part of the grass vegetation of the *usar* tracks in the north-western provinces, and is always a sure indication of the presence of *reh* salts. Other grasses mentioned as more or less characteristic of saline salts are *Aristida depressa*, Retz. (more sandy parts): *Cynodon Dactylon*, Pers. (on less infected parts); *Chloris barbata*, Sw. (more sandy parts); *Tetropogon villosus*, Desf.; and *Diplachne fusca*, Beauv. (in moister parts).

Annual Fodder Grasses.

In dry regions not suitable for permanent pastures the Abyssinian Teff (*Eragrostis abyssinica*) might be grown during the occasional rains and made into hay. This grass will produce a heavy crop of hay in six weeks from the time of sowing. It is very nourishing, and cattle are very fond of it. There are other annual grasses that might be grown during the rains for fodder purposes. In Northern India green wheat is used as fodder, and where a large yield is desired within a short season, green oats are also used, as in St. Helena, for fodder purposes. The maize (*Zea Mays*) is often given as a green fodder, or dried and mixed with other green fodder. On sugar estates in the West Indies and elsewhere "cane tops" are largely used during crop time as fodder for working cattle, mules, &c. The tops are cut small, and sometimes mixed with molasses. They are regarded as most nourishing. In Mysore *Sorghum saccharatum* is regarded as an excellent fodder, and if cut before seeding it is well suited for cattle, especially milch cows—"their milk being enriched to an extraordinary degree by its use in small quantities." The United States Agricultural Department has declared that "the value of sorghum for feeding stock cannot be surpassed by another crop, as a greater amount of nutritious fodder can be obtained from it in a shorter time, within a given space, and more cheaply." The common sorghum (*Sorghum vulgare*), the *Juár* of India, is largely used as fodder, green or dry. It is often specially grown as a fodder crop, in which case it is sown earlier and more thickly than when cultivated for the grain.

A very valuable fodder grass belonging to this group is the Teosinte (*Euchlæna luxurians*). This yields very large crops in good land, and is regarded as one of the most prolific of annual grasses. Four good cuttings can be made in four months.

Most of these annual grasses, as also many coarse-growing perennial grasses, might be largely utilised by being preserved in the green state in silos. In South Africa silos, consisting merely of pits dug in the ground, have been found very useful in preserving fodder that would otherwise be lost, until the dry season. The cost of making silos is comparatively trifling, but it should be borne in mind that fodder preserved as hay is often more generally useful, and especially if made in good weather. Silos, on the other hand, offer a very ready and convenient means for preserving fodder during wet seasons, when it is impossible to make it into hay.

Grass Growing in India.

Voelcker* records an instance of the greatest care in grass growing in India, at Nadiad, in Gujarát (Bombay), where the cultivators do not use the village common land for their cattle. "Every one of their fields," he says, "is enclosed with a hedge, and then comes a headland of grass from 15 to 20 feet wide all round the field, and producing capital grass. There is a double object in this practice, for, as the fields are hedged, and have trees round them for supplying firewood and wood for implements, the people know quite well that crops will not grow when thus shaded, but that grass will. They obtain four or five cuttings of grass in the year as food for their cattle, and when the fields are empty the cattle are let in to graze on them. . . . Dúb grass (*Cynodon Dactylon*) as a crop for irrigation gives a great yield, and is about the only grass that keeps green in the hot weather. At Belgaum, fields are grown with grass; two cuttings are obtained yearly, and 6 annas is the sum paid for 100 lb. of green grass. No seed is ever sown, only the grass that comes up naturally being used."

To supply grass to military cantonments in India regular grass farms have recently been established. These were started by Sir Herbert Macpherson at Allahabad in 1882, and since then have been extended largely.

Previous to the introduction of the grass farm system, the practice had been to send out "grass-cutters," whose duty it was to cut and collect grass for the troops from wherever they could. Owing to a full supply of grass being now obtainable by the "grass-cutters" from Government grass lands great saving has been experienced, and the horses are believed to be healthier owing to the grass no longer coming from unprotected and suspicious sources. The amount of grass grown at military stations in India has been so increased that it is now possible to supply not only the British troops, but even the native cavalry with it. The saving at Allahabad alone for the seven years 1882-89 was estimated at R91,158. The extent of the Allahabad grass farm is 3,558 acres.

Ensilage, or the preserving of green fodder, has been carried out at many places in India. The cost as between haymaking and that of silage is, however, unfavourable to the latter. One advantage of cutting an early crop of grass for silage is that there are many grasses, such as numerous species of *Panicum*, which seed in the rains; these may be secured as silage if rain continues, whereas the other grasses, being kept back somewhat, yield a good hay crop about October, when the rains are over. It may further be said in favour of silage that by means of it some grass which would otherwise have been altogether lost owing to the heavy rains is saved by being put into the silo. Voelcker concludes: "I differ entirely from the opinion of one of my predecessors to the effect that India is the great field for the development of silage. That it is the field for haymaking I am much more ready to think. With a sun and climate such as exist over the greater part of India, I cannot see how it could well be otherwise. Hay requires no making, for it makes itself. Silage, I repeat, will only be useful when by means of it can be saved what would otherwise be lost."

* Report of the Improvement of Indian Agriculture, London, 1893.

ZOOLOGICAL NOTES FOR AGRICULTURAL STUDENTS.

The order *Rodentia* is characterised by two long incisor teeth in each jaw, separated by a

wide interval from the molars. The lower jaw has never more than two of these incisors, and the upper jaw very rarely; but sometimes there are four upper incisors. There are no canine teeth, and the molars and premolars are few in number (rarely more than four on each side of the jaw). The feet are usually furnished with five toes each, all of which are armed with claws. To this order belong the mice, rats, squirrels, rabbits, hares, beavers, porcupines. The first five mentioned are all more or less destructive to agricultural and horticultural produce. The beaver is hunted chiefly for the sake of its skin, but also for the substance known as *castoreum*. This is a fatty substance secreted by peculiar glands and employed as a therapeutic agent. The quills of the porcupine are used, among other purposes, for making porcupine-quill boxes well-known in Ceylon.

The order *Chieroptera* is considered "the most distinctly circumscribed and natural group" of the Mammalia; the following are the characteristics of the Chieroptera:—The anterior limbs are longer than the posterior, the digits of the fore-limb (excepting the pollex (or thumb) being enormously elongated, and united by membrane (patagium) which is also extended between the fore and hind limbs and the sides of the body, and sometimes even between the hind limbs and tail. This membrane serves for flight. The thumb and sometimes the first finger have claws, while all the toes are clawed, the digits being all of a size.

The order includes only the Bats, the great peculiarity of which—already referred to—is the modification of the hand for the purpose of supporting a flying-membrane.

Bats generally appear at dusk or at night; they are sometimes carnivorous, sometimes frugivorous, and often do much damage to fruits. Their ears are large compared with their eyes, and their sense of touch is believed to be very acute. During the day, bats retire to caves and other dark recesses, where they suspend themselves by means of their hind-feet which are provided with curved claws. The droppings of bats in such places form a very rich manure.

Insectivora comprises a number of small mammals resembling the Rodents, but without the peculiar incisors of the latter. In the insectivora all three kinds of teeth are present; the molars are serrated with numerous small pointed cusps for crushing insects. Usually all the feet are furnished with five toes which have claws. The animals walk on the soles of the feet, and are generally nocturnal and subterranean. To this order belong the moles, shrews and musk-rats.

VALUATION OF MANURES.

The following useful data and many of the tables that follow are taken from *Bulletin* 55 of the New York Experimental Station, prepared under the direction of Dr. Peter Cellier:—

	Price per lb. in pence.
Nitrogen in ammonia salts ...	8½
Nitrogen in nitrates ...	7¾
Nitrogen in meat, blood, and mixed fertilisers ...	8¾
Nitrogen in fine-ground bone and tankage ...	7½
Nitrogen in coarse bone and tankage ...	3½
Phosphoric acid, soluble ...	3¼
Reverted phosphoric acid ...	3
Phosphoric acid in fine bone and tankage ...	3
Phosphoric acid in coarse bone and tankage ...	1½
Phosphoric acid in wood ashes ...	2½
Potash, high grade sulphate ...	2¾
Potash, kainit ...	2¼
Potash, muriate ...	2¼
Organic nitrogen in mixed fertilisers ...	8¾
Insoluble phosphoric acid in mixed fertilisers ...	1

Chemical analyses often show the three elements in combination not referred to in this tabulation. There the nitrogen may be given as ammonia or the potash may appear as the chloride or sulphate, in which case it will be necessary to reduce such compounds into their equivalents of the element or other compound required. These conversions may be made by the use of factors as shown below:—

1. To change ammonia into equivalent nitrogen, multiply ammonia by ·8235.
2. To change nitrogen into equivalent ammonia, multiply nitrogen by 1·214.
3. To change muriate (chloride) of potash into equivalent potash, multiply muriate by ·63.
4. To change potash into equivalent muriate of potash, multiply potash by 1·585.
5. To change sulphate of potash into equivalent potash, multiply sulphate by ·54.
6. To change potash into equivalent of sulphate of potash, multiply potash by 1·85.
7. To change phosphoric acid into equivalent phosphate of lime, multiply phosphoric acid by 2·183.
8. To change soluble sulphate into equivalent phosphate of lime, multiply soluble phosphate by 1·325.

How these tables are used will be best seen by means of an example. Suppose one of the mixed fertilisers common in the markets be purchased, which is guaranteed to contain—nitrogen 3 per cent, soluble phosphoric acid 6 per cent, reverted phosphoric acid 4 per cent, potash 2 per cent. The commercial value, first of 100 lb. of this fertiliser and then of one ton (2,240 lb.) will be shown in the following calculation:—

	s.	d.
3 per cent nitrogen—in 100 lb., 3 lb. —at 8¾d. ...	2	2¼
6 per cent soluble phosphoric acid—in 100 lb., 6 lb.—at 3¼d. ...	1	7½
4 per cent reverted phosphoric acid—in 100 lb., 4 lb.—at 3d. ...	1	0
2 per cent potash—in 100 lb., 2 lb. —2¼d ...	0	4½
Value of 100 lb. ...	5	2¼

Multiply this value of 100 lb. (62¼d.) by 22·4 gives us as the value of one ton (2,240 lb.) of this fertilisers, £5 16s. 6d.

To make another example, in this case a Queensland manufactured bone-dust. The analysis shows for this article the following composition:—

Moisture	5·38 per cent
Organic substances (containing 3·78 per cent nitrogen, equal to 4·59 per cent ammonia)	40·10 ,,
Lime	29·15 ,,
Phosphoric acid (equal to 48·78 per cent phosphate of lime)	21·42 ,,
Carbonic acid	1·06 ,,
Insoluble (sand, &c.)	0·72 ,,