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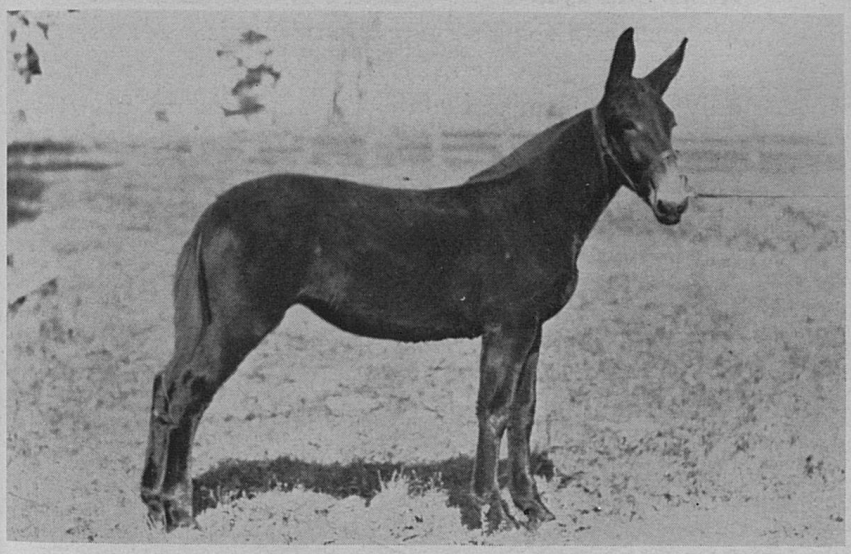
CIRCULAR NO. 306

WORKSTOCK



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WORKSTOCK

Horses or mules are necessary on all farms that are cultivating farm crops and producing livestock. They can be raised by the use of farm-grown grasses and grains, and can be maintained while at work by farm-produced feeds. Mares are desirable on many farms because they not only do the farm work but they also can produce horse or mule foals, if desired. The young animals have an attractive sales value if not needed for replacement. Horses and mules are versatile. They can be worked single, double, or in multiple-hitch. They can be used on steep or rough land. They can be ridden or driven on unpaved country roads; and they are useful in hauling crops from wet fields.

Circular No. 306

WORKSTOCK

By W. S. Anderson

In American agriculture power animals have always played an important part. The early farmers used oxen as well as horses but they have been almost completely replaced by horses and mules. About 1920, horses and mules reached the maximum number of 26,000,000 in the United States; but due to the greater use of automobiles, trucks and tractors the number has decreased to 16,000,000 at the present time. Horse and mule breeding has fallen off in the interval from one and one-half million foals annually to less than one-half million. The annual loss of a million foals and the high death rate because of old age has produced an acute shortage of workstock.

The decrease in horses and mules in Kentucky was from 675,000 in 1920, to 450,000 in 1937, which number is less than two for each farm in the state. A recent survey indicates that there are on the average slightly less than four stallions and four jacks standing for service, per county, in Kentucky; not enough, if used to full capacity, to sire as many foals as are needed for replacement. An unusually large percent of horses and mules are aged animals and the death rate will deplete the numbers rapidly. While there has been considerable increase in breeding in the last two years, not enough foals are being produced to replace the loss by death and other causes. Farmers are buying horses shipped in from other states, a practice which seems unwise when it is evident that horses of a more excellent quality can be produced on Kentucky farms for less cost than is being paid for the imported ones.

THE PLACE OF WORKSTOCK IN AGRICULTURE

In Kentucky and many other states there are farming areas where work animals are indispensable. Small farms, hillside fields, rolling land and poorly drained areas can be successfully and economically farmed only by the use of horses and mules. The economic advantage of the use of workstock instead of power

machinery for farm use is that horses and mules can be raised on farm-produced grasses and grains and maintained, while at work, in the same way. Farmers who own rolling or infertile farms, or who are farming on a subsistance basis are unable to purchase tractors or other power machinery. Such farmers are able to raise horses or mules and to use them to do farm work with the outlay of but little money. The grasses, hays and corn stover can be utilized for roughage not only for growing young workstock but with the addition of but little grain to maintain them while at work.

There is much work on large as well as on small farms that can be done successfully and economically by horses or mules. The horse is indeed the utility animal of the farm. He not only does all the power work of preparing fields for planting but he also does the cultivating. He is used to harvest the mature crop and likely later to haul it to market. The horse may be ridden on various errands from place to place on the farm or from farm to farm or other visitation.

On large level farms growing crops for market, farm power

FIG. 1. A hard-working farm mare, light type, with her promising weanling by a draft stallion.

machinery may be used to advantage but the vast majority of those larger farms keep and use some horses and mules to supplement the work of power machinery.

THE FARM BROOD MARE

Suitable brood mares are necessary for farmers to produce good horses and good mules. No one type of brood mare is suitable for all farmers and all sections of the country. The sections of the country that produce cotton require a peculiar type of farm workstock, mainly small to medium mules. North of the cotton belt is a territory that is more or less broken and the farms are not large. This territory requires horses and mules of a heavier type. In the corn belt sections north of the Ohio River and west an entirely different type of workstock is in use; namely the purebred and grade draft animals and the heavy mules. It requires different types of brood mares to produce the different kinds of workstock needed in these different sections.

Light-Horse Mares. The rather small, inexpensive mules that are needed in the southern states must come from light-horse mares. The utility farm mare of the light-horse type is the result of mingling the original farm workstock with the Morgan horse, the American Saddle horse, the American Trotting horse and the Thorobred horse. These light horses have been in use ever since the first settlements were made in America. The pioneer farmers needed them for riding and driving and to do light draft work. At first the early settlers supplemented the light horse by using oxen for heavy draft work. At present the ox is almost unknown on American farms.

The mingling of the blood of the purebred horses of the light type with utility farm mares has resulted, at this time, in a very substantial farm type of light horse. Over a large section of our country this light type is used for riding, for driving and for cultivating crops and especially for brood mares to produce the lighter and more active kinds of mules needed in the southern states.

The best of these utility brood mares weigh from 950 to 1150 pounds and are 15 to 16 hands in height. They have short, com-

pact barrels, the bones are very compact and strong, feet of medium size and of durable texture. Their most valuable characteristics are their activity, alertness and durability. The amount of service that farmers get out of these light horses is remarkable. A pair of them can draw the turning plow to very good advantage. They can haul loads of considerable size over rough country roads. They can be used for the cultivation of corn on rather steep slopes, and there are many hundred thousand acres of this kind of corn land so cultivated. They are used under the saddle on unpaved country roads and in many remote sections they are used for drawing light vehicles.

One of the reasons that this light type is used so extensively in rural sections is their ability to thrive on the grasses, hays and grains raised on the farm. They do not require excessive amounts of grain for their maintenance. During the slack season of the year, when little farm work is to be done, they get along on farm-produced roughage supplemented with just a small amount of grain per day and when the busy season arrives and they are hard at work they require about one-half the grain that the large draft horse must have.

FIG. 2. Saddle-bred mare and her colt by a draft stallion.

When mares of this type are bred to medium-sized jacks they produce very desirable mules. It is true the mules from light horse mares will be of the light type, ranging in weight from 900 to 1200 pounds, and in height from 14¾ to 16 hands. The bones of these mules may appear to be too light but they have a compactness and durability that in time compensates for their lack in size. The two most desirable characteristics of the light type of mule are their activity and their durability. At light draft work a team of these mules will do more than a pair of draft mules because they step more lively. It is true that some of these mules, if improperly broken, may be erratic and their heels dangerous. Ordinarily when broken and handled properly they are dependable and very easy to handle. It is nothing unusual for a pair of such mules to work together on the same farm for twenty years or more and this durability is a very desirable feature because it cuts down the necessity for frequent replacement. These light-horse mules of the smaller type are used in the mountain sections for riding and for the cultivation of crops on the slopes. They are also used for inter-row cultivation of cotton. The tenants on cotton plantations cannot produce their crops of cotton without a work animal which is almost always a mule. These small light mules can endure the hardships which are imposed upon them by the cotton growers. There are many thousands of tenants growing cotton in the cotton belt that must have one work animal and the animal best suited for this farm work is the small mule from the light-horse mare.

When light-horse mares are bred to large, well-formed light-type stallions, good utility foals are produced. In some sections progressive farmers are mating their ordinary farm mares to registered draft stallions. For this purpose, Kentucky farmers are using Percheron and Belgian stallions. Unfortunately there are only a few registered Percherons and Belgians standing for service in the state.

Fig. 6 is a registered Belgian stallion which has been in one locality for 8 or 10 years. The improvement which he is making can be seen from Figs. 2, 5, etc. Many of his crop of 1937 foals are

valued at $100. The mature horses of his get out of mares that do regular farm work are valued very highly by buyers for market horses.

Grade Draft Mares. Another class of brood mare is known as the grade draft mare. These mares originated from mating ordinary farm mares with small stallions, usually Percheron. These grade draft mares are not as symmetrical as the light-horse mare or the purebred draft mare but they are good utility farm mares and are used extensively over wide areas of the country. They are expected to do a big share of farm labor and at the same time to raise a foal each year. When mated to purebred draft stallions they produce on the average foals that develop into excellent farm workstock. Perhaps the biggest burden of work done on the farms north of the Ohio River and west is done by the good grade draft geldings and mares. They are not as active as light horses and they require more feed, especially a greater amount of grain, than the light type; nor can they stand the heat as well as the light type; but they can move heavier loads and are suitable for the multiple hitch that is now being used on the larger farms of the corn belt.

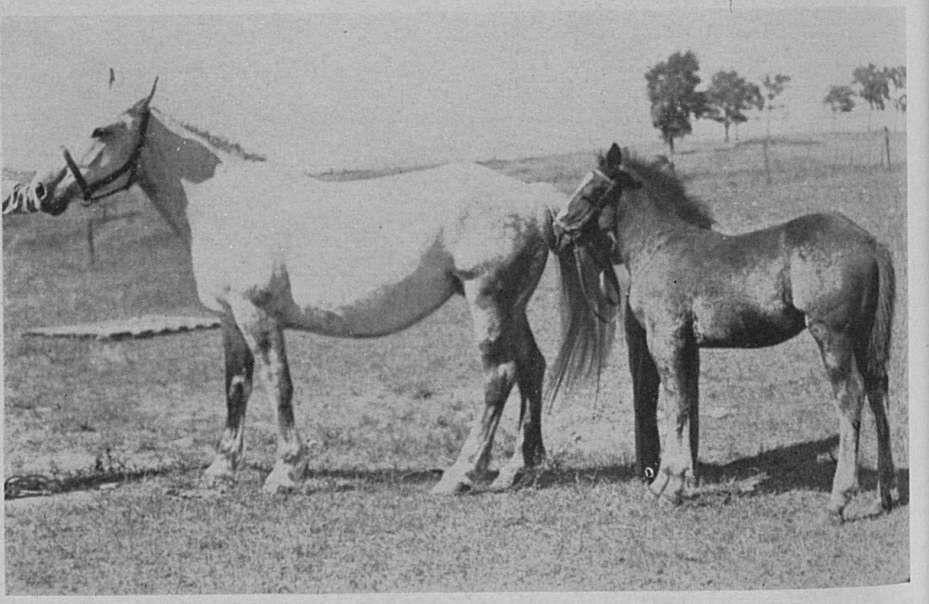

FIG. 3. Grade draft mare, working on farm and raising foal by a draft stallion.

Grade draft mares weigh from 1150 to 1600 pounds. They vary in height from 15½ to 16½ hands. They have heavy bones and larger feet than light horses, altho neither the bone or the feet are so compact or so tough as those of light horses.

The grade draft mare is used extensively for mule production. When bred to good jacks they produce mules that have considerable size and weight and often show the draft influence in their conformation. In addition to height and weight the mules have heavier bone, larger feet and sometimes objectionable flesh on the legs. The mules will have a more sluggish temperament than mules from light mares. They will also require a greater amount of feed while growing. Being larger and heavier they will require an extra amount of grain for maintenance. While they will not be so active as the lighter kind, they can do heavier work and are somewhat better suited to work in the multiple hitch than the small, more nervous and active mules. The larger, more compact and smoother type are classed as draft mules and are in great demand for the show ring and for heavy draft work.

Purebred Draft Mares. The purebred draft mares are rarely

FIG. 4. Grade draft mare. Dam of weanling mare mule on title page.

used for mule production. They are usually in such great demand for the production of purebred draft horses that they cannot be used for mule production. The lighter types of some of the draft breeds do make excellent brood mares for producing mules. Mules from them are of excellent conformation, show the full draft characteristics and develop into very desirable draft animals. The scarcity of purebred draft mares of the type suitable for mule production gives breeders no expectation of ever producing any quantity of mules in this way.

CARE OF A STALLION

Housing. There should be a roomy, dry, box stall for the stallion, which is kept bedded deep with clean, dry straw. The stall should be freed of all droppings and damp straw each day. There should be a built-in feed box for grain and a rack for hay. The dimensions of the stall should not be less than 16 ft. by 16 ft., the larger the better.

Exercise and care. If possible, the stallion should have a grass paddock large enough for exercise and grass enough to satisfy his appetite for green stuff. He must have exercise each day, winter and summer. The most natural method is to roam in a paddock.

FIG. 5. A ring of fillies by the same purebred draft sire and out of farm mares.

In the absence of a suitable paddock it is necessary to ride or drive him several miles each day.

He should be curried or rubbed down once a day. His feet must be watched carefully and kept pared in proper shape, with shoes as necessary. The groom should handle the horse gently but firmly, requiring him to develop good, quiet habits. Kindly treatment is usually better in cultivating a good disposition than harsher methods.

Feeding. One pound of grain per day for each 100 pounds of live weight and at least the same amount of good hay should be given a stallion. Oats is the standard grain for stallions. Some corn may be substituted for an equal amount of oats; and bran occasionally should be added for variety in the grain feed. Alfalfa, clover, lespedeza or a good mixed hay should be the roughages with available pasture during the growing season. Hay should be fed in such quantities that the horse will just consume it all. It is well to have a box in the stall in which to keep salt to be consumed at will. No other mineral supplements are needed by stallions. The usual grains and legume hays fed to them furnish all the minerals required when an abundance of salt is available. If a laxative is needed, a pound of linseed oil meal fed with two or three pounds of wheat bran once a day will usually give relief.

Work on the farm. Stallions should have abundance of exercise and not be confined day after day in small or dark stalls. The stallion may be exercised by work on the farm. Draft and even light-horse stallions can be trained to work in harness on the farm. By this means they can be made to pay for their feed during the busy season on the farm. If he is used as a work animal a stallion should work very moderately during the breeding season, but when it is over he will be all the better for full work on the farm. Draft and most light-horse stallions readily fall in with the work routine and become as amenable as mares or geldings.

Breeding. A mature stallion can be mated once a day during the usual breeding season. During the height of the season he may be allowed nine or ten services per week. There should be stated hours for breeding; if once a day, set a morning hour or an

afternoon hour and do not vary from it. If two services a day, they should be at 8:00 a. m. and 4:00 p. m.

The mare to be mated should be tried to determine if she is ready for mating. She should be hobbled, tail bound and washed. If she is nervous a twitch should be used.

The stallion should be washed after the service. For cleansing, tepid water should be used with some chlorine disinfectant in it. Calcium chloride can be purchased at any drugstore and the package contains directions for the amount to use per gallon of water to make a mild disinfectant.

No mares should be bred unless healthy and free from discharge. Mares with foals should be bred on the ninth day after foaling and barren mares on the third day in heat, not on the first day. After breeding, mares should not be tried again until the 18th to 21st day. If a mare fails to conceive from the first or second service, it is well at next heat period to mate her every other day during the heat period, provided the services of the stallion or jack are available for such frequency.

Often mares with considerable age are in heat as many as 6 to 9

FIG. 6. Registered Belgian stallion, 14 years old, 1800 pounds in weight, sire of 76 living foals in spring of 1937. Sire of the foals in figs. 1, 2, 3 and 5.

days. It is impossible to know when the ovum is liberated and ready for fertilization during the long heat period. When it is liberated and on its way in the fallopian tube it is not known how soon it loses its ability to be fertilized. Whether it retains its vitality for many or only a few hours is still unknown. The evidence indicates that it does not retain its viability longer than 24 to 36 hours and there are indications that the viable period may be less than 24 hours, both for eggs and sperm. This writer has found that sperm of stallions reaches the fallopian tubes of mares in nine hours after mating. Near the end of the heat period seems best for mating in the case of horses and cattle also.

In view of the short viability of sperm and ova it is reasonably certain that much barrenness of mares is due to man's inability to know when is the best day in the heat period to mate each brood mare. Should the breeder be able to discover the best hour for any one brood mare for any one year, he could not depend on that time for subsequent years, because of her tendency to vary from year to year. He also cannot determine how other mares may behave from the behavior of one mare.

It is fairly well established that the one service that results most frequently in conception is the one given on the ninth day after a mare has foaled. All mares, even if entirely recovered from foaling and fully in heat, do not conceive on that day; but of all the days of the heat cycle it is the one on which service is the most likely to result in pregnancy.

On the range, when a stallion is turned with a band of brood mares during the breeding season, a very large percentage of the mares conceive. The reason is that occasional matings, one or more a day, occur during the entire heat period. In our trials in horse breeding, mating barren mares every other day during a prolonged heat period gave excellent results. Matings are ineffective unless viable sperm unite with viable ova.

JACK STOCK FOR MULE PRODUCTION

Cost of jack. The most difficult problem which the horse breeders have to solve is the one of obtaining the services of good jacks for mule production. The reason it is difficult is because

jacks are scarce and expensive. One of the reasons jacks are expensive is that jacks have no economic value whatever except as sires of mules. Jacks and jennets cannot be used as farm workstock. They are too slow, too sluggish and too stubborn. The upkeep of a herd of jennets requires not only considerable outlay of money but a considerable area of pasture land and, of course, grain and hay must be provided in the winter season.

A jennet does not, as a rule, produce a foal every year even when bred to the most potent jacks. Usually two jennets have to be kept in a herd to obtain one foal per year. Since one-half of these foals are females, four jennets must be maintained to get one jack foal. In the best of herds not all jack foals live to maturity and of those that do live to maturity not all are first-class animals.

When the price of farm workstock dropped, the animals that suffered from the depression most were the herds of jennets. Thruout almost every section of the country where jacks are in demand there is a scarcity of jennets.

Mammoth jacks. During the last half of the previous century and in the first years of the present century American breeders of jack stock developed a distinctive type of jack stock known as the Mammoth type. The best specimens of this type are 15 to 16 hands in height and their weight is from 900 to 1150 pounds. When these superb jacks are used on good brood mares they produce the best type of mules that so far America has been able to produce. At the present time very few of these excellent jacks are available for the use of mule breeders. The few good jacks that are available are very expensive and even a jack of average size costs much more than seemingly he is worth; but when the scarcity of these animals is considered and when the actual cost of producing them is taken into consideration it can be understood that they are not too expensive.

There is one other reason why jack stock is scarce and that is that the fee for the service of the mule jack is rather small, and hard to collect which makes farmers unwilling to own jacks and offer them for service.

Heredity of mules. When jacks are mated to mares the resulting hybrid shows the influence of the sire in his conformation. The head of the mule, the size of the ears, set of eyes and even the Roman nose resemble the sire. The thick, heavy neck with erect mane and the rat-like tail are very similar to that of the sire. The shape of the bones of the leg and the contracted foot also resemble the sire, but the texture of foot and bone fortunately resembles the dam. The size, both height and weight, largely depends upon the brood mare. The barrel of the mule for the most part is fashioned by the dam. Because this is so, frequently large mares mated to comparatively small, light-boned jacks produce mules of good size and conformation. The size of the jack is not nearly so important in mule production as the size and conformation of the mare.

Feeding and care. The care of a jack is a considerable problem for a farmer. He requires attention every day in the year. Our most successful farmers carry their jacks in somewhat the following way. They enclose a paddock with a fairly high fence, and in one corner they build a one-room box stall with manger so the animal

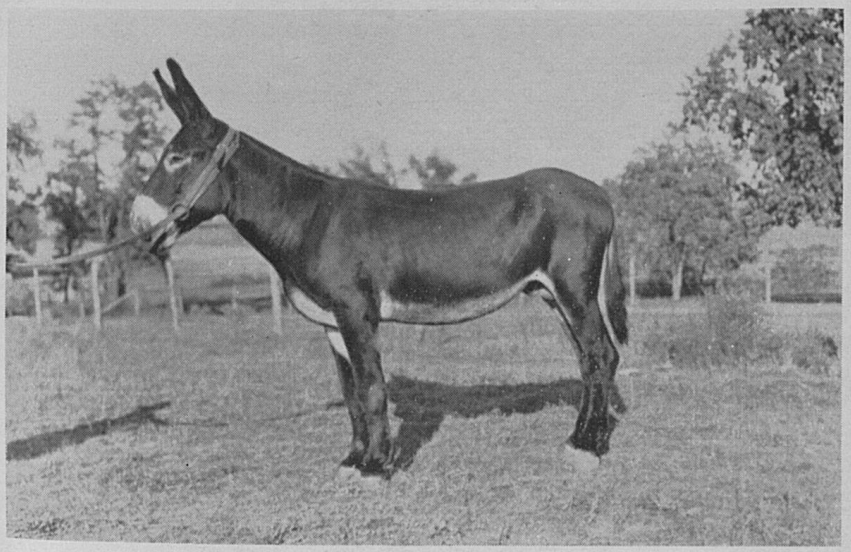

FIG. 7. An American Mammoth jack of almost ideal conformation. Sire of weanling mare mule on title page.

may be fed his grain and hay the year round in the stall. The door to the stall is left open thruout the year so the animal can come and go at his pleasure. The paddock should be something like an acre in size, well covered with good grass, a bluegrass sod being ideal, and with plenty of water available.

Any good hay will do for the jack's roughage. He should have some grain every day thru the year and a full grain ration just before and during the breeding season. The grain feed should not be corn alone. Oats or oats and bran are excellent feeds for jacks but may be supplemented by a small amount of corn. Whole barley or ground barley may also be used for variety. In August it is wise to begin feeding a few stalks of green corn each day and continue it as long as green corn is available. It is a mistake to feed too lightly between seasons. At all times the jack should be kept in good flesh.

Three-year-old jacks may be given as many as thirty mares a season while older animals may be mated to as many as sixty in any one breeding season. Mature jacks may have as many as two services per day. Whether there be but one service or two the jack should be bred at a certain time in the day. Usually when two services are permitted, the first one is at eight o'clock in the morning and the other at four o'clock in the afternoon. Care should be taken to space the services not closer than seven hours, and an eight hour interval is still better.

It is never advisable to attempt to take a jack out on the road to various farms. A stallion may be thus treated and keep in good form but the jack is not amenable to such treatment and will not do as well as when kept at one place and given a daily routine.

Breeding. There seems to be an idea among certain breeders that more widespread use of jacks and stallions may be made by means of artificial insemination. Careful studies of this method of breeding have resulted in the advice to breeders not to attempt artificial insemination unless it is done by an experienced veterinarian. The average man who handles jacks and stallions for service is not well enough acquainted with breeding hygiene to

successfully use the artificial method. The delicate reproductive organs of mares are too easily infected for any one except an expert to attempt the unusual artificial method of insemination.

The owners of mares should be on the alert, however, to see that their animals are in a healthy condition before presenting them for service. It behooves the owners to use every possible precaution to keep their mares in first class shape by using whatever method is necessary to keep them clean and healthy. Should the owner of the jack suspect from careful examination of a mare that she is not in a healthy condition, he should require the owner to have a veterinarian make an examination of her and if need be, treat her for any ailment before he permits her to be bred.

The advantage of having mares brought to the farm for service is that the material necessary to take care of jacks and stallions can be kept at the breeding barn. One of the essential requirements is that the mare shall be properly hobbled. No matter how quiet she may be, it is never absolutely safe to breed a mare unless she is fitted with a pair of substantial hobbles. The other equipment needed are bandages, buckets and sponges for cleaning purposes and some method of obtaining warm water and frequently there is need of some antiseptic solution. Every barn housing a stallion or jack should have this equipment. Care should be taken to render the mare and jack so clean that there will be no danger of transferring pathogenic bacteria from one to the other.

Blemishes. While blemishes can in no way be transmitted to the offspring of a jack they interfere with the health and efficiency of the animal and every precaution should be taken to heal as quickly as possible any accidental abrasion that may occur, especially on the legs of the animal. A jack may become infected from a very slight abrasion or wound. When an abrasion occurs it should be carefully cleaned with soap and hot water and then treated with a good antiseptic such as carbolic acid, tincture of iodine or alcohol. If severe, it may be treated with an ointment containing some compound of mercury and the abrasion thoroly bandaged to protect it from flies. Why a jack can develop such enormous sores from a small wound is something which seems

to be beyond the knowledge of men. But such sores ruin the sale value of the animal and may develop so extensively as to make him worthless.

The best "treatment" is to prevent sores from developing. Flies are objectionable because they pounce upon the slightest injury and carry an army of bacteria with them. It does not take long for them to develop a small center which may become the beginning of a sore. During warm weather it may be necessary as a precaution to keep the jack in a dark stall much of the time and allow him to graze and exercise at night. Good fly sprays should be used freely and the coat of the animal examined each day.

BREEDING AND RAISING MULES

As a rule it does not pay to keep bands of brood mares for mule production alone. The economical method is to use the farm mare for this purpose. If the brood mare is used enough on the farm, as a work animal, to pay for her feed and depreciation, the farmer has taken from the foal one of the largest items of its cost of production. The foal requires little feed until it is weaned at the age of five or six months. The money outlay is a nominal stud fee.

The type of mule produced will depend upon the kind of brood mare used. From the light-horse type the light mule is expected; from the heavy grade draft mare the heavier draft type of mule is produced.

Whether to breed farm mares to jacks or stallions depends on the availability of stallions and jacks, and also on what need a farmer may have for young workstock. Usually, the mules can be sold more readily than horse foals but if there is need of future brood mares the mating should be to the stallion.

Why the mule? Why not eliminate this class of workstock and use horses exclusively? There is a real, substantial difference between horses and mules as work animals. Perhaps the one word "toughness" comes nearer expressing the difference than any other term. The mule is tougher than the horse. By this is meant that

the mule can endure more hardship than the horse and he can stay in better condition under heavy labor than the horse. The mule is not so liable to be blemished as a horse. When blemished, the mule's selling price is not depreciated as the same blemish would depreciate the value of a horse. Another feature in favor of the mule as contrasted with the horse is his ability to last longer on the farm than a horse. In extreme old age they are better, more dependable work animals than horses of the same age; and a much greater percentage of mules reach old age than of farm horses. The larger farmers of the South would not consider giving horses to their tenants for raising cotton, if mules are available. There is a real place in American agriculture for the mule and it would appear from present indications that the mule will continue to be popular as a work animal.

The question is often asked why the mare mule for utility use is so much more in demand than the male mule? The reason is that the mare mule is in full possession of all her endocrine glands and therefore is normal in every respect. The mutilated male has lost some of his essential hormones and in addition to his ungainly appearance he is slow and sluggish because of the lack of the sex instinct. He is slightly more inclined to disease than the mare mule. Altogether he is neither as good looking nor as valuable as the female.

Show mules. The heavier draft mules that are in demand for show animals are pushed from birth to the show ring. They are given all the feed they will consume while nursing and when weaned are given constant care not only in the best of feeds but they are constantly groomed and taught to pose at the end of a halter. The show mule must have rather short legs, a compact, smooth barrel, high withers, heavily arched neck, ears set close on the head and held erect, prominent eyes and a somewhat Roman nose. The successful show mule must weigh close to 1600 pounds at maturity.

It is seldom that a mule is suitable for show purposes. The reason is that when he is gelded he loses the sex hormones. The loss causes his bones to grow longer and his barrel to become more

angular, a condition which feeding will not correct. For this reason the best female mule foals are selected and prepared for the show ring.

Care of the foal. Horse and mule foals differ but little in the care and feed which they should have. The care of the foal should begin with its mother before its birth. She should have well-balanced feed not only to maintain her in a healthy, vigorous condition but also to enable her to furnish to the developing fetus all the materials essential for sinew, bone, flesh and muscle, before birth. If any nutritional element is lacking, she will have to draw on her own body for it. This depletes her system and renders her less vigorous at parturition and less able to nourish the foal after birth. If she be fed such grains as oats, corn, barley and bran, with hay containing some clover, alfalfa or other legume, she will receive all the necessary minerals for her own and the foal's welfare.

The young foal should receive good care at birth. The cord usually breaks; if it does not break, it may be tied with a sterile tape and cut about ½ inch below the tie so as to be about 2 inches long. The stub of the cord should be treated with a disinfectant. Tincture of iodine is a safe disinfectant to use and one easily obtained.

The foal should nurse within an hour after birth. The first milk, called colostrum, should bring about an action of the bowels in a few hours. Should this elimination not take place, 2 ounces of olive oil heated to body temperature should be injected; or a rectal douche given of tepid water in which a little salt and a table-spoonful of baking soda have been dissolved.

Some foals may have to have some aid to stand and nurse the first time or two, especially if it be the first-born of a young mare.

When it becomes necessary to work the mother in the field, the foal should be left in a box stall, or two foals can keep each other company in one stall. A little grain may be put in the manger. When the brood mare returns from work she should be given water and allowed to rest and cool off before the foal is allowed to nurse. Before the mare goes to work, it may be well to take her

away from the foal for a short time at first, lengthening the time each day, to accustom both the foal and the mare to the separation. Foals should never be allowed to go with their mothers except on pasture. Besides being a nuisance, there is danger of injury when the foal is out with its mother at work. The only safe place for a foal when its mother is working is in a comfortable stall or small inclosure.

Handling foals. A foal should be handled from birth. During the first weeks, it should be handled each day and, at the same time, broken to lead. It may be fitted with a head stall provided with a ring, to be worn all the time, and to which a leading strap may be snapped when needed.

The legs should be rubbed and the feet lifted to teach the foal to submit to all kinds of handling and render it perfectly gentle. The feet often need rasping to keep the hoof wall from breaking or splitting. The heels should be kept level by trimming lightly.

Grade horse colts and all mule colts should be castrated at about one year of age. This operation should be done by a veterinarian or by one who has had successful experience and who can perform the operation without danger of infection.

Feeding the foal. If the mare is fed grain in her stall, the foal will soon learn to eat with her. Oats, corn and bran are relished by the young foal. At first it eats little but gradually more and more. By weaning time, it should be eating so well that it does not miss its mother's milk when separated from her. Foals should be weaned when about six months of age.

The six months after weaning are the critical months of the young animal's life and care should be given to the feed so that normal growth will result. During this first winter it is essential that the foals have all the good hay they will consume. If possible, alfalfa should be part of the roughage or else a good mixed legume hay. Timothy or orchard grass hay alone will not bring about the full development of the young animal.

Oats, corn and bran are the dependable grain feeds or a mixture of two or all of them. The quantity necessary depends on the size and vigor of the animal. The yearling should be given an

ample supply of feed. It should have almost all it can eat and still be hungry at the next feeding. It should exercise in the open during the first winter and graze during the next summer on good pasture. Some farmers do not feed grain to yearling workstock when on good bluegrass pasture. In case of drouth, some grain supplement should be given to maintain weight and growth. It will pay to feed some grain each first and second winter season as well as an abundant supply of mixed hay containing alfalfa, clover or Korean lespedeza. The reason a legume is emphasized is because legume hay is rich in the essential minerals, calcium and phosphorus, which are necessary for growing animals.

It is a mistake not to take good care of the young workstock. They should have plenty of feed, good roughage and grain in winter. If there is nothing available but ear corn they will do well on that with good legume hay. They should be kept gaining all the time as they grow so that as two-year-olds they will be good-sized animals. As a matter of fact, the two-year-olds may be so well grown that they can do light work before they are three years old. It will be all the better if they be broken as two-year-olds and taught the routine of farm work but they must not be expected to do nearly as much work as mature animals. There are many light things on the farm that a two-year-old can do along with either a brood mare or an older work animal. It is most important to keep the two-year-olds gaining in weight so that as three-year-olds they will be almost as heavy as they will ever be. If they have been properly cared for they should have reached their height and close to their mature weight when they are three years old.

When mules are raised for sale they are usually offered for sale in February and March of their three-year-old form. If the breeder has properly fed and carefully broken the young mules he can get the top price when they are three-year-olds. Buyers look for conformation, size and condition; and they also want to know if the animals are broken to work. Another thing that adds to the value of the three-year-old mule is, if possible, to have a matched pair to offer for sale.

In feeding the mules no fancy or expensive feed is necessary.

The farmer who produces mules either for his own use or for sale should use roughage and grains grown on his own farm. Young mules are like pigs in one respect, they can grow well and take on flesh on corn alone as the grain feed. It is desirable, of course, that they have oats or sheaf oats or some barley along with the corn, but with pasture and good farm roughage it is not necessary to buy any grain to supplement the corn raised on the farm.

During the grass-growing months young mules should be kept on good pasture. If yearling mules have access to good bluegrass pasture they need little or no grain during the time of year when grass is good. In the case of drouth or when fall comes on, the young animals should be watched carefully so that they may be fed grain as soon as needed to prevent loss of flesh. To mature properly, the young workstock should be kept gaining weight from the time of birth until they are put to work or on the market as mature animals. Any economy in saving of feed for young mules will be more than offset in the sales price of the mature mules.

Salt. Growing workstock should at all times have access to salt so that they can satisfy their need for it.

GELDINGS

A good farm practice is to sell the geldings and use brood mares for farm work. The gelding does not increase in value after he is mature, but really decreases in value the older he gets after full maturity. He is a satisfactory work animal and usually has as a young, mature animal a profitable sales value. Matched geldings broken to work bring the best price.

For farm use the mare has the advantage over the gelding because she can produce a foal each year or as desired, as well as do her share of the farm work. If there are a number of mares on the farm, each year one or more will likely be barren; and during the foaling season when the foals are young the barren mares can be pressed into the heaviest work until the foaling mares are ready for full work again.

Rather than use geldings on the farm it is more profitable to keep a few extra mares. The mare pays her way by raising a foal

and she can do, in addition, over three-fourths as much work as a gelding. The need for young horses and mules is so great that it seems the part of wisdom to use mares for farm work; and to breed them to good stallions or jacks.

It is doubtful if bands of brood mares to produce workstock alone will be profitable. Such mares would have to compete in their produce with the mares which not only produce but also work. The greatest virtue of mares for farm work is that they can produce horse or mule foals. When the young things are ready for work they can be used for replacement of older workstock or sold to increase the farm income. A good practice is to match and break the farm mule teams or horse teams, geldings or mares, use them for two or three years until they are gentle and dependable and sell them at the age of 4 to 6 years when they have reached their greatest value. By having young animals coming on they can be made to pay their way from three years of age until sold.

ECONOMICAL FEEDING OF WORKSTOCK

Water and salt. Good feed alone will not keep workstock in good condition if they fail to get the proper amount of water and salt. The more labor the horses and mules do, the more water and salt they require. Watering work horses two or three times a day is not enough. There should be fresh water available after each feed. Salt should be kept in the stall or pasture all the time. A special box or trough should be in each stall in which salt is kept and some suitable receptacle containing salt should be provided under shelter in each pasture field. It is the universal practice to provide water in all fields used for pasture where horses can drink at will. By the use of a large bucket, water can be kept in the stall so the animal may quench its thirst after eating grain and dry roughage. The time and cost of providing salt and water is so small compared to their value in the welfare of horses and mules that it pays the owner better in keeping horses in condition than an equal amount of time or money spent in any other way.

There is danger in working horses on extremely hot days. Heat

and heavy work causing excessive sweating deplete the system of water and salt. The animal system can only stand the loss of a certain amount of water and salt. Collapse and death, especially of heavy horses, follow if the animals are kept too long at work. However, if the horses are watched carefully and rested at intervals, and given water, injury can be avoided. Water can be brought to the field for use during the rest periods. An extra precaution should be taken to add an ounce of salt to each gallon of water. The sole purpose is to prevent too great a loss of water and salt at any one period of work.

Feeding. The enterprising farmer wants to feed his horses and mules adequately with the least possible cost. To accomplish this he can do two things; one is to make the best possible use of pasture and farm-grown roughages; the other is to raise, as near as he can, all the grains on his farm that he will need to feed his workstock.

Fortunately, horses and mules need no great variety of feeds, nor do they require concentrates of high protein content. Work horses need feed that can be readily converted into energy, such as carbohydrates and fats. Grains, which are rich in carbohydrates and fats, that grow on Kentucky farms, are corn, oats, barley, rye and wheat. The two most suitable for workstock are corn and oats. A large amount of shelled oats is not produced in Kentucky, but a considerable amount of sheaf oats, and oats cut and cured as hay, are grown. Shelled oats are the main grain for horses in the oat-producing states just as corn on the cob is the main grain fed to Kentucky workstock. Barley has almost the same feed value, pound for pound, as corn, however, unlike corn and oats, rye and wheat should be crushed before feeding because of the smallness of the grains. In the state there is a tendency, on account of its value as a cover crop, to increase the production of barley, and it may be necessary to use more of it for horse feed. Even if crushed, it should be mixed with less compact grain as it has a tendency, when fed alone, because of its compactness, to cause indigestion and colic. Rye is not relished by horses and usually wheat is too valuable to be fed to farm stock.

Year in and year out, corn on the cob is not only the most common grain fed to work animals, but it is the cheapest grain for the purpose. No expense of shelling or milling is necessary. The teeth of horses and mules are particularly adapted to biting corn off the cob and they seem to like to do it. The grains are large enough to enable the animals to crush them so that very few are swallowed whole. Horses are liable to swallow whole grains if fed barley and wheat uncrushed. With corn or oats as grain, or these grains mixed, horses and mules need some mixed hay including some legume hay such as alfalfa, lespedeza, soybean, or clover. About one-half the roughage consumed should be a legume. The other half may be timothy, orchard grass, Johnson grass, prairie hay or other carbonaceous roughage. The purpose of the legume hay is to supply the protein, calcium and phosphorus not found in large enough amounts in the corn and the oats and non-legume crops.

An important problem of animal husbandry is the care of horses and mules on rainy days, week ends, and in the idle time of winter. It is doubtful if work animals on the average are worked on farms over 125 days of the 365 days of the year. Many are busy less than 125 days a year. When pasture is available and weather will permit, the idle days should be spent in grazing. It is best to stable the horses the night before they are to resume work and let them have some hay and their usual grain feed the morning they go to work. When it is necessary to keep idle workstock confined, either in winter or summer, the grain ration should be cut to at least one-half and the roughage should be only slightly reduced. Enough roughage should be fed to practically satisfy the animals and yet not permit the greedy ones to gorge themselves.

If work horses are kept confined on their idle days with full grain feed, they are likely to have indigestion, swollen legs, or "Monday Morning Disease." The condition is called Azoturia and is brought about by too much feed and not enough exercise. To prevent this trouble, it is only necessary to cut the grain ration and give them plenty of exercise.

Idle horses and mules, even in winter, should have the run of

pasture fields except on very cold or stormy days and nights or when the ground is too soft. If they have access to a hay or straw rick they will not need other roughage and only require enough grain for maintenance. If horses are allowed access to the fields in those sections where corn is shucked from the uncut stalks, they will do well on what they gather from the corn blades and shucks. If this practice is followed, care must be taken to see that the wet weather of the early fall has not caused accumulation of mold on the corn stalks. If it is found that mold has infested the field, horses should be kept out. Moldy or musty grain or roughage is extremely dangerous and should not be fed to horse stock.

Idle workstock will do well in winter on pasture land if they are fed clean corn stover as their roughage. Corn stover from compactly shocked corn contains valuable feed not only for horses and mules but other farm stock as well. It should be fed, however, in the late fall and early winter or before the winter rains cause it to become weathered or musty. Where it is possible to shred the stover in the fall while it is dry and free of mold, it can, when properly stowed away, be fed to workstock the winter thru. It is a useless waste and an evident loss to feed valuable hays to idle horses and mules and leave unused in the fields corn stover which could well be used as most of the roughage for idle workstock.

Economical feeding is accomplished by feeding home-grown grains and utilizing pasture and unsalable roughages. If the farmer can raise on his farm all the corn needed, he does not have to buy any other grain. If in addition to corn he can raise some oats, he will have all the grains necessary for feeding workstock. Oats is not essential, but it gives a desirable addition to corn especially when the weather is unusually warm and horses are doing heavy work. It is wise to feed less corn and some oats on the hot "danger days." Corn seems to have a heating effect on horses and mules and it seems best to cut slightly the corn ration and in its place feed some oats or bran. But this change in feed should not prevent the precautions of rest and watering in the field on hot days.

FEED REQUIREMENTS FOR WORKSTOCK

At work: 1 to 1.4 lbs. concentrates and 1 lb. of hay for each 100 lb. of live weight.

At light work: 0.5 lb. to 1 lb. of concentrates and 1.25 lbs. of hay for each 100 lbs. of live weight.

Idle confined: Little or no concentrates and 1 lb. to 1.25 lbs. of hay for each 100 lbs. of live weight.

A 1000-lb. horse or mule should have each day 12 lbs. grain and 10 lbs. hay when at hard work. When at moderate or light work, from 6 lbs. to 9 lbs. of grain and 12 lbs. of hay. Idle and confined, little or no grain and about 11 to 14 lbs. of hay.

Mineral supplements. Horses require no tonics or mineral supplements to their feed if fed a balanced feed. Oats, corn, barley and mill feed, fed singly or in combination, as the grain feed, and a legume or mixed legume and grass hay contain all the minerals needed by horses and mules, as well as all carbohydrates and protein that they require.

Parasites. If horses and mules are not doing well on such feed there is some reason. It may be rough or diseased teeth preventing proper mastication of feed, or it may be due to intestinal parasites or intestinal worms which interfere with the normal assimilation of feed; or the unsatisfactory condition of the animal may be due to a parasitic infection of the stomach due to the developing maggot stage of the botfly. The botfly lays innumerable eggs on the coat of hair of the horse or mule. The animals lick these eggs which hatch in about seven days into spiny maggots and the animal, in biting itself, takes them into the mouth and from there they find their way into the stomach and attach themselves to its walls and proceed to extract food from the stomach lining. The bot or maggot lives in the digestive tract 8 to 12 months as a parasite. When mature the maggot passes out and seeks protection by burrowing into the ground, pupating and emerging as the botfly.

Horses severely infested by the parasitic worms or maggots, sometimes called bots, cannot make the best use of their feed and will show it in their appearance.

For any of these troubles, a veterinarian should be called to make a diagnosis and to treat horses or mules needing treatment. "Tonics," or mineral mixtures will not remedy the condition and may actually do harm.

ANSWERS TO QUESTIONS

Questions about breeding, handling, breaking and feeding workstock come frequently to the Experiment Station. It seems worth while to answer some of these questions as an appendix to this circular.

Q. What ventilation and lighting arrangements should the stallion's stall have?

A. The stall should be of ample size. The walls should be of solid lumber up to 5½ feet from the ground. Then slats two inches apart to admit light from the driveway should be placed to the ceiling. In case the stall does not open on an ample driveway, windows should be placed in the outside wall high enough to be out of reach of the horse. If electric current is available the stall should be equipped also with that method of lighting.

Q. What care should be taken of the stall?

A. The floor of the stall should be solid clay. A deep bed of straw or sawdust should be kept on this. The damp, soiled material should be taken out at frequent intervals. Occasionally a light coat of lime may be sifted over the clay and the bedding replaced.

Q. Should one man only handle the stallion or jack?

A. There is a distinct advantage in the same individual caring for the stallion or jack. Stallions and jacks acquire habits and readily drop into a routine. One attendant can learn the disposition of the animal and then get him to put forth his best efforts.

Q. During the breeding season should there be a change in feed?

A. Just before and during the breeding season the stallion should have an ample supply of good grain, of which oats should be a part, and a good mixed or legume hay. He should have access to a grass paddock for exercise and for grazing.

Q. Should the stallion be shod during the breeding season?

A. Not if he has the run of a paddock. If he must go on the road then he must have shoes. His feet should be watched and trimmed to the right shape.

Q. Is it necessary to wash the stallion after matings?

A. It is necessary. Warm water should be used with a mild disinfectant. Some grooms also sponge off the legs and body of the stallion that have come in contact with the mare.

Q. How should the mare be prepared for mating?

A. She should be carefully but amply teased. If possible the stallion himself should not be used to tease. All larger farms have a teaser for that purpose. The mare should be hobbled, and twitched. The tail wrapped; and she should be carefully washed with warm water containing no soap or disinfectant. The twitch in no way interferes with conception.

Q. Should a mare foaling every year for four or five years have a rest period of a year before being rebred?

A. No. It is best to keep a mare producing each year when possible. Make it up to her by resting her from work and by giving extra attention to her feeding and care. A broodmare's ability to produce each year is a most desirable asset.

Q. Can a jack be used on jennets and mares?

A. Yes. If the jack is broken to serve mares he will serve jennets. He should never be used to tease mares; all mares bred to jacks should be teased by stallions. Some mares conceive easier when bred to jacks while others when bred to stallions.

Q. Why not castrate foals when young?

A. The glands are not descended as a rule in horse and mule foals until they are a year old or over. Besides, the conformation of the mature animal will not be satisfactory if it is done too soon.

Q. Should workstock which never go out on roads be shod?

A. It is not necessary to keep shoes on workstock all the time when at work on the farm. The feet must have constant attention. If there is a tendency to break off at the outer edge or to grow too long on the front the danger must be corrected by shoes or trimming at intervals.

Q. At what time of year is it best for mares to foal?

A. In the spring before hard work is necessary.

Q. Can a community organization successfully handle a jack or stallion?

A. Theoretically yes, practically no. It has been tried over and over but in most cases it is not very satisfactory or successful. Individual ownership gives an incentive which community interests do not give. To make the standing of a stallion or jack profitable requires all the attention of some one enterprising man.