (crystalline) when they need phosphorus. When on good forage and gaining in weight they will consume only small amounts of bone meal or disodium phosphate (crystalline) and salt lick.

In Fig. 2, note that the weight of the mature cows forming the herd begins to decline about the first of November each year. Weights continue to decline until about the first of March. However, if cottonseed meal or cake is fed during the winter, weight losses are not so marked. When spring grazing becomes available supplementary feeding is discontinued, and the herd makes rapid increase in weight which is well maintained until fall.

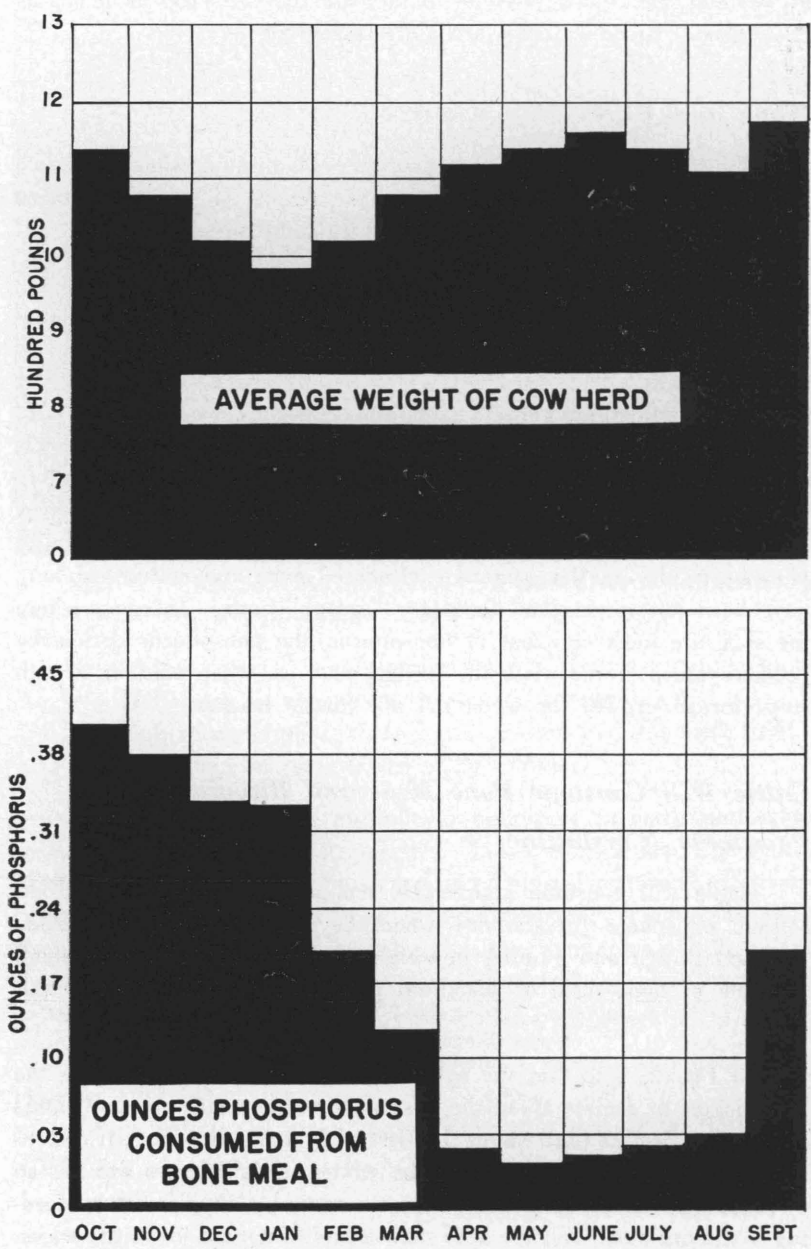
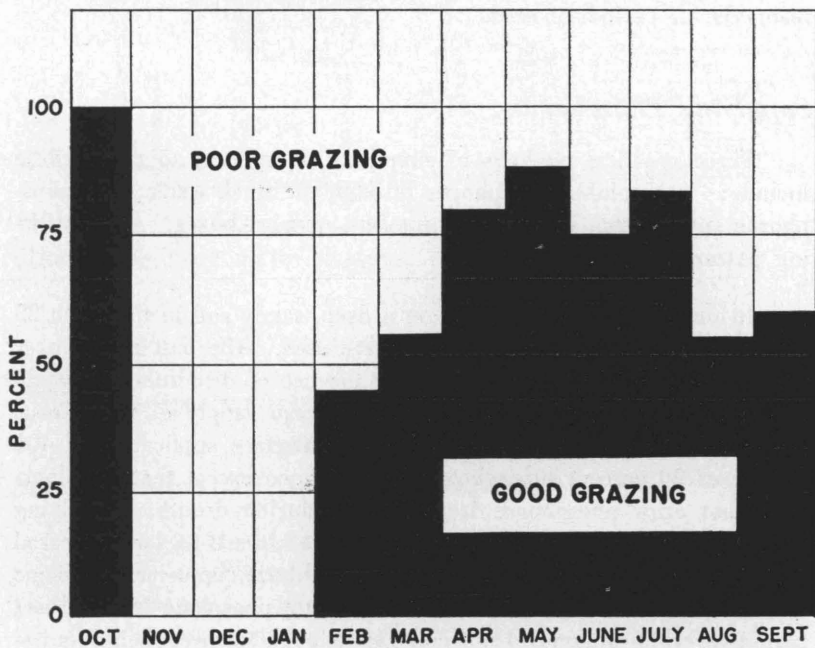
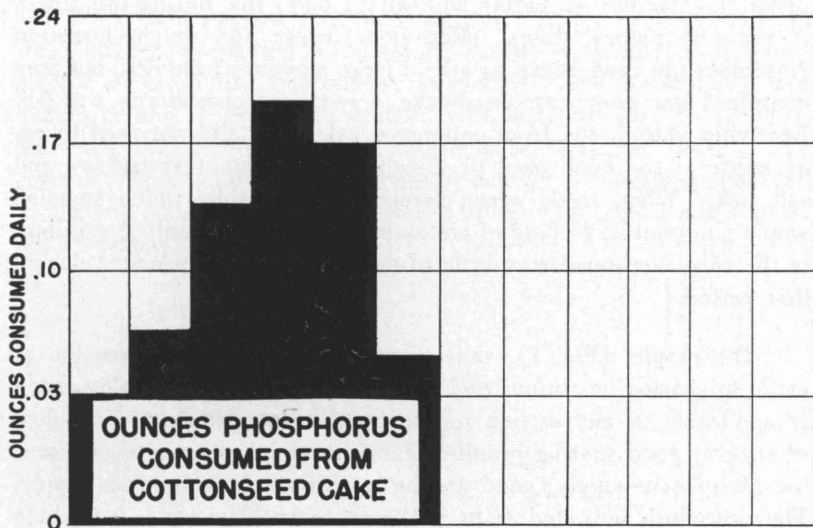


Fig. 2. Average ounces of phosphorus consumed from bone meal ; weight of cow herd during a two-year period at the East Texas Past





...nseed meal, percent of grazing on poor and good pasture and average ...gations Station, Lufkin, Texas (1939-1940).

What happened in the consumption of bone meal or disodium phosphate (crystalline) (2 parts) and salt (1 part) lick during this time? A perfectly natural thing. With poor forage and weight losses in November the cows began to take a large amount of the lick, but they consumed less when cottonseed cake, a source of phosphorus, was fed. Receiving phosphorus from cottonseed cake, they did not need to eat as much of the bone meal or disodium phosphate (crystalline) and salt lick. When fresh, green forage was available, which supplied ample phosphorus, feeding of cottonseed cake was stopped. Accordingly the cows consumed very little of the phosphorus supplement during that period.

The graphs (Fig. 2), show a natural picture of the reaction of cattle to grazing conditions and phosphorus supply. This information is applicable in any section of the State. Poor grazing means loss of weight; good grazing promises gain in weight; poor grazing means low phosphorus supply; good grazing assures ample phosphorus supply. The procedure indicated is to feed protein supplements in winter to supply both a balanced ration and phosphorus; use phosphate supplements during periods of need.

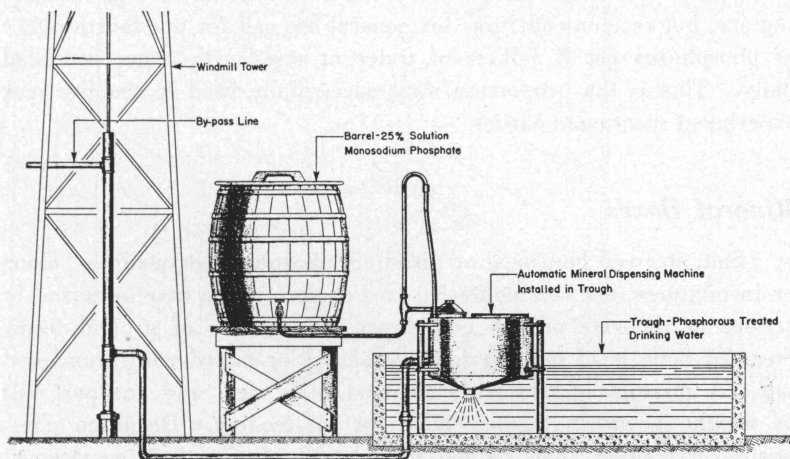
### ***Supplying Phosphorus***

Three practical methods of supplying phosphorus to range cattle include: (1) soluble phosphorus through the stock water; (2) phosphorus supplements in weather protected mineral boxes; (3) fertilizing pastures.

In one five-year experiment on a deep, sandy soil in the 20 to 25 inch rainfall belt, all three methods were used. The best results over the five-year period were obtained by the use of disodium phosphate in the stock water, with constant and uniform supply of phosphorus the principal advantage. Results from the surface application of 400 pounds of 20 percent superphosphate were good except that the plants could not draw phosphorus from the soil during drouth. Supplying bone meal or disodium phosphate (crystalline) in self-feeders increased production over that from native pasture without supplements. Some cattle did not take the bone meal or disodium phosphate (crystalline) regularly, while others did not consume enough to meet their requirements.

## Phosphates in Water

Where it is possible to control the water supply of cattle, as from wells, adding phosphorus to the water probably is the most satisfactory method of preventing phosphorus deficiency. This is especially true during periods of prolonged drouth. The materials may be added to the water troughs by hand, but an automatic dispenser (Fig. 3) has been developed which adds the desired amount of phosphate solution to a given amount of water. It can be used with almost any type of water system.



**Fig. 3.** An automatic dispenser which can be used with almost any type water system.

The two phosphorus compounds recommended for use in stock water are disodium phosphate (crystalline, or anhydrous) and monosodium phosphate (anhydrous).

### *Stock Solution for Automatic Dispenser*

The automatic dispensing machine requires the use of a stock solution. This solution should contain  $2\frac{1}{2}$  pounds of monosodium phosphate per gallon of water or 100 pounds to 40 gallons water. Disodium phosphate has a tendency to clog the machine and should not be used. Either kind may be used in hand distribution.

### ***Hand Method of Supplying Phosphorus in Water***

Soluble phosphate compounds may be added to the drinking water by hand. Any one of the following products are recommended for use except in earthen tanks or ponds:

Disodium phosphate (crystalline)—20 lbs. per 1000 gallons water

Disodium phosphate (anhydrous)—10 lbs. per 1000 gallons water

Monosodium phosphate (anhydrous)—8 lbs. per 1000 gallons water

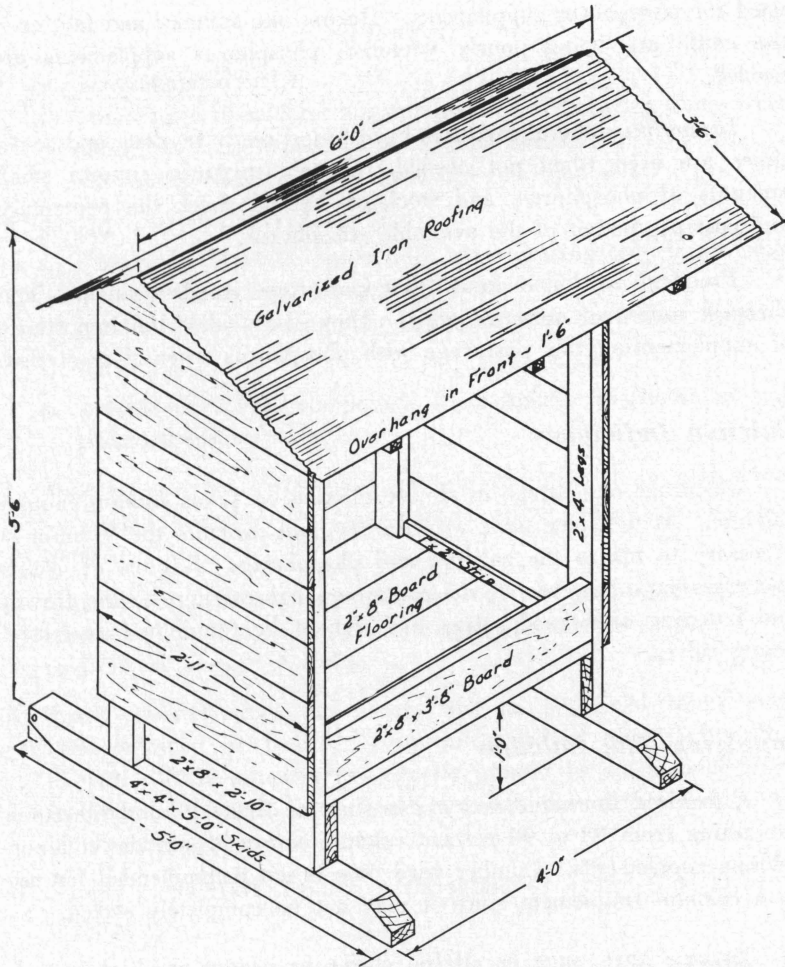
Phosphorus requirements and water consumption vary in different regions, but recommendations for general use call for one-fourth ounce of phosphorus per 8 gallons of water or one-fourth ounce per head daily. This is the proportion most successfully used in the five-year experiment mentioned earlier.

### ***Mineral Boxes***

Salt, steamed bonemeal or disodium phosphate (crystalline), alone or in mixtures, are commonly fed free choice. Each may be mixed in rations at the rate of one pound per 100 pounds of ground feeds. Steamed bone meal may be fed free choice or mixed with granulated salt. A mixture of two parts steamed bone meal and one part salt by weight is widely recommended for self-feeding. Disodium phosphate (crystalline) can be fed in the same proportions as steamed bone meal. Mineral boxes (Fig. 4) permit protection from wind and rain, lessen waste, insure constant supply and help preserve the quality of the minerals.

### ***Pasture Fertilization***

Pastures fertilized with superphosphate may supply beef cattle needs for phosphorus while the forages are green. In areas having very high rainfall and impervious soils, pasture fertilization alone may not be worthwhile unless other improvements are made. Such improvements might include adequate drainage, seedbed preparation and seeding to adapted grasses and clovers. Under favorable moisture conditions the forage yield is increased and it is more nutritious than from unfertilized pastures. In low rainfall areas the expense of pasture fertilization may not be justified.



**Fig. 4. Mineral boxes prevent waste. Order Blueprint No. 356.**

### *When Phosphates Are Needed*

Year-round use of phosphorus supplements is recommended in regions low in phosphorus.

Where the soil is not deficient in phosphorus or where pastures are highly fertilized, or the cattle are being fed as much as two pounds of 41 percent protein cottonseed cake per head daily, there is little

need for phosphorus supplements. During late summer and fall, or if the cattle are being poorly wintered, phosphorus supplements are needed.

Numerous mineral mixtures have found ready markets and sometimes are used when not needed. Certain mixtures contain small amounts of phosphorus, and stockmen should check the percentage and cost per pound of the available phosphorus.

Practical stockmen know that pasturage is the principal and cheapest source of most minerals. They also realize the importance of supplementing this pasturage with phosphorus when it is needed.

### *Calcium Deficiency*

Pasturage and forage in almost all parts of Texas contain enough calcium. At the same time, plentiful sunlight provides the Vitamin D necessary to utilize the calcium and phosphorus. Rations of grains and grass hays, however, do not contain enough calcium for the growth and fattening of weaned calves, and rickets are found in barn-reared young calves.

### *Supplying The Calcium*

Pulverized limestone and oyster shell or finely ground limestone containing from 92 to 98 percent calcium carbonate are the common calcium supplements. Lumber yard lime is not recommended for use as a calcium supplement since it may not be completely slaked.

Legume hays, such as alfalfa, clover or peanut are high in calcium, compared with grass hays, such as Johnsongrass or other sorghums. When cattle are fattened on grain and grass hays, it is advisable to feed about one-tenth pound of limestone flour or pulverized oyster shell daily per head as a calcium supplement. This should be mixed with the ground grain and cottonseed meal. Fattening rations allowing three to four pounds of alfalfa hay daily per head for yearling or older cattle need not be supplemented. Calves, however, should get the supplement even with the alfalfa, since they need a good deal of calcium for growth and because they have a limited capacity for hay.

## *Summary*

1. Supply granulated SALT:
  - a. Free choice in mineral box for all cattle (except in those areas along the coast where cattle do not lick salt).
  - b. Two parts steamed bone meal and one part salt.
2. Supply PHOSPHORUS through:
  - a. Pasture fertilization—good only when grazing crop is growing.
  - b. Steamed bone meal in mineral box.
  - c. Soluble phosphate compounds by hand in controlled drinking water.
  - d. Soluble phosphate compounds by automatic dispenser in controlled drinking water.
3. Minerals are not “cure-alls,” yet are essential along with other nutrients; namely, proteins, carbohydrates, fats, vitamins and water.
4. Mineral requirements vary with age, sex and purpose of cattle as shown in Table 2. The calcium and phosphorus content varies in feeds as shown in Table 1.
5. Texas research work has shown that no beneficial results have been obtained by feeding “trace minerals” in addition to phosphorus. Trace minerals are usually present in adequate amounts in natural feedstuffs. Improperly fed cattle are deficient in almost all essential nutrients.
6. Supply CALCIUM through a limestone or oyster shell flour in mineral box.

### *Acknowledgement*

A portion of the information in this bulletin was taken from Texas Agricultural Experiment Station Progress Report 1100, "Phosphorus for Range Cattle" and Progress Report 1341, "Supplying Phosphorus to Range Cattle Through the Fertilization of Range Land".