

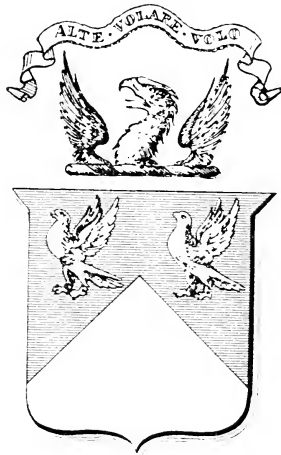
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CATTLE AND DAIRYING

IN THE

PUNJAB.

1910.

Printed at the "Labour:
PRINTED AT THE "CIVIL AND MILITARY GAZETTE" PRESS
BY SAMUEL T. WESTON.

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Punjab. Dept. of agriculture.

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HENRY MORSE STEPHENS

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I.—INTRODUCTORY.

In August 1909 the Punjab Government decided that a report should be prepared dealing with the cattle trade of the province with special reference to the profits of cattle-breeding, and the Director of Agriculture was asked to obtain information on the subject from District officers. The Director of Agriculture issued a circular,* drawing attention to the principal points to be dealt with by the District officers in their enquiries. The present report is based on the replies to this circular. In order to obtain an idea of the subject from the stand point of the province as a whole the officer deputed to write the report visited the principal fairs and breeding centres of the Punjab during the last three months of the cold weather and had the opportunity of talking over the subject with District officers, the officers of the Civil Veterinary Department and the principal landowners and zamindars. At the end of the cold weather an informal conference was convened by the Director of Agriculture, consisting of Major Walker, Chief Superintendent of the Civil Veterinary Department, Major Farmer of the Hissar Cattle Farm, Mr. Woodley of the Civil Veterinary Department and the writer at which a short note of the principal conclusions arrived at was discussed.

So far as the Punjab is concerned the interest taken in this important matter is by no means of recent growth. The reports of the Assistant to the Inspector-General, Civil Veterinary Department, from 1895 to 1898, by Captains Pease and Gunn form a fairly complete survey of cattle-breeding in the Punjab at that time, and contain many suggestions and anticipations which have received too little attention. Captain Pease's "Note on Indigenous Breeds of Cattle in the Punjab" is a valuable record of typical stock to be found in the province, but his treatment of the subject is primarily technical, and questions such as the encouragement of village breeding, and the preservation of fodder in times of scarcity are only incidentally discussed. A survey of cattle breeding in each district is now being undertaken by the Civil Veterinary Department. But as the time of these officers is fully occupied by their ordinary duties the progress of the survey is likely to be slow.

In the quinquennial cattle census † which has been taken since 1899, the province possesses a store of information as to the numbers and distribution of its cattle. But mere figures in this case

* See Appendix No. 2.

† See Appendix No. 1.

are misleading, unless supplemented by some estimate of the quality and breed of the cattle enumerated, and some enquiry into the relation of demand and supply. In the present report an attempt has been made to focus the outstanding features of the subject, the extent to which the extraordinary spread of cultivation has diminished the sources of supply, the necessity of preserving and improving the remaining breeding centres, the development of Government assistance, and the results which may be expected from co-operative effort.

II.—PRESENT CONDITIONS OF CATTLE-BREEDING IN THE PUNJAB.

The last twenty years have been for the Punjab years of unexampled development. The great canal colonies have been brought into existence, irrigation from the older canals has expanded, while the pressure of population has brought under the plough large areas of unirrigated land. The cultivated area of the Punjab (excluding the districts transferred to the North-West Frontier Province) has grown from 35,000 square miles in 1890 to 44,000 square miles in the present year, and the percentage of this area receiving irrigation has increased from 30 to 41. The number of wells has risen from 240,000 to 280,000 in the last twenty years. Between 1891 and 1901 the population rose from 18½ to over 23 millions.

This rapid development called for a corresponding increase in the number of bullocks required to work the ploughs and wells, and in the milch cattle which provide the dairy requirements of the population. But hardly had this new demand declared itself than the province was faced by a period of ten years' famine and scarcity. The unirrigated tracts, which are the chief sources of the cattle supply and were being heavily drawn upon to meet the calls of expanding cultivation, suffered severely from the drought. The stock decreased while there was no slackening of the demand. Expanding cultivation meant diminished grazing grounds, and the requirements of the growing population in the matter of dairy produce were supplied with increasing difficulty. That the demand for draught animals has been met is an undoubted fact, otherwise we should hear of wells abandoned and land uncultivated. But the strain of the transition period has been very great and has affected the conditions of cattle-breeding and the cattle trade throughout the province.

The most obvious result has been the great enhancement of the price of draught cattle and of dairy produce. In 1896 and 1899

under stress of scarcity the zamindar of Hariana was compelled to sell off his young stock at unusually cheap rates, and the Lyallpur colonist, in this as in other respects, profited considerably by misfortunes of the south-eastern districts. But the surplus store was soon depleted, and the demand continued to grow till prices were forced to their present level. Another consequence of the keen demand has been the exploitation of every available source of supply, and the increasing popularity of the male buffalo as a draught animal affords daily evidence of changed conditions. Whether the general quality of the cattle has deteriorated is a moot point. Bullocks probably as fine as any ever produced in the country can still be bought and are bought daily. But the price is prohibitive for all except the wealthy zamindar of the central canal districts and the colonies. The quality of the average bullock is probably lower than it was 20 years ago. But there is no doubt that the general working capacity is far greater. The inefficient tend to disappear under the stress of modern conditions. There is less grazing and less fodder for the aged and infirm animal, whose disposal has been facilitated by the development of the cattle trade on strict commercial lines. How completely business-like this trade has become under the pressure of new economic forces will be apparent when we consider in detail the sources of supply and the means by which the demands of the province are satisfied.

III.—DEMAND FOR DRAUGHT CATTLE.

According to the returns in the Crop and Season Report for 1908-09, the number of ploughs in the province was 2,169,085 and the sown area 29,298,297 acres, which gives $13\frac{1}{2}$ acres as the average area worked by each plough. The area assigned to each plough varies of course, largely from district to district according as the cultivation depends on wells, canals or rainfall. Jullundur, for instance, with its numerous wells requires more bullocks in proportion to its cultivation than an unirrigated district like Hissar, or canal-irrigated tracts like the new colonies.

But that the average of $13\frac{1}{2}$ acres is hardly correct is shown by the fact that in Lyallpur, where the strain on the bullocks is perhaps heavier than in any other canal-irrigated district, the landlord when leasing his land estimates that one yoke of bullocks will plough half a square or 14 acres. The provincial average may be put at 15 acres per plough, and no doubt a large number of the ploughs recorded are not in use. If then we assume 15 acres as the average plough unit, the number of working ploughs will be 1,953,217, for which 3,906,434 oxen are required. The

number of bullocks and bulls in the province according to the enumeration of 1908-09 was 4,247,494. Allowing for one per cent. being bulls, the number of bullocks may be taken as 4,200,000. But we have also to allow for inefficient animals, for those working at the wells, and for a considerable number used for cartage and other draught work. On the other hand the male buffalo is coming more and more into use in the Punjab for work in ploughs, well wheels and carts and the number of draught animals may be increased by a good proportion of the male buffaloes, which in 1908-09 numbered 624,965. In the Rawalpindi Division the cow and the female buffalo are frequently used as draught animals and as there are no complaints of land left uncultivated and wells unworked for want of cattle, the number of animals required for draught purposes may be considered sufficient. But the demand is only met by utilising every available draught animal of the bovine species. Some idea of the extent to which every source of supply is exploited may be gathered from the fact that zamindars from the Gurdaspur district visit the cattle fairs of Hariana in order to buy the stunted cattle of the Bagri villages bordering on Bikanir, which are despised by every zamindar who can afford a better class of animal, while at the last Amritsar fair in their efforts to tap new sources of supply some Fakirs of the Hoshiarpur district had imported cattle from the Karauli State (Rajputana).

IV.—SUPPLY OF DRAUGHT CATTLE.

In certain parts of the Punjab, notably the unhealthy riverain tracts, cattle breeding has always been attended with difficulty, and it has been necessary to supplement the local stock by importation. But before the spread of canal irrigation, the rest of the country was self-supporting. Each of the divisions of the province maintained a distinctive breed. The Delhi territory was famous for the Hariana breed, the Manjha and Malwa tracts each produced a separate type of animal, the Bar and Kachhi cattle were to be found in the deserts north of the Ravi, while the northern Punjab had developed characteristic varieties such as those of Dhani, Potwar and Talagang. The cultivation of the western districts being confined to the comparatively unhealthy tracts near the great rivers developed no indigenous breed of any note, except that of Dajal in the Dera Ghazi Khan district. The supply of good cattle was kept up, as it is now, by importation from Sindh.

The development of the great canal system has changed the face of the province but in no respect has it produced more marked results than in the breeding of cattle. When canal irrigation

begins the increase of moisture renders the climate less healthy. Breeding becomes less and less successful. Even where, as in the lower reaches of the Sirhind Canal and in parts of the colonies, climatic conditions are still not unfavourable, the contraction of grazing grounds makes the zamindar less and less inclined to be at the trouble and expense of breeding his own plough cattle, and cultivators who have to stall-feed their animals learn that it does not pay to keep more than are sufficient for their own requirement. As improved communications have gone hand-in-hand with expanding irrigation, the cultivator finds it easier to buy his cattle than to breed a type suitable to his requirements. The local type is replaced by imported animals, and the distinctive breed disappears. Thus Captain Pease found that very few pure bred specimens existed of the cattle formerly characteristic of the Nardak and Bangar tracts in the Karnal district. In that locality well irrigation from a deep water level carried on by means of powerful bullocks has been abandoned in favour of canal irrigation. In the early days of the canal the Bangar country was swamped and became unhealthy for men and beast. The local breeds gradually disappeared, and their place is now taken by importations from the Hariana tracts of Rohtak and Hissar. Major Walker in his recent survey of cattle in the Amritsar District states that the Manjha breed described by Captain Pease is now almost extinct as a separate type. Similar forces are at work in the case of the Malwa breed. In the Bar tracts before the advent of the canal little cultivation was done, and the Bar herds though famous for their milch cattle never produced draught cattle of any importance.

The sources of the cattle supply are now practically confined to the Hariana tracts in the south of the province, the Potwar, Dhani and Talagang tracts of the Rawalpindi, Jhelum and Attock districts in the North-West, and the country near Dajal in Dera Ghazi Khan. Certain tracts such as the Ferozepore district, the Phulkian States and the Colonies are still to some extent self-supporting. The rest of the province though producing and exporting (chiefly to the United Provinces) a number of inferior animals, relies for its best draught cattle on importations from the remaining breeding centres.

V.—GENERAL BREEDING ARRANGEMENTS.

Most villages in the central and southern districts of the province have one or more bulls, occasionally provided by Government but more often let loose as a religious duty by well-to-do banias or zamindars. Wealthy Hindus usually provide yearlings, too often of inferior quality. But village communities, if sufficient-

ly strong and united, buy bulls for the use of the village and exercise great care in their selection. They generally procure a two year old bull calf costing from Rs. 60 to Rs. 125, the price being often reduced in consideration of the use to which the bull is to be put. No special arrangements are made for the feeding of these animals. They generally follow the village herds and graze with them, and are allowed to bull the cows promiscuously. This practice gives satisfactory results provided the bulls are of good quality. Unfortunately for the progeny, these sires if not actually inferior at the outset, are left with the herd even when enfeebled by age, or suffering from disease. The people are usually too apathetic or powerless in the face of religious prejudice to arrange for the removal of inferior or worn out sires. No arrangements are made for keeping young male stock separate from the cows, and the feeble offspring of immature bulls is too often in evidence.

In the north-western and western districts the methods of breeding are somewhat different. Bulls are occasionally found either belonging to Government or dedicated by Hindus common to the whole village. But usually they are owned by private individuals, and in parts of Chakwal and at Dajal fees are charged for services. There is no doubt that this is the only sound system of cattle-breeding. But, as the Deputy Commissioner of Jhelum remarks, the people are notoriously factious, and the comparatively few owners of bulls will only allow them to serve their friends' cows. The bulls, and indeed all cattle, are stall fed to a much greater extent than in the central and southern districts, but they are given plenty of exercise, generally under supervision. Great care is taken, especially in the western districts, to keep the male stock apart from the cows and heifers.

Buffalo bulls are the property of individuals and are chosen with great care. Fees, usually one rupee, are charged for their service.

VI.—BREEDING AND EXPORTING TRACTS.

(i). HARIANA-

The districts of Hissar and Rohtak, and Gurgaon, together with the adjoining territory of the Phulkian States, and of Bikanir, and Jaipur, may be considered as constituting the Hariana tract. Of this country Captain Pease writes: "The whole of Hariana produces a number of cattle greatly in excess of requirements, and must be looked upon as a store from which are supplied many of the districts in the Punjab and North-Western Provinces, in which cattle-breeding has been completely pushed out by extensive cultivation."

This well known fact hardly requires demonstration, but it is interesting to observe the confirmation it receives from the returns of stock sold at the seasonal fairs, for which the tract is noted, and from the recent cattle census of the Province. Every animal attending the fair is bred locally, and every Central Punjab district draws on Haryana for bullocks. A large majority of those recorded as sold in the tract itself find their way almost immediately into the hands of traders from other districts, or are taken by local dealers to Lyallpur to meet the demands of new cultivation in the colonies. The sales to districts of the United Provinces are scarcely less numerous. Having regard to the admitted excellence of the Haryana breed the importance of this tract as a store-house of cattle for the rest of the Punjab cannot be over-estimated. The whole population of Haryana is vitally interested in the maintenance of this store and the matter is of no less importance to the districts drawing their supplies from this source.

The physical features of Haryana constitute an ideal breeding ground. The climate is dry, and though at times extremely hot, is generally healthy. The dry sandy soil contains an amount of lime essential to bone formation in young stock. The rainfall is scanty, but a few monsoon showers produce a plentiful crop of excellent grasses both in the cultivated fields and on the sandy hillocks, which are a marked feature of the more arid tracts. In the dry seasons the scarcity of fodder, inasmuch as it forces the animals to roam far in search of their needs, ensures a sufficiency of exercise, while the fodder itself, though deficient in quantity, is always rich in nitrogenous principles.

The cattle are generally kept in enclosures formed of dried thorny *Jhar* bushes (*zizyphus nummularia*) inside the village. The herds consisting of cows, young stock, and bullocks not actually working, are driven out to graze every morning and return at night.

Cows usually have their first calf at about 4 years, most of the calves being born in the latter months of the cold weather. The calves are usually allowed half the milk for 4 months and are then gradually weaned and sent out with the herd to graze. Bull calves which remain unsold, if not selected as bulls, are castrated between two and three years of age. To supplement the grazing to which the herds are driven every day, stall-feeding is given, especially in the rainy season before the grass springs up. The staple fodders are *jowar-chari*, chaffed or thrown down in bundles; *pala* or the leaves of the *Jhar* (*zizyphus nummularia*); wheat and gram, *bhusa* gram, *khal* or oilcake in the hot season, and *binaula* (cotton seed) in the cold. Cows in milk and working bullocks get more than dry cows and bullocks not in work.

The indigenous breed is by no means uniform in size or quality. The typical characteristics are thus described by Major Walker, Chief Superintendent, Civil Veterinary Department.

“The cattle of the Hariana tract vary considerably in size, but they are similar in general characteristics.

Typical animals vary from 54 to 60 inches in height and they are compact, active and powerful.

In colour the cattle of this breed are almost invariably grey, the neck and shoulders being of a darker grey in some cases.

The bulls are generally black or blue, grey over the neck and shoulders. The skin is usually black in colour and rather thick in comparison with English cattle.

The head is light and the face elongated; the ears are long and inclined to be pendulous. Very large and pendulous ears are disliked by the people. The horns are fine and rather short; they are carried horizontally when short, and when longer curve upwards and inwards. They are usually black in colour.

The neck is of medium length, and the hump large especially in bulls. The body is light on longish clean legs; the tail is short and thin; the feet small, hard and well shaped.

The dewlap is large and pendulous; the sheath in the males is short and close.

The cows are of course lighter in build. The udder is capacious and well formed and extends well forward with the milk veins well developed; teats from one and a half to two inches in length, equal in thickness, and hanging perpendicularly. A good milch cow gives from 8 to 12 seers daily in its native country, but the yield falls off when the cow is exported.”

The country lying between the Salt Range and the Sohan River is to the north-western districts of the Punjab what the Hariana tract is to the south. The climate is healthy and the cultivation depends entirely on rainfall. There is little grazing in the true sense of the term, for excepting the rocky ridges and the ravines which intersect the country, every acre is under cultivation. But the people are good cattle masters, and take a pride in their animals, which they are careful to exercise so far as space is available. Communications are still difficult, and this fact has tended to preserve two or more distinct varieties. The general type is thus described—

The Dhanni breed of cattle, also known as Pothwar and Nukra is confined to a comparatively small area in the Jhelum, Attock and Rawalpindi districts, the chief breeding centres being Chakwal and Talagang. The animals are uniform and differ considerably from the other breeds of the Punjab.

In height the bulls vary from 50 to 56 inches, they are compact and very active.

The colour varies considerably. Animals with parti-coloured, or mottled black and white coats predominate. White cattle often show black patches in the skin.

The head is short but wide, eyes small, muffle wide and coarse, ears pendulous but short. Horns vary in size, being either short and stumpy or fairly long, growing upwards and curving inwards.

The head is carried on a powerful short thick neck which terminates in a well developed hump. The dewlap is well defined, and often extends as far back as the sheath. The sheath is very small, back straight and long with sloping quarters; the body heavy, ribs well rounded and deep girth; tail well set on, long and thin with fine hair which terminates in a tuft reaching to the heels; legs short, forearm and thigh powerful but light below the knee and hock; hoofs small and close.

The bullock closely resembles the bull, owing to the late period at which the latter is castrated. This is generally done from 3 to 4 years. He is a very willing worker, chiefly used for making "bands", ploughing and working at the wells. Bull calves are well cared for.

The cow is small and poorly developed, colour white, grey or mottled; head and face finer than in the male; horns fairly long and upright; legs weak and calf-kneed.

The most distinctive and in many respects the best variety is the Talagang breed. The characteristic features of these animals are their fine delicate skin and the circular markings which show beneath it. They are found in Talagang, the centre of the Awankari, the tract inhabited by the Awan whose own fine stature is evidence of the admirable climate. The Chakwal or Dhanni variety, found in the neighbourhood of Chakwal, is a less pure breed but is no less hardy and sought after. Breeding is also carried on near Jatli in the Potwar tract of the Gujar Khan tehsil and to a certain extent in the Fatteh-jang tehsil of the Attock District. 3

Owing to the lack of grazing alluded to above, all cattle, and especially the bulls, are stall fed. Bull-calves are given as much of the cow's milk as they require for four or five months. They then get boiled gram or moth according to the season. They are given wheat and gram cut green in the rabi and chari and moth in the kharif, in addition to any grazing which may be

available. —Heifer calves are neglected and underfed. The bulls are put to the work of terracing and embanking the slopes and ravines by which the area of cultivation is extended. If not sold before the age of 4 they are castrated, and owing to the risk attending the operation an owner will often ask and sometimes obtain a higher price for the animal as a bullock than as a bull.

This source of supply, owing to its inaccessibility has only been drawn upon in comparatively recent years. But the breed is now well-known and the bulls are in demand for tracts where the heavier Haryana animal is unsuited to the small indigenous stock. Thus the riverain tracts of the Ajnala tehsil, and the Gurdaspur and Ferozepore districts are now importing Talagang-Potwar bulls, and large numbers of bulls and bullocks are disposed of yearly at the Gulu Shah fair in Sialkot and at the Amritsar fairs for use in the districts of the Central Punjab. They have also been largely imported by settlers from the northern districts into the Jhelum and Lyallpur colonies, and find a ready sale at the Lyallpur fairs. The good prices obtained are inducing the Awans to sell off their locally bred cattle and replace them by the inferior animals brought by traders from down country fairs, and there is evidently a danger of the breed deteriorating under stress of the increasing demand.

In the Western Punjab the only breeding centres of any value lying within the boundaries of the province are the two southern tahsils of the Dera Ghazi Khan district, including the Rohjan country, the territories of the Mazari Chiefs. In reality these two tahsils form the northern limit of the great breeding tracts of Balochistan and the Sukkur District. Just as the north-west of the Punjab is supplied from the Dhanni-Potwar tracts, and the south from Haryana, so the best cattle of the western districts, Multan, Muzaffargarh and the Derajat are imported from the Sukkur and Balochistan country on the west bank of Indus, which may thus be classed as the third source of supply. The most noted western breeding centre actually within the boundaries of the Punjab is the neighbourhood of Dajal in the Jampur tehsil, but the breed of this tract is merely an offshoot of the famous *Bhagnari* breed, found in the Bhag tehsil near Sibbi, and owes its origin to a number of *Bhagnari* bulls specially imported into Dajal about 80 years ago.

The characteristics of the *Bhagnari* cattle are given in Captain Pease's "Breeds of Punjab Cattle."

"These cattle are by far the best bred for draught purposes I have yet seen in the Punjab. They are above medium stature

about 14 hands at the shoulder, very handsome, possessing fine silky coats and thin skins, the colour of the skins invariably black and of the hair covering them white or grey, generally black about the shoulders and neck, the rest of the body being white. Some are much darker than others in colour, but generally white predominates. They are easy to distinguish from other Punjab breeds, possessing well-marked differences. The first point which strikes us is the head, which is very bovine in appearance, that is to say, the frontal and parietal region is very broad and massive, the frontals specially are broad and the horn cores are set on very wide apart; the horns themselves being short, stumpy, of great girth, and terminating in a broadish point. Their direction is in almost all cases outwards and upwards. The forehead arches very considerably, and is broad, dipping again at a level with the superior commissure of the eyes. It again curves slightly forwards just above the muffle. The muffle is small, the jaw light; the eye large and mild, the ear of medium size. The head is carried fairly erect, but in some cases is slightly below the line of the back. The neck is very short comparatively. The dewlap well developed as is the hump. The chest is good, broad and deep, the shoulder good, sloping and fairly light; the limbs strong and of medium length. The line of the back is fairly straight, dipping very slightly immediately behind the hump and rising again very slightly to the croup, which is of good conformation in these animals. The girth and belly measurements are good, and the loins broad and powerful. These animals, although appearing to be rather long in barrel, are exceedingly well ribbed up. The tail is long and very tapering. The sheath large and more or less triangular". This description applies equally to the Dajal cattle.

A very hardy type of bullocks is bred in the *Kachi* or riverain tract of the Rohjan *illaga* and the Mirpur tahsil of the Sukkur district near Massuwah Channel taking out from the Indus. These animals are strong and sturdy but much smaller and more clumsy in appearance than those of the *Bhagnari* breed. They are much sought after for work on the wells of the riverain tracts Multan, Muzaffargarh and the Derajat, and are imported as far east as Sialkot, Gujranwala and Amritsar. They are extremely hardy, and will thrive on any kind of fodder.

In these western breeding grounds the young bulls are carefully kept apart from the cows, and there is little of the immature breeding which is so much to be regretted in the central and southern Punjab districts. The bulls which are privately owned, are kept at stud and the cows are brought to them. The bulls

begin to serve at three years of age and are generally castrated at 5 or 6 years. The cow has a first calf usually at the age of 3 years and the calf is allowed as much milk as it can take during the first six months.

In the Bhag tract a certain amount of grazing is available in the rains. The principal grass (known locally as *gum*) is somewhat like *china* in appearance and is very nutritious. It appears with the winter rains, and Gundhil grass also grows very densely. But the chief cattle food both in the Bhag tract and near Dajal is *jowar*, of which a very fine quality is grown in this part of the country, containing an unusually large amount of sugar.

The Massuwah cattle are not stall fed to the same extent as those from the Bhag and Dajal tracts. They graze during the day on the river banks. From July to October they get green *jowar*, and from January to March pease and *methi* mixed with *bhoosa*. In the evening they are generally given chopped *jowar* and oil-cake.

VII.—THE INTERMEDIATE TRACTS.

Certain parts of the province may be considered as occupying an intermediate position between the tracts where climatic conditions are entirely favourable to cattle-breeding and where a profitable export trade is in existence and those less favoured districts in which the farmer is forced to import a class of animals superior to that produced locally. Such intermediate tracts producing and rearing for export, and also importing, are the territories of the Phulkian States lying between the Ghaggar and the Sutlej, the southern part of the Ferozepore district, and the Lyallpur district. The Phulkian States and part of the Ferozepore district, corresponding roughly to the tract known as the Malwa, are naturally well suited for breeding, and the Malwa breed is still recognised as a distinct type. But owing to the introduction of canal irrigation and the contraction of grazing grounds, cattle-breeding in the Malwa is becoming less important than cattle-rearing. A judicious restriction of canal water has prevented the climate from deteriorating, and the Jat Sikhs, who are the most important inhabitants of the Malwa, have not been slow to recognise the advantages which their country possesses, lying as it does between the breeding grounds of Hariana and the highly cultivated districts of the Central Punjab. The prosperous and enterprising Jat goes to the cattle fairs of Hariana, and even further afield, buys up cattle of the best type, two or three years of age, and returns with them to his home. The sandy soil and healthy climate of the Malwa together with the

abundant fodder supply provided by canal irrigation constitute an ideal rearing ground. The cattle bought at the southern fairs are soon ready for the plough. They are yoked for some two years and then brought to the fairs at Jaitu and other centres. There they are sold to traders for a price at least as great as they were originally bought for, and pass away from the Malwa to the Central Punjab districts and beyond. In this way the Malwa Jat obtains a succession of the very best plough cattle for little more than the cost of their keep. At the same time practically all draught cattle are sold before they become unserviceable, and the religious prejudices of the Sikhs are thus not offended by kine slaughter within their territory.

In the Lyallpur district the enormous demand for draught plough cattle is met to a certain extent by local breeding. The cattle census of 1909 shows that the young stock of this district are more numerous than in any other district of the Punjab. At present the animals are of very fair quality, and though greatly inferior to the high class bullock imported from Hissar or Chakwal, the local product fetches good prices in the district and is even exported. Owing to the great demand, the number of locally bred cattle may possibly be maintained, but quality will certainly deteriorate under the unfavourable climatic influence of canal irrigation. Fodder is abundant and the possibilities of cattle-breeding are not neglected, but the district does not enjoy the same advantages as the Malwa in the matter of climate and space for grazing. Mr. deMontmorency writing of Lyallpur as an exporting district says: "It appears to me that more young stock are sold to buyers out of the district at the fair than is warranted by the future needs of the district."

The Deputy Commissioner of Jhang reports that the Kachi cattle described by Mr. Broadway in Chapter IX of Captain Pease's "Breeds of Indian Cattle" are still found in the Shorkot tehsil of that district. They are evidently a useful type, but have not been exported to any large extent, and no attention appears to have been paid to the development of the breed.

VIII—THE IMPORTING TRACTS.

The remaining districts of the Province may be described as importing tracts. In these districts, it is true, cattle are produced, often in considerable numbers, but from a variety of reasons the stock is below the standard required for agricultural or draught purposes. The zamindar prefers to buy good cattle from elsewhere and in these days of high prices for agricultural produce is not deterred by the large increase in the cost. The Settlement Officer

of Ludhiana writes: "The district bullock is quite a useful animal but neither so efficient nor so much valued as the imported stock. The extent of importation is determined simply by the money available, If a zamindar can afford it he will always use Hissar-bullocks. If he is really well off he will make a hobby of good foreign stock. As all tehsils are very prosperous, the import trade is large." These remarks are of general application to all the districts of the Central Punjab. Other reasons for importation in these districts have already been touched on. With the spread of cultivation and the development of the Canal System the Manjha breed of the Lahore and Amritsar districts has disappeared as a distinct type. The Karnal and Delhi districts have suffered in a similar manner. In the densely populated submontane tracts of Sialkot, Gurdaspur, Hoshiarpur and Ambala conditions have never been favourable to cattle-breeding. The Hoshiarpur report notes that in the Dasuya tahsil of Hoshiarpur the death rate of cattle is heavy owing to the climate and the hard work in the rice fields, and the *charsa* wells of Jullundur require a more powerful bullock than is produced locally. In the Bar tracts of Montgomery, Gujranwala and Gujrat the local breed, though famous for its milch cattle, was never of a type to supply the demands of canal-irrigated cultivation even if the numbers had been sufficient. The colonists of Lyallpur had therefore no option but to import their cattle from their old districts. The addition to the Bar cattle was briefly of the Desi (or Central Punjab mixed breed) with a good sprinkling of Hissar and some Dhanni cattle. In the Jhelum colony the importations are chiefly of the Dhanni breed. The western districts—Multan, Muzaffargarh and the Derajat—have always imported the strong Sindhi bullocks to supplement the local stock of undersized animals bred in the riverain tracts.

It might have been supposed that the Shahpur and Mianwali districts would have been favourable to a local breed. But though the number of cattle is sufficient for local requirements and few are imported, the quality of the stock is inferior. The Khushab tehsil, however, exports to a certain extent and with increased attention better results could be achieved.

Of the Jhelum colony the Colonization Officer writes: "There is practically no export. The only cattle that are bred for sale are bred by the Janglis but they are of poor class and are not exported but sold locally. Year by year breeding for sale is likely to decrease as facilities for grazing are very small and the present breeding is only due to the Janglis, who formerly lived chiefly by cattle, having not yet reduced their herds to the requirements of a canal-irrigated country."

IX.—MALE BUFFALOES.

The different breeds of buffaloes will be described later in dealing with milch cattle. As regards male buffaloes used as draught animals, it is sufficient to note that they are being every year pressed into service in greater numbers. Except in the Delhi Division, male buffaloes have for years been employed as the motive power for Persian-wheels. But whereas formerly it was exceptional to find a male buffalo yoked to the plough or used in a cart, it is now an extremely common sight in the Central Punjab. No particular breed of buffalo seems to be preferred for draught purposes, nor is any particular attention paid to their rearing. They are sluggish but strong and hardy, and compared with the bullock extremely cheap.

X.—HILL CATTLE.

In the hill tracts of the Punjab which may be taken as including the Simla Hills, the Una tahsil of Hoshiarpur, the Pathankot tahsil of Gurdaspur, Kangra and Kulu, and the Murree tahsil of Rawalpindi, cattle of a small type are required. The supply is kept up mainly by local breeding; the diminutive cattle of the Pathankot tahsil, for instance, appear to be a purely local breed. But cattle from Mandi and Suket and also from the neighbouring tracts of Gurdaspur and Hoshiarpur are imported into Kangra and the Una tahsil, and the Murree tahsil imports from Hazara and also from Jammu and Poonch. In the latter case the trade is hampered by toll fees and export dues. In Kulu the importation of cattle is confined to the Arains settled in Bajaura and the neighbourhood by Colonel Rennick and other large proprietors. Most of these men come from the Bhal tract in Suket and Mandi, and buy their cattle in the Bhal tract and not in Kulu.

Attempts have been made to introduce Hissar bulls into Kangra, but it is obvious that they are unsuited to hill tracts, and bulls of the Dhanni breed are much preferred. The Assistant Commissioner in Kulu reports that the results of attempts to cross the Kulu cows with Kerry, English and Panjabi bulls are bad beyond description. He also notes that in Spiti and the upper parts of Lahoul yaks are interbred with ordinary cattle on the most scientific principles.

XI.—MILCH CATTLE.

(1). Cows.

The demand for milch cattle is practically impossible to estimate. Leaving aside the dairy requirements for civil stations and cantonments, for which special arrangements are made, the

demand is chiefly for ghi and milk. Trade returns show that, roughly speaking, the province is self-supporting as regards its supply of ghi, but the universal complaints of inferior cow's milk in urban areas where the consumption is greatest, give rise to an apprehension that either the stock of milch cows is insufficient or that the quantity of milk they give might be largely improved. According to the Crop and Season Report for 1908-09 the present number of cows has not yet reached the number ascertained in 1894, while there are at present moment more cow buffaloes in the Province than in any previous enumeration. An examination of the district figures shows that in all the districts where breeding is important such as Hissar, Rohtak and Jhelum the number of cows enumerated in 1908-09 shows a most satisfactory increase over the figures for 1904. On the other hand in the districts of Lahore, Amritsar, Gurdaspur and Gujranwala, where breeding is of little account and draught cattle are imported, the number of cows has largely decreased, their place being taken as milch cattle by buffaloes. A decrease in the number of cows seems inevitable as breeding becomes of minor importance. In highly cultivated districts cows are valuable chiefly as milkers, and for dairy purposes the buffalo is more profitable than the cow. The tendency therefore is for the number of buffaloes to increase. The buffalo, though undoubtedly a finer animal when bred and reared in natural grazing grounds, nevertheless takes kindly to stall feeding, and as there is no likelihood of any diminution in the profit from dairy produce, while the male buffalo is becoming increasingly in demand for draught purposes, there is every probability that the next census will show an even larger increase in the stock of buffaloes.

Practically every cultivator in the Province keeps one or more cows according to his means and the facilities for grazing at his disposal. But except in certain localities, these animals are not noted for their milking qualities and are chiefly regarded as breeders, their milk being an incidental profit.

The two best known breeds of milch-cows are the Hansi Hissar and Sahiwal (Montgomery) breeds. The Hansi cows are merely the cows of the excellent Haryana breed already described, which besides being fine breeders also possess great milk-giving qualities. The cows of the Haryana breed and good milk-cows of the ordinary Desi type are seldom brought to a fair or sold at all except in times of drought. Small numbers are, however, procured by military dairy farms or by private dairy farms of the United Provinces and Bombay.

The Sahiwal cows are not noted for the excellence of stock produced, but are exceptionally good milkers. The following description of the Montgomery cow may be quoted from Major Pease's book on the "Breeds of Indian Cattle, Punjab" :—

"The head is long ; forehead rather narrow ; ears small-sized ; the face long and fine ; the head is large ; neck short and light. There is present, and well developed the peculiar fold of skin under the abdomen in a position corresponding to the sheath of the male which is called by the natives "lola" but which is not by any means peculiar to this breed alone. The dewlap is not very large, but is well developed ; the limbs are light. The milk escutcheon is very good. The back is slightly dipped and longish, and rises generally an inch or so at the croup ; tail sweeping the ground and not very thick. Sheath in the male well developed and tufted with hair. The limbs are symmetrical, and the general outline is good. The bullocks are active and good workers, the cows are good milkers, yielding from 7 to 12 seers per diem, or even more in some instances. They are usually milked twice during the day."

Before the colonization of the great Bar tracts, the herds of this valuable breed were very numerous. But the spread of canal irrigation has reduced the grazing area available, and the yearly decline in a number of good Sahiwal cows is one of the worst features of the present state of cattle-breeding in the Punjab. The drain on the remaining stock increases yearly and losses are never replaced. Besides the large numbers of Montgomery cows which are bought whenever possible for down country districts, the Gujars of the Central Punjab districts are prepared to pay large prices for good animals, and at every Amritsar fair large numbers are disposed of. The city Gujar, provided he can extract a large amount of milk from the cow, is utterly careless of the progeny, and the calf stunted of milk seldom comes to maturity. The change, which has been brought about in the Bar tract by the substitution of settled cultivation for nomad grazing, and the stages by which the buffalo has taken the place of the milch cows of the Sahiwal and Kachi breeds are well described by Mr. de Montmorency in the Lyallpur report :—

"Prior to the opening of the Chenab Canal the Chenab Colony area known as the Bar was a large desert with a scanty rainfall lying partly in the Jhang and partly in the Montgomery and Gujranwala districts. The lower-lying portions of the Bar had depressions, into which the water from the higher surrounding hard desert used to flow after rain and lie for some time. Round these depressions nomad graziers known as the Janglis used to gather with very large herds of cows, young cattle and goats. After even a little rain the Bar which was covered with the roots of various grasses, such as Chimber, Lunak, Dhumen, Pilwahu, Keo and Kawi, used to throw up a fine head of grass. The scrub which covered the Bar retained round its roots a certain amount of moisture, and even after the grass had been eaten down in the open a good supply remained round the

bolts and coppices of the Karil, Jand and Van. Thus the nomad grazier was able to weather out almost the whole 12 months in the Bar in a good season. In years of very scanty rainfall the nomad graziers would exhaust the pastures of the Bar, and have to take refuge in the Belas or riverain tracts of the Chenab, Ravi, Sutlej and Beas. They used on such occasions to wander up as far north as Gurdaspur and Hoshiarpur, and as far south as Bahawalpur. It is probable that in such years the loss of cattle was very great. The Janglis only kept cows and bulls and young stock. Very few young male stock ever came to maturity. They were generally (as they are still in the Montgomery district) starved of milk in their early years and either sold, exchanged or eaten when they began to grow big; the real Jangli had very few buffaloes as he was unable to keep them in the arid climate of the Bar. The buffaloes were almost entirely kept by his neighbours the Hitharis or riverain proprietors of the Chenab and Ravi.

It is estimated that at the commencement of colonization there were about 55,000 Janglis who supported themselves solely by living on milk and by the proceeds of the sale of ghi, hides, horns and young cattle in the Bar. Unfortunately it is impossible to separate the Bar tracts in the *tirni* papers or cattle enumerations of the Gujranwala, Jhang and Montgomery districts, so we cannot form even a rough estimate of the number of cattle possessed by the Janglis when the Canal came. The Janglis state that the bulk of the animals which they had were cows and young stock of the Montgomery or Kachi (Chenab) breeds, a few cows and bullocks of Hissar, Dhan, Desi and Sind breed which had been passed on to them by thieves in other districts, a large number of goats of what are known as the Bahawalpur and Shahpur breeds and a few buffaloes.

Into this area the colonist was introduced and the Jangli himself received land to cultivate. No grazing areas were reserved in yeoman and capitalist chaks. In peasant chaks, which form the bulk of the colony area, 20 per cent. grazing area was reserved in 250 villages, and in the remaining villages in the colony 10 per cent. The better low-lying area was snapped up in every chak for cultivation and only the higher and less fertile land left for grazing with the result that the grazing area in most villages only affords real grazing in the months of Sawan and Bhadon and not at other times of the year. By the end of 1906 (last special census) the population of the colony had risen to 857,829 souls and out of the Bar area 1,829,860 acres had been allotted for cultivation. The colonists as a rule brought with them one or two yokes of plough bullocks per family and a cow or buffalo for milk. Tenants brought much the same and village menials brought a few poor milch or plough cattle and some sheep and goats. For the first few years of colonization owing to the lack of thanas and the large bands of unsettled Janglis wandering about the Bar who were expert thieves, people did not care to bring good cattle to the Bar as they were speedily stolen. As the Janglis got settled they had to get rid of their extra stock and sold very large numbers of cows and young stock to the immigrant colonists. The Jangli finding he had plenty of green fodder on his grant in turn began to purchase buffaloes, which he esteemed on account of his milk diet, from the *Nili* (Sutlej) and *Chenab*. This stage is therefore marked by unloading by Janglis of their Montgomery and Kachi stock of cows and young bullocks to immigrant grantees

and the substitution in Jangli chaks of female buffaloes for cows. The immigrant grantee for his part adding to his stock of "laveri mal" (milch cattle) by purchases of cows from Janglis and buffaloes from the Ravi and Chenab riverains."

The decrease in the Montgomery breed of milch cattle has received much attention at the hands of the Civil Veterinary Department, and the Deputy Commissioner of Montgomery in his report has made some suggestions for the preservation of these valuable animals. These proposals and others which had been brought to notice will be discussed later on in dealing with the extent to which Government assistance in the matter of cattle-breeding can be developed or improved.

(II).—MILCH BUFFALOES.

The value of the buffalo is becoming yearly more appreciated by the Punjab cultivator, and, as this animal thrives when stall fed better than the cow, it is inevitable that the increase of buffaloes should proceed *pari passu* with the spread of cultivation and the shrinking of grazing grounds.

Before the spread of canal irrigation buffaloes were confined almost entirely to the tracts bordering on the great rivers of the Punjab and in low-lying flooded regions such as the *Naili* of the Sarusti and Ghaggar streams. Each tract produced a distinctive type, the Ravi buffalo being, then as it still is, the best known variety. At present the Kundi buffaloes (so called from their small spiral horns), characterised by a comparatively fine skin and great compactness are considered the favourite breed. They are to be met with in the canal-irrigated villages of Rohtak and Hansi, and the tradition is that this breed owes its origin to importation from the Ravi Bet. Many of these fine animals are exported yearly for dairy farms to the United Provinces, Calcutta and Bombay and even to Java. The Jamna Khadar, the Ghaggar and the Naili tracts of Karnal, Patiala and Hissar produce vast numbers of buffaloes, often of great size but of inferior quality compared with the Kundi type. These regions are visited every year by zamindars from the Phulkian States and the Central Punjab, who buy up young stock for their own use and also for sale at the Amritsar and Jaitu fairs, whence large numbers are exported by road and rail to the north of the Punjab. The Sutlej and Ravi Bets also produce and export buffaloes to a large extent through the medium of the Amritsar and Jullundur fairs.

As has been shown Lyallpur colony now contains buffaloes in vast quantities. But as Mr. de Montmorency remarks, it remains to be seen whether the home bred and stall fed buffaloes will continue to maintain the standard of animals bred in the river *belas*, with their larger roaming grounds and constant changes of food.

XII.—GRAZING GROUNDS.

Success in cattle-breeding depends very largely on the area available for the animals to wander in. The question of grazing grounds is therefore closely allied with the problem of improving the breeding arrangements of the province. The average area of land available for grazing and not yet cultivated calculated for each head of cattle including buffaloes but not including sheep and goats varies from a quarter of an acre or less in Gurdaspur, Amritsar and other Central Punjab districts to nearly eighteen acres in Mianwali. Omitting the hill tracts of Rawalpindi, only nine districts and these in the west of the province show an average of more than $1\frac{1}{4}$ acres for each head of cattle. This calculation assumes that waste land owned by Government is thrown open for grazing, but this addition to the village grazing grounds is only important in the western districts. Such arithmetical calculations, however, must be qualified by a consideration of the advantage enjoyed by tracts where the cultivation is largely *barani* in the extra grazing available in the frequent fallows. Thus, Rohtak with only half an acre of uncultivated grazing land is better off than Lahore where the average is more than three quarters of an acre, and Jhelum has more advantages than Delhi though the average area of grazing is almost identical in both districts. The plains of Hariana provide ample space for the necessary exercising of the cattle bred in that tract. Nor does the spread of unirrigated cultivation destroy the natural advantages of these grazing grounds, for even in a good year the fallows are extensive, and the grasses they contain though sparse, are extremely nutritious. The Dhanni breed possesses no less an advantage in the unirrigated lands and broken unculturable ground of the Jhelum, Attock and Rawalpindi districts, and the conditions of the Sind and Biluchistan breeding grounds are not dissimilar. But where close cultivation, and especially canal-irrigated cultivation, has almost annihilated the waste, the indigenous breed deteriorates in quality until it finally disappears as a distinct type. The space so necessary for exercise is wanting. Valuable crops are always on the ground, and the cattle are driven along dusty lanes to the common grazing ground, seldom extensive and continually encroached on by the plough. Such are the conditions prevailing at the present day in the canal-irrigated tracts of the province and in districts such as Hoshiarpur and Sialkot where the comparative ease with which well-irrigation can be carried on and the fertility of the soil have placed practically every available acre under the plough. The number of animals bred under these conditions must be comparatively small and the quality increasingly inferior.

Grazing grounds in the hills are everywhere reported to be insufficient. During the cold weather the Gaddis and Gujars of the Chamba State bring their cattle down to the Pathankot tahsil to graze. In Murree the cattle often have to subsist on leaves.

District officers were asked to report whether with the ruling high prices there was any probability of grazing grounds being so extended as to admit of an improvement in the number and quality of the animals bred by agriculturists in their own villages. Leaving aside the breeding or exporting tracts the question for the highly cultivated or importing tracts resolves itself into a conflict between the respective profits of cultivation and grazing, the economic aspect of which has been discussed at length by Mr. Moreland in his note on the cattle supply of the United Provinces. His conclusions apply equally to the Punjab, and are borne out by the reports of District officers in the importing tracts. The Settlement Officer of Gurdaspur remarks, "so long as the prices of agricultural produce continue high, the zamindars, whilst keeping a large stock of milch cattle will reduce their male and young stock so as to leave as much land as possible available for the raising of the more valuable non-fodder crops. Under these circumstances home-breeding is not likely to extend, nor are special efforts to this end likely to meet with any measure of success, as there is no scope for the extension of grazing areas without throwing out of cultivation valuable agricultural land." Any improvement in home-breeding by small land-holders involves, as Mr. Moreland points out, the provision of enclosed meadows or crofts, and at present the high profits of cultivation forbid any hope that either the individual agriculturist or the village community will deliberately turn down cultivated land to grazing in order to breed more bullocks. The small cultivator cannot afford to forego the immediate profit from increased cultivation in the doubtful hope of breeding his bullocks cheaper than he can buy them. In any case he is hampered by the conditions of land tenure in the Punjab where holdings are made up of small fields often at long distances from each other precluding the possibility of reserving any pasture worth the name. The difficulty which is experienced in preventing encroachments on the common grazing land of the village even when protected by a clause in the administration paper drawn up at settlement is a commonplace of district administration.

While, therefore, the District officers of highly developed districts agree that at present there is little prospect of the self-cultivating proprietor substituting grazing for cultivation or of any marked improvement in the number of cattle bred in those

districts, there are some indications that the increase in the cost of cattle and the scarcity of grazing is causing a change in present conditions. Thus, the Settlement Officer of Ludhiana reports that in the uplands of that district within recent years the people have set themselves to breed more than the actual stock required in their villages. The exodus to the colonies ten years ago drained away a good many cattle, and there is always a demand by the colonist for cattle from the home district. The Settlement Officer of Delhi found that the value of grazing land has increased to such an extent that even well-irrigated land in a village not far from the city had been turned into pasture. In the Karnal tahsil some three years ago a stong Jat community abandoned the cultivation of a fully irrigated estate owned by them preferring to keep it as a grazing reserve. It is not uncommon to find the owner of a grazing reserve surrounded by high cultivation abstaining from cultivation in order to reap the benefit of grazing fees from the neighbouring villages. The Presbyterian Mission of Ludhiana have adopted this course in a large part of their Bir in the Kaithal tahsil with considerable profit.

The importing districts of the province contain only a small proportion of the 5 million acres of culturable waste land owned by Government, and of the 12½ million acres of such land privately owned. About four-fifths of the Government waste and about two-thirds of the privately owned waste consists of the Bar lands of Montgomery, Jhang and Lyallpur and Multan and the Thal of Mianwali, Muzaffargarh and Dera Ghazi Khan *. The waste lands of the Bar in a few years will be diminished still further by the spread of irrigated cultivation. Before land is actually distributed it may well be considered whether extensive provision should not be made for grazing land either with a view to preserving the breeds of the Sahiwal and Kachi cattle which are already seriously diminished, or in order to facilitate cattle-breeding or cattle-rearing among the settlers who will be introduced. The Deputy Commissioner of Montgomery thus describes the future of cattle-breeding in that district :—

“Cattle are bred all over the district, but in the highly cultivated Divalpur tahsil much fewer are bred than in the other three tahsils in each of which there are large expanses of waste land. It is in these three tahsils that large herds of cattle are chiefly found. Cattle-breeding was before the introduction of the canals the staple industry of the district. The Muhammadan tribes who are the ancient inhabitants of the district naturally do more cattle-breeding than the Sikh colonists as they have greater access to grazing grounds, and less taste for agriculture. All these tribes may be in some sense regarded as professional graziers and their

* These figures are for 1906-07.

status varies from that of the big zamindars whose herds are numbered by the hundred to the small owner of two or three. The big zamindars own extensive herds of cattle, but do not as a rule exploit their produce commercially. Their cattle are to them chiefly a means of maintaining their dignity and supporting their dependents. This they are enabled to do, by the great extent of grazing available. But as the Ganji Bar comes under colonization this will cease to be possible, and these large herds will cease to exist; on the other hand the influx of colonists will keep up cattle for their own use and the numbers of these stall-fed animals will probably be not less than those found at present. Unless the people take to laying down permanent pasture the result will be to substitute stall-fed for pasturing cattle."

With reference to the provision of permanent pasture the Deputy Commissioner writes:—

"A very interesting experiment in this connection has been made by Chaudhri Jehangir Khan. He informs me that with 2 or 3 waterings 50 acres of permanent pasture keep 80 cattle for 4 or 5 months, a larger number than would be kept by fodder crops on the same area, the expense both for water and fodder being much less. If this is found generally to be the case, I believe that permanent pasture will solve the grazing problem. But for permanent pasture to be worked land must be given out in sufficiently large blocks; a peasant farmer cannot afford to keep half his holding under grass."

This system is not unknown in Multan where zamindars are accustomed to irrigate small pieces of land from May to September. Such grazing grounds are known as *posals*. Mr. de Montmorcency considers that the grazing areas in the Lyallpur Colony grants are too small, and urges that in the new Montgomery Colony every Crown *chak* should have at least 20 per cent. of the area reserved as grazing ground (*charagah*). The Deputy Commissioner of Gujrat makes similar recommendations with regard to the Bar lands in his district which are to be irrigated under the irrigation scheme known as the Triple Project.

Arrangements for fairly extensive grazing grounds combined with a system of permanent canal-irrigated pasture would go far towards the preservation of existing breeds, and may even result in the successful development of home-breeding on an extensive scale in the new colonies. This aspect of the colonization problem calls for even more attention than it has received in the past. Its importance must become yearly greater with the increasing difficulty of supplying the growing demand for cattle.

XIII.—FODDER SUPPLY.

Against the disappearance of valuable breeds which too often results from the increase in irrigated cultivation may be set the greater security of the fodder supply. If good animals cannot be

bred in a highly irrigated tract the imported stock can at least be provided with excellent fodder even in the worst years, or in an emergency can be fed by supplies imported from an adjoining district. The working bullock in the "importing" districts is of course excellently fed, and is seen as a rule in far better condition than the working cattle in breeding tracts. The general conclusion of the district officers is, as might be expected, that the fodder supply is sufficient in the highly cultivated districts or importing tracts even in times of scarcity.

It is unfortunately otherwise in the breeding centres and especially in the all-important Haryana tract. A glance at the figures of the cattle enumerations held in the Hissar district during recent years show the fluctuations to which the stock of cattle in Haryana is liable.

				Bulls and bullocks.	Cows.	Male buff- aloes.	Cow buffaloes.	Young stock.
1894	...	...	...	187,483	181,483	5,806	90,841	1,45,089
1899	...	...	...	111,062	111,452	2,119	63,500	1,61,038
1904	...	...	...	85,182	78,908	4,853	58,989	1,32,298
1909	...	...	...	151,161	132,988	7,375	85,550	1,97,577

The cause of these fluctuations is obvious. From 1896 to 1903 the district was in the grip of famine and scarcity, hardly relaxed in the good harvests of 1897 and 1901. Supplies of fodder ran so low that the zamindar was unable to keep his cows and young stock, and the district from being a store-house of cattle was driven to rely as best it could on scanty profits from agriculture. In the Haryana districts comparatively few cattle are required for the vast areas which can be ploughed in favourable rains, and the extent to which the stock available for the supply of other districts was depleted is at once apparent.

In normal years such as 1894, 1907, 1908 and 1909 the autumn sales at the Hissar fairs were as follows:—

	BHIWANI.		HISSAR.		SIRSA.	
	Bulls and bullocks.	Cows.	Bulls and bullocks.	Cows.	Bulls and bullocks.	Cows.
1894	1,012	339	3,771	64	5,203	114
1907	4,546	1,070	Rs. 150—100	Rs. 22	Rs. 55	Rs. 23
1908	1,439	321	4,735	53	5,901	65
	Rs. 185—50	Rs. 22	Rs. 200—70	Rs. 21	Rs. 57	23
1909 ... ..	...	...	6,200	61	...	...
			Rs. 150—80	Rs. 27		

But in 1896-1898, and 1901 as soon as the zamindar realized that the rains had failed and there was no prospect of his being able to keep his cows and young stock, the autumn fairs were thronged, and excellent animals were quickly disposed of at low prices, as is shown by the following returns of stock sales for these years:—

YEARS.	Bhiwani		Hissar		Sirsa.	
	Bulls and bullocks.	Cows.	Bulls and bullocks.	Cows.	Bulls and bullocks.	Cows.
1896 ...	Fair closed on famine	account of	6,800	170	5,901	64
1899 ...	15,254	11,303	22,842	1,314	9,747	47
	Rs. 100-25	Rs. 10	Rs. 77—16	Rs. 8	Rs. 23	Rs. 18
1901 ...	8,447	936	18,846	120	86	306
	Rs. 13—040	Rs. 22	Rs. 113—40	Rs. 15	Rs. 42	Rs. 30

The number of bullocks disposed of in these years was nearly five times as many as in normal times and the average price was less than half what would ordinarily have been obtained. The Deputy Commissioner of Rohtak writes : " Since the famine of 1877-78 besides many years of scarcity there have been 3 famines, and although the returns of cattle sold at the fairs are somewhat misleading owing to a custom prevailing in the rain land villages of selling the oxen after one crop has grown up, and buying afresh for the sowings of the next crop so as to avoid the intervening expense of upkeep, a comparison of the transactions of famine with normal years shows the drain on the resources of the district. Thus the sales of oxen and cows in the famine years 1899-1900 were roughly 16,500 above those of the previous year, and in 1905-06 ten thousand in excess of the years before."

In his Settlement Report of the Sirsa District Mr. (now Sir James) Wilson remarks : " Cattle-breeding in such a country is a very speculative business, and the peasants seem to find it more profitable in the long run to allow their cattle to multiply up to the number which can be supported by the year's fodder until the usual season for a new growth of grass, and to take their chance of the rains failing. If the rains come as usual, the speculation is a success, and the cattle are safe for another year ; if they fail, the speculator loses his profits and some portion of his capital but one or two good seasons soon make it up to him again. It is not improbable that improvements in the methods of storing fodder would be utilised by the Sirsa peasant not so much in guarding against the consequences of drought as in multiplying his stock still further, and taking his chance of the rains as before ; and this is perhaps in the circumstances the most profitable way of conducting this trade as a cattle-breeder."

These remarks written in 1882, apply equally to all districts in the Hariana tract. But since then the state of the Hariana cattle trade has become yearly more important to Northern India, and it is yearly becoming more important to guard against these sudden losses of stock.

It is not too much to ascribe the greater proportion of the rise in price of cattle, of which every district complains, to the depletion of the Hariana store-house during the period from 1896 to 1903. The past few years have been favourable to the Hissar district and the number of cattle in all classes is again approaching the level of 1894. That the store should ever have been depleted, must be a matter for universal regret.

The loss of live-stock is a commonplace of the too numerous famine reports. Its prevention has hardly received due consideration. Famine and its results are apt to be considered as concerning Haryana alone, whereas the disaster affects the whole Province. Nor is it sufficiently realized in how short a time the mischief is done. After the zamindar has abandoned his last hope of rain only a month elapses before cattle are sold in thousands at the autumn fairs, and irremediable loss caused to the whole of Northern India. The remoteness of these districts has hitherto prevented any general attempt to provide reserves of fodder, and so preserve the more valuable stock. But as the country is opened out by the yearly expansion of railways the great difficulties of such an undertaking are appreciably lessened, and in any case the issues are too great to be neglected. The last Famine Commission, primarily considered the preservation of cattle during actual famine conditions, but their final *recommendation was that the whole question of fodder supply in its preventive aspect should be thoroughly examined. A few of their general conclusions may be quoted.

(1) It is better in the long run and cheaper to bring fodder to the cattle than to take the cattle to the fodder (para. 211).

(2) The demand for fodder should be proclaimed at a very early date.

(3) Enquiries should be made in years in which there is no pressure, with a view to supplementing the fodder supply on emergency.

(4) There is this pre-eminent advantage in the growth and importation of fodder that it enables the people to retain the cattle in the villages. Not only does this avoid the dangers that always attend a change of environment, but it is directly economical inasmuch as a far smaller amount of imported fodder will suffice per head for cattle kept at home, where people can supplement the imported ration by petty reserves and pickings.

No definite proposals have ever been put forward for dealing with this problem, but it is clear that extraordinary efforts should be made to give every possible assistance to the Haryana-breeding grounds in ordinary times, and to prevent the loss of valuable cattle in times of scarcity. Bearing in mind the loss which occurs in transferring animals from one tract to another, the conclusion cannot be avoided that if the cattle are to be preserved at all, they must be preserved in their native villages.

The first essential point is to secure information as to the villages where special attention is paid to the breeding of cattle.

*Para. 219 of the Famine Report, 1901.

In ordinary seasons these are the villages which should receive assistance from Government. This aid may take the form of specially selected bulls from the Hissar Farm in considerable numbers, or of a grant to provide first class animals from elsewhere. The Hissar Farm is constantly auctioning stock which, though unsuitable for the requirements of the Farm, is nevertheless often greatly above the average of the ordinary village herd. The scheduled villages should receive special consideration in this respect.

In times of famine these villages would again receive priority of attention. The information collected in ordinary seasons would place the authorities in a position to estimate how much was likely to be disposed of at the autumn fairs. It is obvious that in time of famine a large number of old and useless animals must disappear, and from an economic point of view, this is a positive advantage. But the preservation of really good stock is an object which however difficult of attainment needs to be impressed on the people, and no assistance given by Government in this direction can be considered wasted.

The problem of cattle preservation has two aspects :—

- (1) The storage of fodder in ordinary years to provide against scarcity.
- (2) The importation of fodder at cheap rates when scarcity has actually declared itself.

A good season in the Hariana districts produces *jowar*, *bajra*, pulses and grass in such quantities that, were the stuff properly stacked and preserved, nothing short of a two years' famine of the worst type could reduce the fodder supply below the requirements of all the cattle worth preserving. Unfortunately the grass is neglected altogether, and the *jowar* and *bajra* even when carefully cut and collected and not allowed to stand in the field, is only stacked in exceptional cases. Most of the fodder is sold, chiefly for the Delhi market, and any stacks remaining in the villages will be found to belong to local *bantias* who are prepared to hold till the opportunity of reaping famine prices presents itself. It is easy to accuse the zamindar of laziness in neglecting valuable supplies of grass year by year. But the grass is useless, unless cut at the proper time, which unfortunately coincides with the autumn harvest and the annual epidemic of fever. The zamindar has no leisure himself and labour is at a premium. The difficulty of stacking grass on a large scale seems almost insurmountable. The charge of thriftlessness in dealing with *jowar* and *bajra* fodder has more justification. The zamindar

not only enjoys the proceeds of his fodder sales in good years, but counts on Government for assistance in time of drought. But unless he receives substantial inducement to do otherwise, it is useless to hope for improvement. The District authorities of Hissar have under consideration a scheme by which in good years *bajra* and *jowar* stalks should be bought up by the District Board and stacked at different centres, each centre being made to serve from 15 to 20 villages. It is estimated that properly stacked straw could last about 5 years. In case of scarcity this fodder should be sold to zamindars at cost price, plus interest at 12 per cent., and a sum to cover District Board expenditure. If no such occasion arose the old stock could be sold locally or exported to Delhi, new fodder being bought to replace it. The loss, it is estimated would not be great. The Settlement Officer thinks that a plan of this kind might be tried experimentally. The Deputy Commissioner considers that the District Board must be given material assistance both in men and money if such a scheme is to be carried out.

The importation of fodder at cheap rates in time of actual scarcity was attended by considerable success during the fodder famine of 1905-1906. The only unsatisfactory feature of the action taken was that it came too late. But vigilant supervision would result in enquiries being made soon enough to ensure fodder being railed down when most required, *viz.*, at the end of September when the zamindar needs assurance that his bullocks can be provided for.

The information obtained as to villages where cattle-breeding is important would enable the distribution of the imported fodder to be made with comparative certainty that the expense incurred by Government bore some relation to the assistance afforded to the people. The Deputy Commissioner of Gurgaon points out that importation of fodder must be accompanied by grant of *takavi* to purchase it, care being taken that *takavi* is only given for the preservation of valuable animals.

It is obvious that the amount of work entitiled by these measures, both in ordinary years and in times of famine could not possibly be undertaken by the ordinary district staff, and to work schemes of the kind technical knowledge is required. The Deputy Commissioner of Hissar believes that the stock is deteriorating owing to ignorance or neglect of proper methods of breeding and to constant exportations of the best animals. Arrangements are wanted for arresting that deterioration and for rendering unnecessary the forced sales of live-stock caused by spells of drought. If such arrangements are to be a success an officer of the Civil Veter-

inary Department is required to devote all his time to their supervision. If stationed at Hissar he would have the great advantage of the proper methods of breeding which the Government Cattle Farm affords and of the advice which the Superintendent will be able to give him.

The difficulties of fodder supply do not seem to be so acute in the Dhanni tract. But here too more assistance from the Civil Veterinary Department is required. The subject of the expansion of the Civil Veterinary Department will be developed later.

XIV.—THE CATTLE TRADE.

(1) *Traders.*

From the description already given of the demand for cattle and the sources from which this demand is met, it has been seen that the trade follows certain definite courses. From Haryana in the south, from the Dhanni tract in the north, and from Sindh in the west there is a constant influx of cattle into the centre of the Punjab. Another current of trade, chiefly in young stock, sets from the southern districts towards the United Provinces, while another, less pleasing to contemplate, conveys a constant stream of old and worn out cattle northward along the Grand Trunk Road towards Rawalpindi and Peshawar.

A horde of traders, all known under the generic name of Boparis, are busy throughout the year catering for the needs of the farmer in the fully cultivated districts. The best cattle of the Haryana Nagaur tract are marked down and bought from the breeders, partly in the villages, and partly at the autumn and spring fairs, for which this part of the country is famous. Other bands of traders are engaged in similar work in the Dhanni tract and Sindh, while the Pathan traders from the Chach are to be found at every large fair, relieving the zamindar of his superfluous and worn out stock and transporting them towards the frontier.

The term 'Bopari' includes a number of castes each engaged in a well defined class of business.

The most important of these are the Aroras of Shahpur and Mianwali. They are very well organized and financed by their own community, and their transactions run into many thousands of rupees. They deal only in the best type of stock, which they procure for their old clients in the central Punjab, and their connections in the Lyallpur and Jhelum colonies. These Aroras arrive at the great fairs in the breeding districts in the north and south of the Punjab with a drove of young stock 3 or 4 years of age, selected from the surrounding districts and stake out an enclosure which, they gradually fill with purchases in the fair for which, of course, they pay in cash. They move about in bands of 10 or 20, and exercise great precaution

in safeguarding the money in their possession. When visiting fairs in the Native States they are very well treated by the authorities, who make special arrangements to guard the animals from theft, and often detail a sahukar with whom they can bank their money. Having completed their purchases, which generally consist of first class bullocks, 3 or 4 years' old, and the very best cow-buffaloes, they rail them to the station nearest which they are likely to obtain a market. On arrival at their destination they usually hold a small fair at a convenient centre, notice being sent round to intending purchasers. They seldom demand cash payments, but as all their customers are known to them, they prefer to recover the price of their animals by 3 instalments paid at each succeeding harvest. Their usual procedure is to make their sales before Har, recovering one instalment in Har, one in Lohri and another in the following Har in the next year. The purchaser pays one rupee as earnest-money and executes a bond binding him to pay the instalments as they fall due. No interest is charged, but the price of the animal is enhanced so as to include interest charges. Mr. de Montmorency calculates that the colonist of Lyallpur buying from Aroras in instalments pays $12\frac{1}{2}$ per cent. more than he would if he bought from zamindars of his old district or in a fair. Some district officers calculate that interest included in the price is really much higher than this. The Hoshiarpur report considers the interest as high as 30 per cent. The zamindars seldom default in their payments, otherwise they would be given no more credit. Several district reports touch on the hardship which these transactions involve to the zamindar, and the Deputy Commissioner of Amritsar suggests that Co-operative Societies should undertake immediate cash payments to the Aroras on behalf of the individual members of the society, and so avoid the loss arising from the these credit transactions.

A second class of Aroras from Multan, Dera Ghazi Khan Bahawalpur and Sindh have the trade in high class Sindhi and Dajal cattle in their hands. Their methods closely resemble that of the Shahpur and Mianwali Aroras, but they are reported to be even harsher in their dealings with the zamindars. Owing to the paucity of fairs in this part of the country, these Aroras make their purchases for export chiefly through agents in the villages.

The business conducted by the Rashas, chiefly Gujars and Kasais of the Hazara, Rawalpindi, Attock, Bannu and Peshawar districts, is of a somewhat special nature. Their interest in high class animals is limited chiefly to cow-buffaloes, of which they buy large quantities at the Jaithu, Amritsar, Ludhiana and other

and rail them to Attock, Hassan Abdal and Hazro, where the animals are sold at weekly fairs to trans-border Pathans. They also supply buffaloes to all the north-western districts. But their principal business consists in buying up worn out and comparatively useless cattle at all fairs in the country from Hissar to Lyallpur. These purchases are invariably marched until they eventually strike the Grand Trunk Road, up which a continuous stream of cattle may be seen driven by these Rasha traders throughout the cold weather. On the march they continue their trade and are perpetually selling off animals which can still work for two or three years more at cheap prices, or exchanging fairly serviceable cattle for a larger number of utterly worn out animals. They sometimes include in their droves a few undersized but serviceable cattle from the breeding districts, which the zamindars of the Pothwar and Dhanni tracts are glad to buy at cheap rates to replace the high class animals for which they have obtained large sums of money. The ultimate destination of these droves by the time they arrive at Rawalpindi, or are sold at Hassan Abdal and Gondal, is in most cases the hide merchant.

Export trade to the United Provinces, which mainly consists of young stock from one to two years, is largely in the hands of Banjaras. They limit their operations to the old Delhi territory and are not generally met with north of Ludhiana, and the line of the Sutlej. They do, however, occasionally visit the Amritsar fair. Their purchases at fairs, however, represent only small proportion of their business, for they are constantly on the move throughout the country at all times of the year, but especially in June and July, buying up young stock, which they march through well known grazing grounds to the districts of the United Provinces, where they find a ready market. The stock bought by the Banjaras is always younger than that bought by the Aroras, and never of the same high quality. The cultivator in the United Provinces appears to be less particular than his Punjabi brother as to the type of animal he uses for cultivation. The Banjara caste includes both Hindus and Mussalmans, the Hindu is chiefly interested in the sale of the young stock for draught purposes, while the Mussalman is more closely connected with the Kasai. This arrangement is one of which they are not slow to take advantage when it is more profitable to sell an animal to Kasais than to march it across the Jamna for sale to zamindars. These traders are regular visitors to the weekly fairs at Nuh, Kosi, Muttra and other centres. Their business is on a smaller scale than that of the Arora. They are financed by banias and seldom carry with them a large amount of cash. Their sales in

the fair are usually for cash or short credit, and in any case they do not give credit longer than for one harvest.

The Kasais or butchers are to be found at all fairs, their interest being chiefly centred in procuring worn out or useless animals for the slaughter-house or the hide merchants. But in the south-eastern districts they combine with their usual trade a certain amount of business in agricultural cattle which they supply to the districts of Ambala, Delhi, and Karnal, and to the United Provinces. Their dealings closely resemble those of the Aroras, the price demanded being enhanced so as to include interest, and being recovered remorselessly in two or three instalments at successive harvests.

An important and yearly increasing body of traders are the Sikh Jats from the districts of the Central Punjab and from the Lyallpur colony. It is noteworthy that several co-operative credit societies in Lyallpur and elsewhere utilize their surplus funds in buying up high class bullocks in Hissar, and selling them again at a considerable profit to neighbouring villages of their districts. The Jat Sikh of Patiala, Nabha and Jind is to be found in great numbers at the Hariana fairs, and according to the Shahpur report much of the import trade in buffaloes to the Jhelum colony is in their hands.

A large proportion of the import trade in Bhagnari, Massuwah and Dajal cattle into Multan and the neighbouring districts is in the hands of Baloches, Pathan Fakirs and Sikhs. The Baloches occasionally sell for cash down, but usually trade on the credit system, charging 5 to 10 rupees as earnest-money and recovering the remainder after six months. They also occasionally recover one-third of the price at the time of sale, and the rest in two equal six-monthly instalments. These traders remain for some time at the Khuni Burj just outside the city of Multan in order to dispose of their cattle.

A considerable trade of inferior class of animals is carried on by low classes and menials such as Labanas of Lahore and Ferozepore, Gujars and Changars of Sialkot and Gujrat, Fakirs of Jullundur and Gurdaspur, and Nais and Telis of all districts. Perhaps the most striking instance of enterprise in the cattle trade is the fact that the import of cattle from the Massuwah tract in Sindh and of Bhagnari cattle into the Central Punjab is very largely in the hands of a colony of Mirasis in the Sharakpur tahsil, who are financed by banias in the neighbourhood of their villages. Kakezais of Sialkot and Gujranwala also undertake imports from Sindh.

(ii) *Cattle Fairs.*

The course of the cattle trade is marked by a large and increasing number of cattle fairs, most of which are devoted to a distinct class of business. The transactions in the great fairs at Rewari, Dadri, Narnaul, Bhiwani, Hissar, Sirsa and Jehazgarh are almost entirely confined to the best Hariana stock. The Chakwal and Talagang fairs are the principal markets for Dbani-Potwar breeds. At present there is no corresponding fair for the western breeding centres, but with the development of railway communication this deficiency will doubtless be supplied. At the Abohar and Muktsar fairs, and at the great Jaitu fair and others in the Phulkian States, the sales are partly of Malwa cattle but principally of high class Hariana cattle reared in the tract irrigated by the Sirhind Canal, and of the best buffalo stock.

The fairs at Ludhiana, Jullundur, Hoshiarpur and Gurdaspur supply some of the demand for small sized cattle to work *hart* wells in the Bet villages of the Beas and Sutlej or for ploughing in the submontane tracts. But at these and other fairs on the Grand Trunk Road the business is very largely in worn out or worthless cattle destined for the slaughter-house and the hide merchant. The Lyallpur and Eminabad fairs are very largely attended and a certain number of good cattle brought from Chakwal or locally bred are offered for sale. But their principal use is to provide the colonist with an opportunity for "scrapping" his worn out bullocks which are bought up in large numbers by Pathan traders. The fair recently started at Hafizabad is of the same character. A comparatively recent development in the cattle trade is the system of weekly fairs held at Hassan Abdal and Gondal in the Attock District and continued at various points along the road to Peshawar. A similar weekly fair is held at Nuh in Gurgaon at the other end of the Province. The large majority of the cattle sold at these fairs find their way to the slaughter-house.

The only fairs of a general character at which every class of business is transacted are the large fairs held at Amritsar at the Bisakhi and Diwali festivals and the Gulloo Shah fair in the Sialkot District. Every class of cow, bullock and buffalo may be purchased at these enormous gatherings, while the trade in old and worn out stock is as brisk as at Lyallpur or Eminabad.

These large fairs are all under Government supervision and a considerable source of income to the District Board. There are however a number of small local fairs initiated by Arora and other traders who collect their clients at convenient centres to dispose

of their latest purchases from distant fairs. Many large fairs doubtless owe their origin to such small beginnings.

Some district officers have reported that more cattle fairs are required, notably in Ambala and Rawalpindi. Before starting a cattle fair it should be remembered that no amount of Government assistance or even a connection with an existing place of pilgrimage will create a successful cattle fair unless a demand exists for facilities in carrying on a definite class of business. The warning sounds obvious, but this condition of success has occasionally been overlooked, and instances are not wanting of fairs which, though supported by Government, are languishing through an alteration in the course of trade. It is doubtful whether the cattle fair recently established at Pakpattan provides for any requirements by cattle-dealers or their clients. On the other hand the success of the Hafizabad fair proves that a definite demand is being supplied. The Jalalabad fair receives a larger share of official patronage than those of Abohar and Muktsar, yet the business at Jalalabad is declining while the other two fairs are thronged. The annual cattle fair at Sargodha has been abandoned. But, as the Colonization Officer points out, the demand for good cattle in the Jhelum Colony is very considerable, and the market for young stock and worn-out stock is no doubt proportionately as great as in Lyallpur.

XV.—DAIRYING IN THE PUNJAB.

(i) *The milk supply.*

In dealing with this part of the enquiry it is not proposed to take into account the military grass farms and dairies in various parts of the province, as they affect the total supply to a very small degree.

The supply of milk and dairy produce to civil stations is provided for to some extent by dairies conducted somewhat on the same lines as those managed by the military authorities. Lahore, Delhi, Simla and other stations can show three or four of these institutions, generally under European supervision.

The Settlement Officer of Delhi sends an interesting account of a small dairy started three years ago for the supply of butter and milk to the Cavalry Cantonment.

It is a small affair with only 11 cows and 6 buffaloes. The quantity of milk is estimated to be 60 seers daily : of which 25 seers is sold and the rest is used in making butter. Thirty-five seers of milk yield 4 seers of cream. This cream is collected for three days

and then the butter is formed. The daily outturn of butter is therefore about $2\frac{1}{2}$ seers.

The daily profits are :—

	Rs.	A.	P.
Milk sold ; 25 seers at annas 2 per seer	3	2 0
Milk from which cream has been taken ; 30 seers at pies 9 per seer	1	6 6
Butter sold ; $2\frac{1}{2}$ seers at Rs. 2 per seer	5	0 0
			9 8 6

As the quality of the milk varies and the owner and his family also consume some of it, the average daily income may be put at Rs. 8. The annual income thus comes to Rs. 2,920.

Expenses are :—

	Rs.	A.	P.	Rs.
Rent of military grass farm ...	...	...	...	192
Daily cost of (i) Bhusa and Chari ...	...	1	8 0	
(ii) { 12 seers gram ...	...	...	...
{ 14 seers cotton-seed ...	...	...	...
{ 10 seers oil-cake ...	...	...	...
{ 22 seers gram husks ...	...	...	...
				1,642
				1,834
	Profit	...		1,085

On an average one animal has to be replaced every year.

The arrangements for supply to civil stations are capable of much extension and improvement. Properly controlled dairies account for only a small proportion of the supply. The remaining demand is met by cows privately kept, or from the bazaar.

The urban milk supply is at present in the hands of Gujars in the north of the Punjab, and of Ghosis and Ahirs in the south. Sixty per cent. of the Lahore milk supply is brought in by Gujars who keep their cows five or six miles from the city. The corresponding proportion in Amritsar is 40 per cent. The cows are milked in the morning, and the milk brought by rail or special ekkas for sale in the streets, or to halwais (milk-sellers).

The remaining Gujars live in the city or just outside it, and the present arrangements are highly unsatisfactory. Sanitation is entirely neglected. The cow-sheds, whether inside the city or in its immediate vicinity, are equally dirty and objectionable. Little attention is paid to the quality of the fodder given to the animals. The Gujar or Ghosi cares only for the quantity of milk he can extract.

The Gujars and Ghosis are frequently financed by the halwais. They are under contract (renewed in Delhi 3 times a year), to supply so much milk against money advanced. Milk is hawked about the streets in open and unclean vessels, and the sale of milk by the halwais is conducted in no better fashion. A halwai will only sell pure milk when first establishing his business. As soon as he has secured his customer he does not hesitate to adulterate freely. No attention is paid to the cleanliness of the shop. Many remedies have been proposed for this unsatisfactory state of affairs. Sanitary regulations have been enforced, and attempts have been made to exclude the Gujar from the city. But wholesale condemnation of the present system, or rather want of system, is useless unless an efficient substitute can be provided. Until the people can be shown that a sanitary milk supply is not only possible but profitable both to the retailer and the consumer, any measures directed against the present system are useless.

It is generally found that the wealthier members of the community are only slightly interested in the question of a general supply of pure milk to the public. They are accustomed to retain matters in their own hands and either keep cows in their houses, or have a special arrangement with the zamindars of a village outside the city. The person who suffers and for whom nothing is done is the middle-class clerk or small shop-keeper who is not rich enough to arrange for his own supply of milk, or powerful enough to insist on the improvement of what the Gujar and halwai are pleased to purvey to him.

In Delhi the common rate for cow's milk sold to the halwai is Rs. 3 a maund, and for buffalo's milk Rs. 4. The halwais retail at Rs. 5 a maund fresh, and Rs. 6-4-0 boiled. The Gurdaspur report states that milk ten years ago sold at 11 seers to the rupee, while the rate is now only 9 seers.

The estimate of the rise in prices varies, but in the last 20 years or so the rate seems to have doubled. The rise in prices is actually greater, for pure dairy produce is now seldom found, in towns at any rate. Adulteration is said to be more practised than 10 years ago.

(ii)—*The trade in ghi.*

In rural districts there is little trade in pure cow or buffalo milk though a considerable amount is consumed by the zamindar himself. The attention of the zamindar is devoted to the production of ghi. It is not necessary to describe the process of manufacturing ghi, nor is it possible to attempt any computation of the amount annually manufactured in the province. A

vast quantity is locally consumed and does not appear in any record of internal or external trade. But there can be no doubt that the manufacture of ghi is the principal home industry of the province. It is also equally certain that owing to the lack of co-operative methods the producer fails to receive his appropriate share of the profits and that the consumer has to put up with frequent adulteration of an article, for which he pays an increasing price.

The principal ghi-producing tracts of the province are the districts of Karnal, Hissar, Rohtak and Delhi, and the Jagadhri tahsil in the Delhi Division, the Ludhiana and Phillour tahsils of the Jullundur Division, the Montgomery District, and the Khangah Dogran and Hafizabad tahsils in the Lahore Division, the Lyallpur District, the Kacha and Thals of Muzaffargarh in the Multan Division, the Khushab tahsil of Shahpur and the Thal of Mianwali and the Phalia tahsil and Dinga ilaga of the Kharian tahsil of the Gujrat District in the Rawalpindi Division. The province is chiefly self-supporting in the matter of ghi, the exports to the United Provinces and elsewhere being balanced by imports from other tracts such as the Poonch State and Sindh. The chief consumers, of course, are in the large cities of Lahore, Amritsar, Delhi, Rawalpindi and Multan. Detailed statistics of import and export are difficult to obtain from the railway returns. But the fact that an average of 10,000 maunds, which may be valued at Rs. 3½ lacs, is annually exported by rail alone from the Karnal District, while a large amount finds its way by road to Patiala and other centres, gives some idea of the importance of this village industry. The Deputy Commissioner of Montgomery in his report estimates the net profit from ghi to the district as Rs. 15 lacs.

The wholesale supply trade is in the hands of traders chiefly of the bania class, residing at convenient centres on the railway. The ghi is supplied to these centres by the smaller village traders to whom it is brought by their zamindar clients. The zamindar receives occasionally cash, but more often credit in his running account, which is balanced if at all at irregular intervals and rarely in favour of the zamindar. The profits of the middleman, though extremely difficult to arrive at, are indicated by the number of such persons who pay income in the ghi-producing tracts.

To show the business carried on by these ghi merchants it may be mentioned that a single bania from the village of Gharaunda in the Karnal District, a station on the Delhi-Kalka line, despatched in 11 months, from July 1908 to June 1909, ghi valued at Rs. 39,000 to places as far distant as Simla, Amritsar, Jullundur,

Kartarpur, Rurki, Saharanpur and Hardwar. If his profits as a middleman are placed as low as 4 per cent., his yearly income from this source alone far exceeds the salaries paid to the majority of Government servants. An instance of the bania's transactions with their zamindar clients may be quoted. A zamindar of the Karnal District was provided by his bania with a buffalo of average quality which might have been bought for Rs. 60. The bania however debited him with Rs. 75 and interest was to be charged at $12\frac{1}{2}$ per cent. per annum. The animal calved in October, and by the following August the zamindar had paid in to the bania 71 seers of ghi and was able to keep some for home consumption. The value of the ghi credited against the cost of the buffalo was Rs. 59. This account, an actual entry in a trader's books, shows both the profits to be made from buffalo-rearing, and the loss to the zamindar who is forced to obtain his animal in this manner. Without damaging the profits of the wholesale trader there appears to be a wider field for co-operation in the production and sale of ghi.

The price of ghi has risen very largely of late years. The Deputy Commissioner of Montgomery writes: "Ghi formerly used to sell from 24 to 32 chittanks the rupee. But in villages it is now selling from 18 to 20 chittanks, and in towns and cities about 16 chittanks." In Lahore and other cities the price is nearer 13 chittanks. On the whole a fair estimate of prices would be, 18 to 20 chittanks a rupee for the zamindar's sales to the wholesale trader, 16 to 18 chittanks from the wholesaler to the retailer, and 14 to 12 chittanks to the city consumer.

Ghi like milk is much adulterated, and a regular trade in compositions of ghi, fat and other ingredients is carried on from certain stations in the neighbourhood of Delhi, chiefly to Bengal.

XVI.—PRICES AND PROFITS OF STOCK-BREEDING.

The general conclusion to be drawn from district reports is that the price of bullocks has doubled within the last 10 or 15 years. Whereas the good average working bullock 4 years of age could be bought, say in 1894, for Rs. 50 or Rs. 60, the price is now not less than Rs. 100 or Rs. 120, and it is not rare to find the best Haryana or Dhani bullocks sold for Rs. 200 or even more. Of course bullocks of a sort can still be bought for Rs. 40 or Rs. 50, but these are either old or of inferior stock, such as the Bagri cattle of the Bikanir border. The fact alone is sufficient to account for the increasing popularity of the male buffalo which can be bought in good working condition for prices ranging between Rs. 25 and Rs. 50, though even this price is nearly twice as much as

obtained 10 or 15 years ago. The sale of cows is comparatively rare, but the same increase in value appears to have taken place. A good cow which formerly cost Rs. 30 cannot now be bought for less than Rs. 60. For the milch cows of Hariana or Montgomery as much as Rs. 120 is obtained, and at the Amritsar fair the prices given for good Sahiwal cows are nearer Rs. 200. The prices of cow-buffaloes vary greatly, ranging from Rs. 40 to Rs. 150, and even double this high sum has been realized for high class Kundi buffaloes purchased for Bombay or Calcutta. The prices paid for yearling stock, such as are bought by the Banjaras in the south of the province, range from Rs. 10 to Rs. 30. The average price paid by Aroras for good three year old stock is about Rs. 70. Butchers' prices range from Rs. 15 to Rs. 40.

Conditions are no better in the hills. The small type of cattle imported from Hoshiarpur and Gurdaspur into Kangra only cost from Rs. 15 to Rs. 50 each. But prices have risen everywhere in the same proportion as in the plains. In Kulu the price of a yoke of plough bullocks is reported to have risen from Rs. 8 to a maximum of Rs. 24 within living memory.

Apart from the general rise of prices and wages, which has had its effect on cattle-breeding as on every other industry, the reasons for the enhanced cost of cattle are, as had already been stated, firstly the spread of cultivation throughout the province and the consequent increased demand for draught and milch cattle of all kinds, and secondly the years of famine and scarcity between 1896 and 1903, which reduced the supply in the breeding and exporting tracts to an extraordinarily low level. As has been already shown there is little hope of an increase in the number of animals bred in the villages of the fully cultivated districts and consequently no hope of a reduction in price. But if favourable seasons continue the stock of cattle in the exporting tracts is bound to increase, and if this stock can only be maintained it may be hoped that no further rise in prices will occur.

The Settlement Officer of Hissar has been at considerable trouble to collect information as to the profits from the breeding and rearing of cattle. Several villages in that district are owned by Mahajans who interest themselves in cattle-rearing. They buy good yearling stock at fairs, or take them from their tenants in payment of debt. After rearing them for 2 or 3 years, and using them in their carriages they are able to clear a good profit by an advantageous sale at the half-yearly fairs. The cost of rearing shown below being based on the actual prices of fodder is probably higher than would be incurred by a zamindar who is able to use up

the waste products of agriculture in feeding his cattle. On the other hand a Mahajan who can afford to bide his time for a good bargain would get more for his animals than a zamindar anxious to realize a quick return.

The figures of the Hissar report may be thus summarized. The cost of a fairly good cow may be taken as Rs. 50, and her life as about 15 years. She may be expected to give milk for five months during the year.

On the expenditure side we have :—

	Rs.
Price of a four-year old cow	50
Cost of feeding for 4 years at Rs. 6 per mensem during the time she is in milk, and Rs. 3 per mensem for the remaining days of the year	561
Accidents and contingencies	50
	<hr style="width: 100%; border: 1px solid black;"/>
	661
	<hr style="width: 100%; border: 1px solid black;"/>

The income will be :—

Ghi at Rs. 2 per mensem during the 5 months the cow is in milk, daily produce being taken at 2 chittanks	200
Sale price of 11 calves at Rs. 30 cash if sold as yearlings	300
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	500
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In addition to this the produce of one cow will save a family of 3 persons, one anna each per diem, during the 55 months the cow is in milk, or

Total	809
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The annual profit of 26 per cent. on the original outlay, allows a margin for exaggeration in the profit to the family, and for an underestimate in the head of accidents and contingencies.

The profits of rearing a yearling bullock which may be bought for Rs. 20 or Rs. 30 are thus calculated. The bullock is kept for 2 years, the cost of keep being Rs. 3 a month, or Rs. 72. Against this expenditure of Rs. 102, the rearer may reasonably expect to obtain Rs. 110 or Rs. 120 for the bullock, or a yearly profit of over Rs. 20 per cent.

A cow-buffalo aged 4 or 5 years costs about Rs. 80. She breeds at intervals of 2 years, and continues in milk for about a year after calving during which time she consumes double the amount given to a cow. Her average life is about 15 years.

EXPENDITURE.

	Rs.
Cost of cow-buffalo 5 years' old	80
Cost of feeding for 10 years at Rs. 12 per mensem during the time the animal is in milk and Rs. 6 for the remainder	10,080
Accidents and contingencies	80
	<hr/>
	1,240
	<hr/>

INCOME.

Sale of $4\frac{1}{2}$ maunds of ghi per year or $22\frac{1}{2}$ maunds for 5 years	1,027
Sale of four surviving calves assumed to be half males and half females	92
	<hr/>
	1,119
	<hr/>
And as one buffalo will save a family of 6 persons 6 annas a day during the 5 years she is in milk we may add	675
	<hr/>
Total	1,794
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The annual profit of Rs. 55 per annum on the original outlay of Rs. 80 thus calculated, allowing an ample margin for errors in estimates, explains the increasing popularity of the cow-buffalo.

These estimates of profit relating as they do to high class animals for which there is an established demand are too high for the ordinary non-breeding district. But they indicate to some extent the value of the cattle-breeding industry to the province as a whole. The Settlement Officer of Delhi calculates the annual profit from a cow to be Rs. 25 to Rs. 30 and of a buffalo Rs. 40 to Rs. 50. The latter estimate corroborates the Hissar figures. In the case of the cow the Delhi calculation was for a dairy animal belonging to Ghos's, in which case the profits would undoubtedly be greater than those derived from an animal kept merely for breeding.

XVII.—THE MEAT TRADE.

The zamindar is debarred by religion and custom from what in other countries is a most profitable form of stock-breeding, the rearing of cattle for the meat market. No Hindu farmer will knowingly, or at any rate openly, part with his cattle to a

butcher or to any one who may be suspected of being interested in the meat trade. The rural population, whether Hindu or Mussalman, subsists normally on a vegetarian diet. Under these circumstances both the demand for meat and its supply are very definitely limited. The demand for beef of any kind is practically confined to cantonments, civil stations, and the larger cities, and the demand for high class beef to very limited sections of these communities. The population of cantonments and the European civil population is more or less fixed and there is no evidence that the beef-eating population of the towns is largely increasing. The demand for beef, such as it is, is therefore practically constant.

The supply of beef is limited in the same way. The utmost a butcher is prepared to pay for a bullock or a cow, unless, as happens in very rare cases, it has been specially fattened for the market, is Rs. 20, the butcher looking to obtain a profit of about five rupees, not including the value of the hide. It is obvious that it would be unprofitable for the zamindar to sell working bullocks or milch cows of any value to the butcher. The butcher's purchases, as may be seen at any fair, are old and worn out bullocks bought for the sale of the hide and the inferior meat, and undersized, worn out, barren, or otherwise useless cows. From an economic point of view practically no harm is caused by the disappearance of worn out animals, and undersized cows, though their disappearance may be a loss from the point of view of the milk supply, are seldom to be regretted from the standpoint of the breed. Such animals are sold by Mussalmans direct to the butchers. In the south of the province Hindus will usually deal through a Hindu Banjara who disposes of the animal to his Mussalman caste brother if there is nothing to gain by keeping the animal alive. In addition to these classes of animals, however, there is no doubt that a considerable proportion of the young stock sold to Banjaras and other dealers find their way to the butcher. Large numbers are no doubt sold for draught work, but if grazing is insufficient or it is otherwise inconvenient to keep the animals longer they are sold off to butchers at the weekly fairs in the neighbourhood of Delhi and other large centres. In this way, no doubt, young heifers which might develop into useful cows are lost to the country. The zamindar, however, only disposes of his young stock because he has no space in which they can be grazed, and because it is more profitable to stall feed a buffalo than to stall feed a cow. If the conditions of home breeding can be improved, and as it becomes more profitable to keep young stock than to sell them there will be fewer complaints of the paucity of cows. It is noteworthy that whereas the prices

of cattle and cereals have risen there is no corresponding rise in the price of meat. There are also indications, though information is difficult to obtain, of a trade in dried meat for export. The reason appears to be that the scarcity of grazing and the rise in the price of hides are responsible for the slaughter of many cattle which, though no doubt useless or past work, would otherwise have been preserved. A larger quantity of meat is rendered available while the local demand has hardly increased at all. The trade in hides as the cause of this and other important developments deserves separate treatment.

XVIII.—TRADE IN HIDES AND BONES.

Before the development of the foreign export trade in hides the skins of dead cattle were considered to belong by right to the Chamar or Mochi, who in return was bound to provide the zamindar with shoes and small leather articles used in husbandry without further payment. The rise in the prices of hides owing to the growing demand for export has changed the relations between the zamindar and the menial in this respect. In many districts the old custom still survives but not without constant disputes. Where Chamars and Mochis were powerful and disposed to violence the new conditions occasioned outbreaks of cattle poisoning. The result has not been altogether in favour of the Chamar. In Gujranwala, Gurdaspur and Lahore, and in other districts, especially in Muhammadan villages, the old custom has been abandoned and the zamindars now sell the hide to the Chamar or Chuhra at the market rate. In these districts cattle poisoning has ceased.

It may be generally asserted that in normal seasons even the high prices now obtained for hides do not tempt the zamindar to sell off any but his most worthless cattle. The export trade has undoubtedly stimulated the trade in old and worn out cattle which are worthless except for their hide. But the comparative cheapness of hides in time of scarcity shows that far too many animals, besides those which actually die of privation, find their way to the butcher and the hide merchant. The recent increase in prices, due amongst other causes, to the development of the motor industry, and the fact that the hide of a slaughtered animal is more valuable than that of an animal dying in the ordinary course of nature, have been responsible for unpleasant incidents. Slaughtering of cattle (chiefly young buffaloes) on a considerable scale are known to have taken place in some districts, necessitating the interference of the district authorities. The increasing demand for the male buffalo as a draught animal will no doubt operate to check such incidents. But in default of an export duty on hides, it

is unlikely either that the demand will slacken or that persons interested in the trade cease to look to such sources for their supplies.

The local demand for leather, which is of course very large indeed, is still as from time immemorial chiefly in the hands of Chamars, Mochis and Khojas. Some Chamars and Mochis such as those of Karnal and Ludhiana, are prosperous communities and are in a position to take up any contracts for the supply of boots and shoes.

The profits from the export trade in hides have attracted firms like Ralli Brothers to embark in the business, and the People's Bank of Lahore and other Indian Companies were for a time largely interested. The hides are collected at convenient centres on the railway by agents of the large firms in the chief centres, Hassan Abdal, Rawalpindi, Lahore, Ferozepore, Kasur, Multan and Delhi. Apart from the European enterprise the trade is principally in the hands of Khojas. The prices for undressed hides which the zamindars obtain in districts where the old custom has been superseded are approximately Rs. 7 each. But bullock and cow hides are more valuable, the price for dried skin per maund being about Rs. 40 for cow and bullock hides, and Rs. 33 for buffaloes.

The trade in bones appears to bring in no profit to the zamindar. The *chuhra* is allowed to collect the bones, and stack them at convenient centres where they are bought by travelling agents, chiefly Khojas, for the export trade. The price per maund is from 8 annas to 12 annas.

XIX.—SHEEP AND GOATS.

Sheep and goats are kept in considerable numbers throughout the Province. The higher classes of zamindars consider it beneath their dignity to own these animals, which are usually kept by Gujars or menials. The flocks are not infrequently owned by the butchers of large towns, the produce being shared on the half *batai* system between the owner and the herdsmen. The cost of feeding is practically *nil*, as the sheep graze on the fallows and the goats on jungle shrubs. Milch goats however occasionally get some cotton-seed.

Sheep are valued for their wool and skin, for the meat they provide and for their milk. Sheep dung is also highly prized as manure, and it is common in the Western Punjab for flocks to be invited to the wells in order that their droppings may enrich the soil. The landowner even pays for such visits. In Lyallpur

the herdsmen receive Re. 1 per acre for herding sheep for some time on plots to be sown with sugarcane and cotton.

The number of sheep has increased throughout the Province during the last five years, especially in the north-western, western, and south-eastern districts and in Kangra, where the best sheep are produced. They graze on the fallows and on such sparse vegetation as can be found, and are rarely stall fed except for the meat market in large cities and cantonments. In the Central Punjab the number of sheep appears to have decreased. Cultivation is no doubt too intense in these districts to provide good grazing, and the heavy canal irrigation makes the ground too wet for them in the monsoon season. Sheep prefer the dryer tracts. The valuable fat-tailed sheep is confined to the Kala-Chitta range of the Attock district and the hill tracts of Shahpur and Jhelum. In the plains districts little distinction of breed is recognized. But the best sheep come from Bikanir, Hissar, and the Narnaul tracts of the Patiala State. These animals are said to be the largest sheep bred in the Indian plains, and are imported into Lyallpur and other districts up country, where they are highly prized for their wool. Of the Himalaya hill sheep those from Kulu, Mandi, Suket and Sirmur are most esteemed. The sheep of the Bar and Thal country are very numerous, but inferior in quality owing to the scanty grazing available.

Sheep are sheared twice a year, in April and October, the latter shearing being generally the more productive. The average yearly clip of a plains sheep, varies from one seer in the case of the Thal and Bar flocks of the Western Punjab, to two seers produced by a Bikanir or Hissar sheep.

A considerable amount of wool is used locally for clothing, especially in the Western Punjab and in the hills, and some is taken by the mills at Dhariwal and elsewhere. But a very large quantity, including the best fleeces, is exported. The most important markets and centres of export are Multan for the western districts, Amritsar for the Central Punjab, Fazilka and Abohar for Hissar, Bikanir and Ferozepur, Rawalpindi and Gujar Khan for the Rawalpindi and Jhelum districts, and Basal in the Attock district for the Kala-Chitta range and the Trans-Indus hill tracts. The wool is usually put upon the markets in a very dirty state. But some care is bestowed on this important matter at Gujar Khan and Multan where much cleaner fleeces are brought in. Prices vary considerably, the average being about Rs. 20 a maund uncleaned, but as much as Rs. 27 a maund has been obtained recently. These prices are double those of a few years ago. Clean wool fetches about three times as much. Cleaning

and combing machinery will shortly be installed at Fazilka, and baling presses are working at Fazilka and Abohar. Undressed skins fetch from 8 annas to Re. 1 and are used locally for water bags, shoes, musical instrument and bags for keeping money, clothes, flour, etc. The skins are also sold to wandering traders who collect for the large export trade at Amritsar and other centres.

The ewe has offspring when about a year old and produces about five lambs worth about Rs. 2 each in the next three years. She gives about 6 chittacks of milk a day for four months. The milk is rich in butter fat and can be made into first class ghi either by itself or mixed with cow or buffalo milk. The use of the sheep as a dairy animal is commonest in the Thal. A full grown ewe costs from Rs. 5 to 10 or double the price, say of 15 years ago.

The relative position of sheep and goats has been reversed in the last five years. In 1904 goats were the more numerous, there are now more sheep than goats. The number of goats has decreased in every plains district; only in Attock and in Kulu has there been any increase. The general decrease is largely due to the prevalence of disease throughout the Province. Another reason is no doubt the spread of cultivation which has reduced the scrub jungle on which the goat thrives. There is also a general consensus of opinion that owing to the increasing profits to be made from wool and ghi the sheep is the more valuable animal. But the goat is hardier and can subsist in times of drought where other animals fail. It would therefore be premature to affirm that the decrease in the number of goats was in any way permanent.

Like sheep goats are most numerous in the south-eastern, north-western and western districts. No special breeds are distinguished, but the goats of Lawa in the Talagang Tahsil, and of Dajal in the Dera Ghazi Khan are exceptionally good. Goats like sheep are valued for their dung, especially as manure for tobacco. But they do more damage than sheep and are therefore less welcome. The she-goat bears when a year old producing one kid or sometimes two in the year. She will produce altogether 7 or 8. She-goats are milked twice a day, and give from 14 to 20 chittacks of milk daily for four months. A good she-goat will yield as much as 2 or even 3 seers. The price of goat's milk is rather under 1 anna per seer. The milk sells well as it is supposed to have a medicinal value. A milch goat costs from Rs. 5 to Rs. 15, and the average price of a kid is about Rs. 2-8-0. These are double the prices of a few years ago. Goats are sheared

in the spring and again in the autumn if sufficient hair has grown. The annual yield of hair is about 4 chittanks for each goat. As goat's hair fetches about Rs. 10 or Rs. 15 a maund the value of the hair (jat) is little more than 1 anna for each goat. The hair is sold to camel men or banias and is made up into ropes, sacks and mats.

The undressed skins like those of sheep are sold to traders who collect for the export trade at Amritsar and elsewhere. The skins are also used locally for shoes and bags. A goat's skin is rather more valuable than that of a sheep, and fetches from Re. 1 to Re. 1-8-0.

The male stock both of sheep and goats are largely disposed of for meat. The average plains sheep will fetch about Rs. 5 and the goat about Rs. 6, the butcher making perhaps Rs. 2 in each case. But the Kulu sheep specially fed for the Simla market sells for Rs. 8 and the butcher's profit by sale of meat is as much as Rs. 5.

XX.—ASSISTANCE FROM GOVERNMENT AND LOCAL BODIES.

The principal forms which Government assistance has hitherto taken are (1) the cattle-breeding establishment at Hissar, (2) the free distribution of bulls by the District Boards, (3) the management of cattle fairs and provision of prizes for good stock, (4) the grant of *takkavi* loans for replacement of agricultural cattle, and (5) the creation and expansion of the Civil Veterinary Department.

No mention need be made here of Military Grass and Dairy Farms as their influence, though undoubtedly of educational value, is chiefly confined to cantonments.

(1). *The Hissar Cattle Farm.*—The principal object of the institution, so far as cattle are concerned, is to provide a good animal for transport purposes. Prior to 1902 the class of animal load in the farm was extremely mixed. Bulls and cows had been purchased from all parts of India and allowed to breed indiscriminately. The original local stock had consequently been crossed with a large admixture of Gujrat and Mysore blood.

Since 1902 the object of the breeding operations has been to return as far as possible to the local type still characteristic of the Hissar District. The success has been very great and the bullock now issued is a powerful animal, possessing great bone and extremely symmetrical. The large horns and black colour of the Gujrat breeds have practically disappeared. This result was

attained by judicious purchases of cows in the villages of the district and the old mongrel stock was gradually eliminated, a large number of cows and bullocks being sold by auction. The establishment now consists of (a) bulls bred in the farm which conform to the requirements of the type prevalent in the Hissar-Nagaur country, (b) cows mostly bred on the farm, possessing the same characteristics, (d) a few older cows dating from before 1902, retained because, though themselves are not true to type, their offspring generally satisfy requirements. The provision of fodder receives great attention, and the farm since 1902 has been self-supporting in this respect. The Bir provides grazing in abundance, and some of the best grass (anjan) is regularly stacked, the seed being in demand for the Lyallpur Farm and various Regimental *rakhs* in the colonies. The cultivated area provides a sufficient quantity of gram, and *jowar-chari*, and nothing is bought from outside even in the worst years.

Though primarily maintained to meet the demands of the Government services, the farm also supplies District Boards with bulls for distribution to zamindars and in special cases complies with indents from Jamaica, Brazil, and the Dutch colonies in Java.

The Hissar Cattle Farm is controlled by the Inspector-General, Civil Veterinary Department, and is not a Provincial Institution.

(2). *District Board Bulls : Their maintenance.*—The District Boards of the Province undertake the duty of providing free of charge a certain number of selected bulls in order to improve the breed of cattle. Until recently these bulls were obtained either from the Hissar Cattle Farm, or bought locally. The results have been generally valuable, but mistakes have been made in the past which have not infrequently produced dissatisfaction among the people.

The Agricultural Department has endeavoured to guide the Boards in this matter. Agricultural circular No. 1* recommends District Boards to prepare a working plan for the purchase and distribution of bulls. In most cases this recommendation has not been translated into action. But much good has been done by enquiries as to the type of bulls suited to particular districts. The Hissar bred bull is no longer distributed indiscriminately in districts like Shahpur and Jhelum for which the Dhanni variety is obviously suited, nor in the Bet tracts of the Central Punjab where a smaller type of bull is required for the stunted cows of these localities. But no Board appears to have drawn up a definite scheme of operations.

* See Appendix No. 3.

At the same time considerable progress has been made in the last four years. The District Boards' bulls in 1906 only numbered 256. These are now 472. In the last four years 431 bulls have been bought, so that allowing for replacements the number has nearly doubled. In 1906 the Agricultural Department in their scheme for utilizing the special annual grant of one lakh for veterinary improvements recommended that one bull should be bought for each tahsil every year. Taking the province as a whole this standard has almost been attained. In some districts the number of bulls bought has exceeded the standard, in others owing to the want of a definite scheme and to difficulties in the matter of maintenance little has been done. Allowing for the considerable expenditure which had to be incurred in providing Veterinary Hospitals District Boards may be said to have fully utilized the portion of the special grant allotted for the purchase of bulls. Government have decided to continue the grant of one lakh per annum and further improvements may be expected.* Much remains to be done. It is somewhat surprising for instance to find that there are at present no Government bulls in the Jhelum Colony. At present little care is taken to trace the effect of the bulls on the stock of surrounding villages. The attention of the Boards might be directed towards this important matter.

The District Boards of all districts south of the Sutlej, and the central districts, Lahore. Amritsar, Gurdaspur, Gujranwala and Lyallpur, buy their bulls from the Hissar Cattle Farm. The Hissar bull is specially suited to the uplands of Ferozepur and Ludhiana where conditions of soil and climate are not too far removed from those prevailing in Hissar and where the indigenous cow is not too small. The resulting stock is generally of good type and commands a very fair price, but it is not to be compared with the animals imported direct from Haryana, or the Haryana bullocks reared in the Cis-Sutlej States. It is being recognized that in the Bet tracts where the cows are stunted the Hissar bull is not so useful as the Dhanni, and the District Boards of Ferozepur and Gurdaspur have lately bought a number of Dhanni bulls for the riverain tracts. It is a common complaint, especially in the Haryana Districts, that the bulls from the Hissar Cattle Farm produce sluggish stock far less hardy than the offspring of the zamindar's own bull. The reason for these complaints is to be found in the history of the Hissar Farm during the last ten years. Previous to 1900 the Hissar bull was of extremely mixed breeding. Bulls of all the best Indian breeds had been congregated in the farm and no attempt had been made to preserve distinctive types. The result was too often an animal, sometimes powerful enough

* See the recent circular issued by the Agricultural Department in Appendix No. 4.

but hopelessly cross-bred and exhibiting the defects of each type in a marked degree. These bulls were undoubtedly less hardy than those of the Hariana breed found in the best villages of Hissar and Rohtak. But since 1900 the Hissar Farm has endeavoured to breed as near the Hariana bulls as possible and has in the main succeeded. In buying from the Hissar Cattle Farm the District Boards now get a bull of the Hariana type, hardy and almost entirely free from the defects to which the zamindars take exception. Apart from the difficulties connected with their keep and maintenance there can be no doubt that the Hissar bulls are extremely popular both in Hariana itself and in other central and southern districts for which they are suited. The best animals in the fairs are generally found to possess a very considerable strain of the Hissar Cattle Farm bull. The District Boards of the districts north of the Chenab have of late years distributed Dhanni bulls, and the western districts bulls bred in Dajal. These animals are bought locally, usually with the advice of the Civil Veterinary Department.

Maintenance of District Board Bulls.—The Agricultural Department have refrained from advising the District Boards as to the maintenance of their bulls, as the policy adopted must necessarily vary with the conditions prevailing in each district.

In all districts, except in the north-western and western districts of the Province the bull, after having been stall-fed for a week or two to induce him to remain in the village, is allowed to roam with the herds. No special arrangements are made for his keep but the zaildar and the lambardar of the village are generally responsible that he remains healthy and does not stray too far. Complaints are not infrequent that zaildars and lambardars dislike the responsibility of looking after the animal and that the zamindars grudge the damage to their crops. In parts of the Jhelum, Rawalpindi and in Montgomery and the western districts the bull is kept in the village and the cows brought to him. Some Boards, notably those of the Rawalpindi and Dera Ghazi Khan Districts have even paid the zaildar or other person entrusted with the bull for his fodder and keep. Liberality could go no further. Under this system there is the risk, if the money is properly expended of the bull being overfed and too little exercised. On the other hand the person in charge may take it upon himself to levy fees or may possibly divert the allowance to his own uses. In Dera Ghazi Khan the bull entrusted to a zaildar is often neglected. The difference between the breeding arrangements of the central and southern districts, and those of the northern and western seems to have been overlooked. Where bulls are privately

owned and kept at stud, as they are in the latter tracts, the system of making the zaildar responsible is unsuitable. The soundest method of encouraging breeding is to provide private owners at a reasonable cost with bulls for which they charge fees. Conditions in the northern and western districts seem most favourable to such a development of District Board action.

The condition of the district bulls is reported on from time to time by the staff of the Civil Veterinary Department, and in some districts the location is changed at more or less regular intervals. In the worst cases, but not with sufficient frequency or system, an old or diseased bull is castrated or removed to the protection of a local gaushala. It must be confessed that hitherto no District Board has evolved a completely satisfactory arrangement for the maintenance of bulls, and the absence of system goes far to lessen the value of the Board's generosity.

It may be noted that the efforts of Government and the District Boards have been directed solely to the breeding of draught cattle. No special attention has been devoted to the improvement or preservation of breeds specially suited for dairy purposes.

(3). *District Board Cattle Fairs.*—The benefit which the cattle trade of the provinces derives from the large fairs has been already described. These fairs are managed by the District Board either on behalf of the Provincial Government as contractors, or on their own account. A small fee is charged on each sale within the limits of the fair, and except in a few cases, the Board, after paying rent to Government and necessary expenses, clears a considerable balance. The annual profits from cattle fairs usually exceed the yearly expenditure on District Board bulls. It is perhaps too much to hope that all these profits should be earmarked for the improvement of cattle-breeding, but it would be only just for the expenditure on such improvements to bear some relation to the advantage which the District Boards reap from the cattle trade of the Province. Prizes are given at each fair to encourage breeding and rearing.

(4). *Takkavi.*—The arrangements for assisting the replacement of agricultural cattle by the grant of *takkavi* loans are dealt with in the Financial Commissioner's Standing Orders. Between 1896 and 1904 Government distributed no less than six lakhs in *takkavi* loans for agricultural cattle in the Hissar District alone, apart from the free grants given for that purpose from charitable funds. Of this amount large sums were remitted. It is a matter for consideration whether in view of the large sums expended

by Government on *takkavi* it would not be better to devote more attention to the preservation of cattle by the storing and importation of fodder.

(5). *The Civil Veterinary Department.*—The Civil Veterinary Department of the Punjab consists of a Chief Superintendent and two Superintendents controlling the operations of 14 Veterinary Inspectors. A Veterinary Inspector is in charge of 3 or 4 districts, to each of which are posted a Veterinary Assistant for the hospital in each tahsil and an itinerating Veterinary Assistant. This establishment is fully occupied with the prevention and cure of disease and with horse, mule and donkey breeding in districts outside the operations of the Remount Department. Their assistance in the matter of cattle-breeding is most valuable. But the staff, especially in the higher grades, is at present inadequate for the important work allotted to it, and extremely small compared with the establishments of the Remount and Army Veterinary Department.

Initiative and executive action in matters of cattle-breeding rest with the District Boards, which are advised on technical points by the officers of the Civil Veterinary Department. The diaries and inspection notes of these officers are full of valuable suggestions as regards cattle-breeding, which might with advantage be followed up with greater energy by the District Boards.

XXI.—SUGGESTIONS FOR ACTION BY GOVERNMENT AND LOCAL BODIES.

(1) *Development of the Civil Veterinary Department.*—Government has for some years considered the question of providing a cattle-breeding depôt in the Northern Punjab, which would be for that part of the province what the Hissar Cattle Farm is for the south, a centre for the breeding of first class cattle on scientific lines. A project has been drawn up for such a depôt in the Jhelum colony, and Rs. 1,20,000 were actually sanctioned with that object. But the scheme is at present in abeyance, the chief objection being the unsuitability of any site in an irrigated tract. As an alternative it has been suggested that a cattle-breeding depôt might be established by the Kot Estate in the Futtehjang tahsil of the Attock District which is at present under the Court of Wards. But however desirable it may be to encourage wealthy landowners to conduct the breeding operations in their large herds on scientific principles (an important point which will be dealt with later on), the difficulty in the case of an establishment situated in a private estate would be to secure continuity of action when the estate was no longer under the Court of Wards. The most reasonable proposal would seem to be to

treat the whole Dhanni-Potwar tract as a selected breeding ground forming the separate charge of a Superintendent of the Civil Veterinary Department working as regards cattle-breeding under the Deputy Commissioners of the districts concerned. His duties in addition to the supervision of measures for dealing with cattle disease and veterinary hospitals would be to collect information as to the villages where the best cattle of the valuable Dhanni-Potwar type are bred, to assist the people with advice in technical matters connected with breeding and to direct the distribution of bulls and the provision and, if necessary, the importation of fodder in times of scarcity. To prevent the increase in the number of touring and inspecting officers the Superintendent could take over the duties of the Transport Registration Officer for this tract.

This plan would have the advantage of economy. No expensive buildings and recurring expenditure on upkeep would be required. The appointment would be merely a stage in the development of the Civil Veterinary Department, a department thoroughly popular with the people and admittedly under-staffed. The necessity of a Superintendent for each Division has been already represented to Government. It is not necessary to repeat the recommendations of the district authorities of Hissar as to the necessity for a Superintendent of the Civil Veterinary Department specially deputed to the Hariana tract with his headquarters at Hissar. His duties would be similar to those assigned above to the officer posted to the Dhanni-Potwar tract. His attention would be even more markedly directed to the provision of fodder in time of scarcity.

As has been pointed out the valuable breed of Sahiwal milch cattle is already being diminished by continual export, and with the extension of canal irrigation in the Montgomery district is likely to decline still further both in quality and numbers. The Deputy Commissioner of Montgomery has submitted a proposal to lease 200 acres to a zamindar as a stud farm for the breed, and the scheme had been sanctioned by Government. The conditions of the lease are that at least 200 cows shall be kept up, no bulls introduced that have not been approved by Government authority, and that any of the produce can be claimed for Government at prices to be fixed by the Deputy Commissioner. If the experiment proves successful the system might be extended. But there is always the difficulty of enforcing conditions of this kind if, as is only too likely, the lessee is tempted by the profits of cultivation to bring more and more land under the plough. The Montgomery district and adjoining tracts really require the attention of a

Superintendent of the Civil Veterinary Department no less than the breeding grounds of Hissar and Chakwal.

There is perhaps less urgency for similar arrangements in the Dera Ghazi Khan district but the matter should not be lost sight of.

(ii).—*District Board Bulls.*

The provision of good bulls will always remain the principal field for District Board action with regard to cattle-breeding. As has been pointed out above, with the improvement of the class of bull now turned out from the Hissar Cattle Farm, the quality of the bulls provided by District Boards cannot be gainsaid. Their distribution requires more attention than it obtains at present. In every district localities will be found with sufficient grazing facilities, where the climate has not been spoilt by excessive irrigation. In such centres it might be possible to build up an excellent breed if a number of bulls were stationed there and the results carefully watched. The excellence of the cattle near Beri and Jehazgarh in the Rohtak District is due to the efforts of a Nawab of Jhajjar, who, some 80 years ago, imported a number of Nagor bulls and placed them in the villages near Jhajjar. In the villages of the old Skinner Estate a similar course was followed. The Dajal breed in Dera Ghazi Khan owes its reputation to steady importations of Bhagnari bulls into the villages of the neighbourhood of Dajal. It is understood that the District Board of Lahore contemplate action in this direction, and this example might well be followed in other districts.

The difficulties experienced in arranging for the maintenance of these bulls arise very largely from the fact that the bulls are provided free of charge. The zamindars of the villages where they are stationed having incurred no expense in procuring the bulls are only remotely concerned in caring for what they consider the property of the Board. The Civil Veterinary officers point out that far better results would be obtained and the animals would be far better cared for if the bulls, which at present are turned loose to wander with the herds and are owned by no one in particular, were the property of individuals who were interested in securing fees for the bull's services. As has been mentioned, the practice of individuals charging fees for their bull's services is extremely rare, and only found in exceptional cases in Chakwal. It has been suggested to prosperous agricultural co-operative credit societies that the purchase of bulls would be a profitable outlet for their superfluous funds. The answer has always been that so long as the District Board provides bulls free of charge, there is no reason why co-operative credit societies should pay for them. This answer provides as

good an argument as any in favour of the proposal that in future the District Board should cease to provide the whole cost of the bull. It would no doubt be undesirable for the District Board to withdraw from all participation in a most popular enterprise. But there is no reason why the yearly allotment should not be made to go twice as far as it does by restricting the District Board's share in the cost of bulls provided for selected villages or co-operative credit societies to one half.

In this way the villages would be brought to some sense of responsibility in the matter of the bull's maintenance, while the District Board bearing half the cost would still be in a position to impose conditions as to the inspection of the bull and his produce by Veterinary officers.

(iii).—*Improvement of village breeding.*

The present high prices of cereals and the lack of grazing grounds restrict the numbers of cattle which the zamindar is disposed to breed. But if the number of animals cannot be increased efforts should at least be made to improve their quality. The bulls provided by the District Board, even if their number is increased by the adoption of the proposals made in the preceding paragraph, will always remain the smaller proportion of the bulls which the province requires. The improvement of the ordinary bull, whether provided by the village community or dedicated by the pious Hindu, is a matter to which attention must be devoted. Where the zamindar is alive to the profits to be obtained from stock breeding efforts are already being made. In Rohtak the zamindars select their bulls with great care, but complain of the inferior animals let loose by banias in towns and large villages. Even in Gujranwala, where cattle-breeding receives no special attention, the Deputy Commissioner reports that zamindars have refused offers of inferior bulls which rich Hindus proposed to let loose in the name of charity. In Hissar a scheme initiated by Major Farmer of the Government Cattle Farm met with some success. The object of this scheme was to enlist the sympathy of charitable Hindus in the improvement of cattle, and to this end the District Board agreed to pay, as far as funds permitted, a portion of the price of a Government bred bull, if the other portion was forthcoming from private sources, the bull being then loosed in the names of private contributors. This arrangement appealing as it does to the religious feelings of the Hindu community should be capable of development and is well worth a general trial. The Townsend Agricultural Society of Hissar, though at present devoting its attention to the encouragement of camel-breeding, contains members who are generally active in getting rid of bad bulls out of their zails and villages. With regard to this important

question Mr. Townsend remarks : " It is hard to see how banias and other Hindus can be prevented from letting loose such bad animals till a more healthy public opinion grows up. I do not think legislation would do any good ; the zamindar would probably welcome it, but the Brahmin and Bania would oppose it very strongly as interfering with their religious ceremonies."

Mr. Dunnett, the Settlement Officer of Ludhiana, makes the useful suggestion that the donor of one or two really good bulls might be recognized and rewarded in the same way as the builder of a sarai or a roadside well.

The example of the Townsend Agricultural Society of Hissar in endeavouring to remove unsuitable bulls deserves to be followed throughout the Province. The working out of a scheme for the improvement of cattle-breeding which would include the removal of undesirable animals as well as the provision of new bulls might be entrusted to a strong sub-committee of each District Board. Working on a carefully considered plan this sub-committee might be trusted to arrange for the supply and control of bulls provided wholly or in part by District Board funds. They would direct the distribution of the animals and see that they were properly cared for, and would also arrange for the removal of unsuitable sires. They would also encourage charitable persons to provide animals only of approved quality.

In order to arrange for the removal of the inferior animals at present only too frequent throughout the central and south-eastern districts, recourse may be had to castration where it is not objected to. But the numerous gaushalas throughout the country never refuse any animals which are sent to them, and would no doubt welcome the prospect of assisting the improvement of cattle, by receiving worn out or inefficient bulls. Some of these institutions, notably those maintained by Rai Sahib Ram Gopal at Sirsa and in his estate in Bikanir, are very well managed. Proper accounts are kept, and in most years the income exceeds the expenditure. The institutions have a good balance in hand and the Rai Sahib expressed himself strongly in favour of a proposal to keep good cattle apart from the infirm in separate herds.

(iv).—*Improvements in breeds of Milch Cattle.*

The necessity for preserving the valuable herds of Sahiwal cattle has already been dwelt on, and suggestions put forward for ensuring that a fair proportion of the land distributed on the new Canals is reserved for grazing. The proposal of the Deputy Commissioner, Montgomery, to lease land as a breeding depôt for Sahiwal cows has been alluded to. The Deputy Commissioner of Lyallpur has a plan for supplying Sahiwal bulls to the Gujars in

Lyallpur and other colony towns, and trying to get them to rear female calves at any rate. At present the Gujars neglect the young stock of their valuable cows and do not allow even the female calves to have much milk. The example of the Deputy Commissioner of Lyallpur might be followed in Amritsar, Lahore and other large towns where the Gujars who provide the milk supply are draining the Montgomery breed of its best cows, without attempting to replace them. A certain amount of assistance in this direction might be afforded by such institutions as the Lahore Central Jail which are obliged to keep up large herds of cows. At present these herds are of a nondescript character, but with a little care it should not be difficult to preserve a herd of the pure Montgomery strain. The Aitchison College authorities who maintain a small herd are making efforts in this direction.

(v).—*Buffalo-breeding.*

The breeding of buffaloes has not hitherto received much attention from the District Boards or the Civil Veterinary Department, nor have Deputy Commissioners made any suggestions on this head in their present reports. Buffalo bulls are kept by individuals who charge fixed fees for service. This is the system which it is desirable to introduce in the case of cattle-breeding, and therefore any attempts on the part of District Boards to provide buffalo bulls should be deprecated. The Deputy Commissioner notes that the District Board of Gujrat had some such scheme under contemplation and it is satisfactory to see that he is reconsidering the proposal. At the same time the attention of the Civil Veterinary department can be directed towards observing the quality of buffalo sires working in districts, and to indicating improvements where such suggest themselves.

(vi).—*Assistance from large landowners.*

The Punjab being essentially a province of self-cultivating proprietors, the number of wealthy landlords owning large estates is comparatively limited. But the Maliks of the north-western districts, the Biluch chiefs, the wealthy zamindars of Montgomery, the Sirdars of Ludhiana, Ambala and Karnal, and the Nawabs of the Karnal District are all interested in cattle-breeding and maintain large herds and extensive grazing grounds which yield them considerable profit. Their cattle, however, are generally somewhat heterogeneous. If these gentlemen can be induced to transform what are at present mere collections of cattle into herds of definite types bred on scientific principles, it would undoubtedly be a most profitable undertaking both for themselves and the province at large. Most of these landowners are themselves expert cattle masters and it should not be difficult to

persuade them to specialize in the breeds suited to the country in which their lands are situated. Hitherto they have received encouragement principally in the matter of horse-breeding, but when once their attention is directed to the importance and profits of scientific cattle-breeding they may be expected to enter upon it with enthusiasm. Courts of Wards have expended large sum in starting stud farms for horse-breeding, few of which have obtained permanent success. Cattle-breeding is a less costly pursuit, and with reasonably good management should be far more profitable than horse-breeding. The Civil Veterinary Department would no doubt gladly assist with expert advice if required.

(vii).—*Improvement of the milk supply.*

The Deputy Commissioner of Jhelum suggests that if District Boards can afford the initial outlay, they should start model dairy farms, and urges the importance of giving the people an object lesson in scientific dairying. But if an object lesson is all that is required the Military Dairy Farms at Lahore, Ambala and Rawalpindi already provide the very best instruction in modern dairying methods; and the Military authorities, it is believed, would be prepared to show these arrangements to duly accredited visitors. The Director of Agriculture could no doubt arrange for persons interested in starting dairy farms in civil stations to inspect the Military Dairy Farms, or even for a course of instruction. As has been stated private ventures of this kind already exist in Lahore, Delhi and other places. The development of this class of industry for the population in civil stations may well be left to private enterprise.

But, although it may be unnecessary for Government to embark on further expenditure in the shape of model dairy farms, there are departments of Government to whom such institutions are almost necessities. For instance, the large and yearly increasing Railway colony in Lahore might well be catered for by a dairy run on the same lines as the military dairy farms. The milk could be collected at centres, say in the Montgomery or Lyallpur districts, and separated on the spot, the cream railed into Lahore, and made up into butter, in the same way as the Ambala cantonment is supplied with cream for butter-making from collecting centres in the Karnal district. The milk supply would need to be arranged for by a dairy farm in the vicinity of Lahore on the same lines as the dairy farm in Lahore cantonments. Besides the North Western Railway, other Government institutions such as the Mayo Hospital, the Central Jail and the Aitchison College are all interested in the supply of pure milk. It would appear that there is as much, if not more

reason for a large Government dairy in Lahore as in any cantonment.

The establishment of dairy farms on European lines cannot be regarded as a remedy for the present unsatisfactory state of the milk supplies to cities and towns. The demands of the Indian population are for pure milk and pure ghi. Only a very small proportion of the Indian community consume butter of the kind which is prepared in European dairies. It would no doubt be possible to manufacture ghi in large factories. But there would be no advantage in starting competition of this kind with a prosperous home industry.

The worst features of the present conditions are the insanitary conditions under which the milk trade is carried on, the extent to which both milk and ghi are adulterated, and the profit which the zamindar loses from want of co-operation in the production and sale of ghi. For the first defect unfortunately no remedy by import from any considerable distance can be hoped for. The supply of milk from any distance above 10 or 15 miles on a scale large enough to provide for the wants of Lahore or Amritsar would be a most hazardous operation especially in the hot weather. Even were it possible to place the milk on the railway no facilities are at present afforded by the Railway administrations in the shape of trains specially fitted for milk traffic.

It remains, therefore, to encourage a supply of pure milk produced under sanitary conditions in the neighbourhood of, but outside cities and towns. It is believed that the Deputy Commissioner of Lahore has endeavoured to start model milk shops in Lahore, and the idea is worthy of all encouragement. If small capitalists can be found willing to start milk shops and to take this supply only from dairy men who are prepared to supply milk produced under sanitary conditions so much the better. The chief difficulty which will present itself is the uncertainty of a demand for pure milk at a somewhat higher price. To meet this Government might assist by inducing Government institutions such as jails and hospitals (in default of a Civil Dairy farm) to obtain their supplies from those shops which were prepared to deal in unadulterated and uncontaminated dairy produce. The ordinary custom might be expected to follow in course of time. The Railway authorities might help by granting favourable rates to those dairymen whose premises and methods had been approved by the sanitary authorities of the Municipality, and the Municipality might remit the octroi dues in the case of such persons.

(viii).—*Co-operative dairying.*

The successful co-operative credit society in rural tracts, as has been already noted, is not slow to recognize the profits to be derived from engaging in the cattle trade. It would also appear that such societies are quite ready to devote their surplus funds to breeding cattle for their own use or for sale, if free distribution of bulls by the District Boards is discontinued. Their attention might also be devoted to the profit which may be expected from co-operative dealing in dairy produce. The successful experience of similar undertakings in Ireland and the profits made in the milk and *ghi* trade throughout the province fully justify a recommendation that prosperous societies should embark in the business of co-operative dairying.

As regards the milk trade it has been shown in the last paragraph that milk cannot be supplied to any centre from outside a radius of more than 10 or at the most 15 miles. The co-operative movement has had its chief success at a greater distance than this from important cities and towns, and it is desirable that such enterprises as cattle breeding and dairying should be grafted on to existing societies which have already prospered rather than societies should be formed for these special objects. But many villages near cities and towns really depend quite as much on market gardening or dairying as on ordinary agriculture and there is no reason why in the case of these villages co-operative credit societies should not be based on what is, after all, their principal industry. In the previous paragraph the conditions necessary for improvement of the milk supply have been discussed from the point of view of the small capitalist. If co-operative societies enter the field they might reasonably expect to obtain the same assistance from Government in the shape of a guaranteed certainty of custom for their improved, but more costly, produce. It is possible however that a well developed co-operative system, by cutting down the excessive profits of the middleman might result in the supply of improved produce with no greater expense to the city consumer. It is believed that the Registrar of Co-operative Credit Societies considers these proposals favourably and is prepared to undertake experiments in such trading.

In the case of the *ghi* trade the question of distance does not arise. Most villages engage in the business and it should therefore be easy to find existing societies ready to add trade in *ghi* to their other activities. It should not be a difficult matter to arrange for the collection of the *ghi* and for the sharing of the profits in the proportion of the amount contributed by

each member. The business part of the undertaking will present more difficulty, and expert management will be required to transport the *ghi* from the collecting centres to the railway and to place it on the market. The details of working must be left to the Registrar of Co-operative Credit Societies, who is understood to be considering these suggestions.

(iv).—*Improvement in breeds of sheep and goats.*

Hitherto little action has been taken towards the improvement of the breed of sheep and goats. From time to time the sheep of the country have been crossed with imported strains, but there has been hardly any perceptible effects on the general stock. But as the officers of the Civil Veterinary Department obtain more and more knowledge of their charge, further efforts will no doubt be made. The recent introduction of merino rams into the Kulu flocks should result in great improvement in the fleece of hill sheep. In the plains much good can be effected by systematic selection of good rams suited to the climate. The merits of the Bikanir and Hissar sheep are already appreciated in the districts further north, and District Boards might give further encouragement to the improvement of the breed by a judicious distribution of good Bikanir rams to suitable persons. The Hissar sheep were themselves much improved by the encouragement given to sheep breeding in the villages of the old Skinner Estate. Similar action could be undertaken in the case of goats.

(v).—*Cattle and sheep fairs.*

The need for cattle fairs in the Ambala district, at Gujar Khan in the Rawalpindi district, in the Jhelum colony, and generally in the Western districts has been mentioned by district officers and has already been alluded to. At present few sheep fairs are held, either separately or in connection with cattle fairs. But it would appear that a sheep fair at Fazilka in the Ferozepore district or at Basal in the Attock district would have considerable prospects of success and would be both useful to traders and profitable to the District Board. Another suitable place for a sheep fair would be Gujar Khan, and the existing fairs at Abohar, Amritsar, Hissar, Bhiwani and other places might be extended so as to include sheep and goats. Prizes for sheep and goats might also be included in the prize lists issued by District Boards on these occasions.

XXII.—SUMMARY.

The conclusions arrived at in the previous chapters may be briefly summarized.

(i) Bullocks.

The demand for draught cattle has largely increased in the last 20 years owing to the spread of cultivation. (Chapter II). This increased demand has been met, but only by pressing every class of animal into service. The increasing use of the male buffalo for draught is evidence of the difficulty felt in meeting the demand. The number of draught animals is not much greater than it was 15 years ago, but the animals kept are more efficient. Grazing grounds are becoming more and more contracted, and the farmer cannot afford to keep old and worn out stock, which can be readily disposed of to traders. The problem of adjusting supply and demand will be greatly facilitated, if, as seems probable, the use of labour-saving machinery is widely adopted. The number of bullocks required can be reduced by more efficient ploughs, cultivations and harrows. Improvements in well machinery, which may be reasonably expected, would also mean a considerable saving of bullock power.

Prices have practically doubled in the last 15 or 20 years partly owing to the increased demand and partly to the succession of bad years between 1896 and 1906 which depleted the sources of supply (Chapter XVI). Nevertheless the profits of agriculture are so great that the zamindar of the highly cultivated districts prefers to pay a long price for imported stock rather than face the very considerable difficulty of conserving grazing grounds and breeding his own stock (Chapter VIII). In highly cultivated districts cattle of a kind continue to be bred locally, but the main sources of supply are the breeding centres of Hariana, the Potwar Dhanni tract and Sind (Chapter VI). Of these centres the first is liable to suffer from drought, and the second is threatened with depletion owing to reckless export. If the quality and quantity of the stock bred in these centres can be maintained a further rise in prices may possibly be prevented. The two essential points to which attention should be directed are:—

- (1) the appointment of special officers to Hariana and the Potwar Dhanni tract to obtain information as to the villages in which the best cattle are bred; to direct breeding operations, and assist the people with expert advice. (Chapters XIII and XX1 (i),
- (2) the storage and import of fodder in bad seasons so as prevent the loss of valuable stock by forced sale in time of drought. (Chapter XIII).

It is probably impossible to breed more animals in highly cultivated districts under present conditions. But the quality of

the stock can be improved by the judicious distribution of good bulls by district boards. The people should be encouraged to bear some part of the cost of the animals provided. The experiment of attaching a number of bulls to villages well situated as regards climate and grazing deserves attention. The most satisfactory system of maintaining stud bulls is that they should be owned either by co-operative societies or by individuals, and that fees should be charged for their service. Under such a system the present difficulties of maintenance will disappear (Chapter XXI *ii*).

The class of bulls provided by private individuals at present is capable of much improvement. Villages should be encouraged to refuse gifts of bulls which fail to reach a proper standard. Rewards and sanads should be freely given to individuals who present really good bulls for the use of the public. Efforts should be made to eliminate worn out and unsuitable sires which should either be castrated or made over to the local gaushala. The distribution and management of the bulls of a district should be entrusted to a strong sub-committee of the District Board (Chapter XXI *ii* and *iii*).

(*ii*)—*Cows and Buffaloes.*

In breeding districts the number of cows is satisfactory and may be expected to increase largely with a succession of good years. If adequate arrangements are made for fodder supply in years of drought, it may be hoped that the numbers will not in future be subject to the sudden fluctuations which have been so unfortunate a feature of the recent droughts.

In highly cultivated districts breeding receives little attention, and, as the buffalo is more profitable as a dairy animal, the number of cows tends to decrease (Chapter XI).

The valuable breed of milch cattle in Montgomery is drawn upon to such an extent that it is in danger of extinction. In distributing land on the new canal the question of providing fully adequate grazing reserves should be considered, as well as the advisability of special rates for irrigating lands which are intended as permanent pasture. In view of the experiment recently undertaken by the Deputy Commissioner of Montgomery in leasing land as a breeding depôt for cows of the Sahiwal type the grant of lands on special terms for this purpose should be considered in distributing the area to be irrigated by new canals. (XI *ii* and XIII).

The attention of Deputy Commissioners should be directed to the efforts now being made in Lyallpur to induce cow-keepers to pay more attention to their young stock (XXI *iv*).

The increase in the number of buffaloes throughout the province is one of the features of present agricultural conditions.

This animal thrives and breeds for the cow in tracts where grazing is scarce and stall feeding has to be resorted to. The dairying profits of a buffalo are much greater than those of a cow (XI ii and XVI).

Buffalo breeding appears to be proceeding on sound lines, but may receive attention from District Boards, and the Civil Veterinary Department (IX and XXIV).

(iii).—*Dairying.*

The development of dairies for the supply of civil stations conducted on the same lines as Military Dairy Farms may be left to private enterprise. There is, however, evidently room for a Government dairy farm in Lahore to supply the Railway Colony, or provide for the wants of the hospitals and jails.

The milk supply to the Indian population of towns and cities is highly unsatisfactory. The conditions under which milch animals are housed and fed both inside and outside the cities are most insanitary. Efforts should be made to remove the cow-keepers from cities. These efforts must, of course, be very gradual so as not to arouse opposition. Owing to the difficulty of transport from a distance the milk supply must be drawn from a radius of not more than 10 miles. Within these limits the production of milk under sanitary conditions can be managed by remissions of octroi and such like concessions to dairymen whose premises are considered sanitary.

The conditions under which milk is hawked about the streets and sold in shops is also unsatisfactory. Model shops should be encouraged by guaranteeing all the custom which Government can give them in order to start the undertaking (XXI vii).

Some assistance may be expected from co-operative effort (XVI and XXI viii).

The manufacture of *ghi* is an established home industry which it would be inadvisable to disturb by any further organization. The profits of the *ghi* trade are very considerable. Co-operative action may be recommended in order to ensure the zamindars receiving their due share of the profits from their produce (XV ii and XXI vii and viii).

(iv).—*The cattle trade.*

The cattle trade is fully developed; and in need of no assistance from Government. The demand of the export trade in hides clears off large numbers of useless and worn out cattle and the zamindar is beginning to take a share of these profits. If however the zamindar kept more of his young stock he would be less dependent on import, but with diminishing grazing this development is not likely to take place (XIV, XVII, XVIII).

(v).—The Civil Veterinary Department.

The superior grades are obviously understaffed, and two more Superintendents are urgently required, one for the North Punjab, to enable special attention to be given to the Potwar Dhanni tract, and one for the South Punjab, to be stationed at Hissar to devote similar attention to the Hariana breeding grounds (XIII and XXI i).

(vi).—The co-operative movement.

Existing co-operative credit societies should be encouraged to buy their bullocks direct from breeders and not from dealers, and thus save the system of purchase by instalments and the very large prices charged in lieu of interest (XIV ii).

They should be encouraged to buy bulls of their own and take up breeding themselves (XXI ii).

Their attention should also be directed to the profits likely to be obtained from co-operative dealing in *ghi*. Co-operative societies for the supply of milk might be formed in the neighbourhood of large towns (XXI viii).

(vii).—Miscellaneous.

Attention should be paid to sheep breeding, the animal being valuable for both wool and *ghi*. Goats are less important but should not be neglected (XIX). New cattle fairs are required in certain localities: at centres where the wool trade is important sheep fairs should be started or combined with existing cattle fairs.

XXIII.—CONCLUSION.

Deputy Commissioners and Settlement Officers throughout the Province have evinced great interest in the enquiry, and have assisted the officer deputed to write the report in every possible way. Specially good reports were received from Lyallpur, Hissar, Gurgaon, Delhi, Ludhiana, Gurdaspur, Montgomery; also from Amritsar, Rawalpindi, Attock and Multan. Almost every matter or suggestion of value outside the district reports and even many points in district reports, must be attributed to Major Walker, Chief Superintendent of the Civil Veterinary Department of the Province and to Major Farmer of the Hissar Cattle Farm. These officers have placed their experience unreservedly at the disposal of the writer, and have helped him throughout with criticism and instruction. A report on this subject should naturally have been written by an officer of the Civil Veterinary Department, and the fact that these officers are far too busy to undertake such work forms one more argument in support of the necessity for augmenting the Veterinary staff of the Province. The Director of Agriculture has throughout the enquiry given the writer the benefit of his advice and criticism.

A. M. STOW.

October 1910.

APPENDICES.

APPENDIX No. 1.

AGRICULTURAL STOCK ACCORDING TO THE QUINQUENNIAL CENSUS TAKEN IN 1909.

[Figures of previous Census, 1904, are given in ordinary type and those for 1909 in antique type.]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Serial No.	District.	Bulls and bullocks.	Cows.	Male buffaloes.	Cow buffaloes.	Young stock of both sexes and all classes shown in columns 3 to 6.	Sheep.	Goats.	Horses and ponies.	Mules.	Donkeys.	Camels.	Pounghs.	Carts.	Boats.
1	Hissar ... { 1909 ... { 1904	115,161 85,182	132,988 78,908	7,375 4,853	85,550 58,989	197,577 132,296	227,540 170,688	219,522 280,256	7,855 4,614	351 399	18,185 13,882	48,686 31,037	89,401 73,509	11,659 11,196	13
2	Rohtak ... { 1909 ... { 1904	95,119 87,795	82,113 63,256	960 1,272	57,093 53,848	140,851 126,687	34,721 23,502	86,712 106,655	3,757 3,164	131 130	13,562 10,302	2,419 2,361	50,870 40,008	16,676 14,826	...
3	Gurgaon ... { 1909 ... { 1904	113,279 115,198	98,714 100,470	1,921 2,435	65,442 71,468	134,069 162,112	42,326 45,121	152,764 231,313	7,738 9,523	62 157	14,251 13,637	1,924 2,426	57,304 52,535	12,693 14,979	14
4	Delhi ... { 1909 ... { 1904	86,307 92,376	60,555 63,063	1,237 2,140	58,385 56,197	92,917 113,266	33,048 35,218	71,194 109,489	5,031 5,645	707 547	10,781 10,408	649 786	88,661 37,456	14,447 15,889	19
5	Karnal ... { 1909 ... { 1904	189,536 177,486	149,159 138,225	4,521 10,547	151,768 161,910	211,870 277,810	92,500 82,904	100,298 139,739	10,388 9,610	1,196 815	19,833 17,227	1,650 1,591	73,974 73,614	18,180 16,927	34

6	Amballa ...	{ 1909	174,684	111,460	2,348	90,459	144,952	53,567	112,398	10,497	3,338	9,280	617	66,726	23,941	80
		{ 1904	168,927	99,596	3,071	80,372	143,118	45,692	126,986	9,285	1,995	8,157	715	68,961	22,019	98
7	Simla ...	{ 1909	6,865	8,109	64	1,311	5,707	3,741	4,518	302	163	18	...	2,790	4	...
		{ 1904	6,501	7,120	43	1,260	5,466	3,363	5,060	265	163	49	...	2,589	5	...
		*														
8	Kangra ...	{ 1909	296,015	238,997	17,377	101,161	214,833	358,491	555,672	8,171	2,374	1,095	189	126,218	130	23
		{ 1904	287,723	238,298	16,976	93,424	240,725	308,050	557,981	8,254	1,101	1,274	116	113,390	91	23
9	Hoshiarpur	{ 1909	201,800	134,156	28,625	91,630	153,589	27,463	176,564	10,683	1,393	6,429	1,724	92,457	20,925	74
		{ 1904	201,767	128,524	26,171	80,415	157,311	29,411	209,769	8,232	1,395	6,582	1,664	91,672	18,240	77
10	Jullundur	{ 1909	180,141	77,219	30,402	64,016	114,634	18,671	75,121	8,804	938	13,506	840	79,121	28,405	77
		{ 1904	194,128	75,892	31,199	54,742	112,194	24,863	124,667	6,730	826	12,629	983	87,297	27,593	81
																E:
11	Ludhiana...	{ 1909	120,981	59,929	2,482	62,263	101,228	34,179	65,883	5,078	278	11,316	2,409	50,897	20,796	34
		{ 1904	131,041	54,591	2,686	54,596	94,813	30,870	121,562	4,740	307	9,989	2,185	52,934	23,204	28
12	Ferozepore	{ 1909	230,377	109,749	22,659	137,979	188,277	243,550	142,338	19,371	1,086	24,021	27,123	112,306	31,411	113
		{ 1904	203,157	92,254	17,780	99,100	153,642	244,412	307,774	14,132	964	20,565	16,458	101,513	26,761	125
13	Lahore ...	{ 1909	185,701	121,894	62,607	144,286	176,836	209,200	103,151	27,607	2,515	33,865	3,914	109,251	16,514	187
		{ 1904	194,315	125,998	59,950	118,006	175,918	260,638	263,699	24,191	1,416	32,648	4,289	112,190	14,690	195
14	Amritsar ...	{ 1909	115,899	79,880	47,405	114,006	119,026	26,499	67,946	16,449	1,968	18,789	608	69,304	8,402	108
		{ 1904	132,057	89,517	48,438	104,704	138,511	32,073	128,581	15,614	1,566	21,419	833	75,809	8,090	106
15	Gurdaspur	{ 1909	156,597	163,604	70,628	76,742	158,600	37,358	119,481	15,749	1,626	12,736	884	86,238	8,760	150
		{ 1904	174,563	166,917	64,843	67,105	177,157	54,804	179,481	13,531	1,047	12,722	1,037	92,180	7,725	155

* The figures do not contain the figures of Lahoul and Spiti tracts where the enumeration is not complete.

APPENDIX No. 1—concluded.

Serial No.	District.	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		Bulls and bullocks.	Cows.	Male buffaloes.	Cow buffaloes.	Young stock of both sexes and all classes shown in columns 3 to 6.	Sheep.	Goats.	Horses and ponies.	Mules.	Donkeys.	Camels.	Ploughs.	Carts.	Boats.
16	Stalkot ... { 1909	129,013	120,685	61,529	127,332	128,398	32,118	39,944	15,406	2,528	17,774	158	104,072	3,754	90
	{ 1904	134,223	113,579	58,245	112,145	140,501	55,069	88,947	12,494	907	15,350	247	105,132	3,021	88
17	Gujranwala { 1909	125,897	110,916	69,273	132,486	149,574	149,398	62,222	18,359	514	23,870	2,178	88,960	5,713	120
	{ 1904	145,070	117,125	65,367	119,451	165,022	179,748	133,760	6,454	455	24,582	2,668	98,001	5,229	97
18	Gujrat ... { 1909	134,790	93,593	33,269	90,382	124,000	46,818	43,247	13,506	833	26,635	2,545	80,248	616	111
	{ 1904	132,067	82,335	32,192	68,907	116,972	74,325	104,680	9,079	578	19,845	2,586	75,619	468	100
19	Shahpur ... { 1909	170,883	168,578	29,636	93,292	166,087	346,736	132,949	27,082	3,165	36,629	16,360	84,825	3,871	202
	{ 1904	148,647	136,418	25,156	53,718	134,191	273,260	166,112	13,822	1,317	27,674	15,774	73,163	2,064	217
20	Jhelum ... { 1909	98,140	102,666	4,946	26,957	86,728	190,856	155,986	6,819	1,861	32,015	5,498	63,733	495	233
	{ 1904	85,402	79,112	3,923	20,611	78,582	160,547	179,435	5,378	1,766	24,771	3,628	60,539	310	189
21	Bawalpindi { 1909	93,465	99,715	2,305	31,789	81,989	128,593	151,488	11,971	7,893	22,560	3,711	65,636	6,285	18
	{ 1904	95,098	81,837	5,884	25,002	74,737	107,561	160,326	8,705	4,616	18,721	3,690	61,697	2,131	3

22	Attock ...	{	1909	95,088	123,657	3,751	19,272	82,661	249,700	171,654	5,755	696	30,173	8,699	68,050	1,467	32
			1904	74,773	99,471	3,015	15,176	70,800	216,482	165,128	4,405	656	23,572	7,092	62,180	1,165	45
23	Mianwali ...	{	1909	100,531	80,806	1,346	16,067	53,744	402,381	208,597	4,938	141	20,218	21,682	47,262	60	163
			1904	87,970	67,916	1,438	13,638	50,561	362,169	223,462	4,747	228	17,515	20,589	42,656	25	148
24	Montgomery	{	1909	139,049	121,627	43,373	63,139	102,587	250,772	147,687	14,722	307	34,555	16,468	73,193	786	111
			1904	110,477	97,187	26,176	45,056	80,118	227,463	265,718	10,022	210	28,641	19,392	57,059	531	104
25	Lyalpur ...	{	1909	198,525	132,759	37,848	143,138	213,030	162,693	85,090	26,490	1,493	19,016	11,135	91,170	29,256	8
			1904	180,365	116,739	38,678	90,391	173,429	85,393	93,092	16,552	642	17,213	18,798	83,236	21,197	5
26	Jhang ...	{	1909	131,541	124,725	22,167	73,339	121,971	242,282	128,886	14,396	145	22,402	12,699	61,468	340	94
			1904	109,225	93,788	15,738	34,619	77,989	170,848	139,514	6,337	71	15,927	6,869	50,166	235	84
27	Multan ...	{	1909	232,260	182,696	9,661	57,154	146,060	281,595	325,966	13,804	542	38,767	23,165	97,921	1,486	112
			1904	195,496	152,300	6,500	45,398	130,019	244,443	369,109	11,622	563	30,952	23,390	85,173	1,390	95
28	Muzaffar- garh.	{	1909	184,952	149,012	3,830	4,993	111,113	334,263	238,615	10,818	171	23,355	33,445	79,169	87	236
			1904	180,247	146,871	3,810	40,239	107,640	293,310	235,365	10,668	177	28,081	31,510	76,498	79	214
29	Dera Ghazi Khan.	{	1909	144,928	137,769	1,420	28,940	97,037	234,333	234,429	16,708	407	26,388	24,148	57,850	529	263
			1904	141,272	131,671	1,131	25,394	91,319	216,795	252,021	15,871	490	24,351	21,746	56,567	441	340
	Total	{	1909	4,247,494	3,383,645	624,965	2,241,371	3,819,975	4,495,442	4,179,232	856,244	38,822	582,576	270,522	2,169,065	287,688	2,719
			1904	4,072,574	3,038,968	579,657	1,867,676	3,652,886	4,059,032	5,469,685	293,686	25,502	502,285	244,460	2,063,359	260,541	2,753

APPENDIX No. 2.

SYNOPSIS OF DISTRICT REPORTS ON THE CATTLE TRADE OF THE
PUNJAB.

BULLOCKS, COWS AND BUFFALOES.

(a) *Exporting tracts.*—Tracts in which cattle are bred for sale. By what classes breeding is carried on. Status and condition of professional graziers. Breeds of cattle. Arrangements for bulls. Arrangements for grazing and feeding. Method of disposal of stock and destination. Range of prices. Present prices compared with prices in past years. Profits of breeding. Increase or decrease in breeding in recent years and causes.

(b) *Importing tracts.*—Tracts into which cattle are imported. Tracts from which obtained and breeds. Means by which imported (itinerant traders or fairs). Range of prices. Present prices compared with prices in recent years. Are purchases from cattle dealers generally for cash or on credit? If on credit, what are the usual terms? If a fair is held in the district, statistics should be given showing the tracts from which cattle are brought, the approximate number, and the sales under each head.

NOTE.—(i) Bullocks and cows and (ii) male and cow buffaloes should be dealt with separately as in (a) and (b).

(c) *Home breeding.*—Any extension of the practice by agriculturists of breeding cattle for their own use. Probability of further extension with ruling high prices. Sufficiency of grazing facilities. Possibility of expansion of grazing grounds or of more extensive production of fodder crops if grazing facilities are inadequate. Quality of the cattle locally bred as compared with cattle bought from graziers. Local arrangements for bulls and suggestions for improvement.

(d) *Dairying.*—Localities in which dairying is carried on and to what extent. Class of dairy animals. In what form produce is marketed. Cattle foods. Yield of milk. Profits of dairying. Recent increase in prices of dairy produce. Expansion if any of dairying in recent years and causes.

(e) *Supply of farm cattle.*—Adequacy of supply of cattle for agricultural purposes. Is it considered that there has been any improvement or deterioration in quality in recent years? Suitability of the male stock of the best milch cattle for agricultural purposes.

(f) *Grazing grounds.*—The extent and the character of the grazing grounds belonging (i) to Government and (ii) to private individuals. To what extent are they utilised and what developments if any are possible to maintain or extend the cattle-breeding industry, or to make the maximum provision for scarcity years?

(g) *Fodder.*—Methods of conserving fodder. Their cost and efficacy and how far resorted to. Is fodder generally sufficient in seasons of short rainfall? If not, in what tracts is there a serious deficiency, and how is the shortage usually met? What steps appear practicable to lessen the shortage in bad seasons?

(h) *The trade in hides and bones.*—Description. Receipts on account of the sale of hides and bones.

GOATS.

(4) Tracts in which goats are kept and to what extent. Recent increase or decrease in the number of goats and causes. Facilities for goat keeping. For what purposes kept. Present receipts and profits compared with those in previous years.

SHEEP.

(7) As for goats.

APPENDIX NO. 3.

AGRICULTURAL CIRCULAR No. 1.

STUD CATTLE.

1. A working plan should be framed for each district fixing the type of bull to be supplied, the number to be purchased annually and the standard scale to be maintained, and this programme should be carefully adhered to, subject to such revision as may be dictated by experience. Success in the improvement of agricultural stock will depend largely on systematic and sustained action. In deciding on the type of bull needed, the Superintendent, Civil Veterinary Department, should be consulted. Each district must be taken on its merits and, in some cases, certain localities within districts require different breeds. In framing a programme, the efficient life of a bull may be assumed to be 7 or 8 years.

2. Stud-bred bulls for breeding can be obtained by District Officers from the Government Cattle Farm at Hissar on annual indent. It may be accepted that bulls from Hissar are generally suitable for the southern districts of the Province.

3. Indents for bulls supplied by the Hissar Cattle Farm must be in form A annexed. They should be submitted to the Superintendent, Civil Veterinary Department, by the 1st of September in each year, and, except in special cases, no attention will be paid to indents received late. The Superintendent, Civil Veterinary Department, will forward a consolidated indent to the officer in charge of the Hissar Cattle Farm. He will also proceed in due course to the cattle farm, inspect the bulls available, and allot them to the various districts. A copy of the consolidated indent will be sent to the Director of Agriculture, with a note as to the number of bulls actually supplied to each district.

4. Bulls will be supplied by the Hissar Cattle Farm at a fixed rate of Rs. 200 each. Payment should be made to the Superintendent of the farm immediately on the receipt of a bill.

5. Where Hissar bulls are not suitable, or are not available in sufficient numbers, Local Bodies should make their own arrangements for purchase. It should be easy to obtain the small number of bulls required annually by purchase in the villages or at fairs through a select committee of experienced agriculturists, of which it is advisable that the Veterinary Inspector of

the Division should be a member. Bulls obtained in this way will not be quite as good as stud-bred bulls, but they will be far above the ordinary class of sire, and will be of immense benefit to the agricultural community. The Superintendent, Civil Veterinary Department, will be prepared to render any assistance in his power, but if he is asked to make purchases he should be given ample notice and furnished with information as to the kind of animal required, and the price, as well as with funds. Where young bulls purchased locally are not old enough for stud work, that is, when they are under $3\frac{1}{2}$ years, Deputy Commissioners can doubtless arrange for their care and upkeep for a year or two.

6. The arrangements required for the management and care of bulls differ according to localities concerned. Generally, the system of letting a bull loose in a certain tract under the supervision of some trustworthy person answers very well. Where this system is objected to on the ground of injury to the crops or of exposure to severe cold in winter, it should be possible to arrange to keep the animal under some restraint in the village at the common expense for such time as his services are required, and to send him on from village to village. The question of management is one which each District Board must settle for itself. In all cases, however, a bull should be in charge of some responsible person who should undertake to see that the animal is kept in good condition and has regular exercise, is not allowed to cover an excessive number of cows, and is placed at the disposal of the public for their cows free of charge. The practice of placing stud-bulls in charge of syces is objectionable. Bulls should be branded, and should be transferred to other parts of the district every two years.

7. A register should be maintained in form B. in the District Board Office, of all District Board bulls serving in the district, showing the date of reception, the breed, age, physical marks, place of standing, person in charge and general arrangements. The register should be written up whenever there is a change of stand, and brief notes should also be made from time to time as to the general results of coverings, etc. Any additions, casualties or transfers should be communicated without delay to the Superintendent, Civil Veterinary Department.

8. Unserviceable bulls from age or otherwise should be sold by auction under the orders of the Collector.

9. All bulls will be inspected regularly by the officers and subordinates of the Civil Veterinary Department. The Superintendent, Civil Veterinary Department, of the Circle will forward such reports and recommendations as he may consider necessary to the Deputy Commissioner. He has power to condemn bulls, when they should be disposed of as in the preceding paragraph. Veterinary Assistants may be required to treat any stud-bull that may be sick.

10. The sanction of Government has been accorded to the establishment of a bull-breeding farm at Sargodha, and it is proposed to take up the Salt Range breed (Dhani), which is suitable for the Northern districts. But it will not be possible to begin issues from the Sargodha farm until 1911 or 1912.

APPENDIX No. 4.

FROM

W. C. RENOUF, Esquire, C. S.,

Director of Agriculture, Punjab,

To

ALL COMMISSIONERS, DEPUTY COMMISSIONERS AND
SETTLEMENT OFFICERS IN THE PUNJAB.*Dated LYALLPUR, the 4th September 1910.*

SIR,

I have the honour to address you in continuation of my Circular No. 1 of 1906 and with reference to the decision of the Provincial Government in their No. 1084-5, dated 23rd June, 1910, to continue the annual grant of a lakh of rupees for veterinary objects for another five years from the 1st of April, 1911. As before, the allotments by districts are to be made by Commissioners for the period of five years. I propose to review briefly the progress made in the last four years and to offer suggestions for the utilisation of the grant.

2. I would first invite a reference to my Circular No. 1 of 1906 in which the position at that time was summarised and in which various general questions were discussed. As regards staff, we are working up to a strength of one veterinary assistant, mainly stationary, in each tahsil, and one itinerating man per district with a 5 per cent. leave reserve. The 14 men still needed to complete this cadre will be recruited by April, 1912. There are now 12 veterinary inspectors in place of 9. The number of Superintendents remains unchanged at 3.

3. The change which was introduced in 1907, from a system under which veterinary assistants were mainly itinerating to one under which they are mainly stationary at their hospitals, going on tour only when summoned to outbreaks of disease, has entailed much heavier expenditure on buildings than was originally contemplated. Complete veterinary hospitals are needed almost everywhere. Nevertheless, excellent progress has been made with the programme. There are now 59 hospitals on the standard plan or affording satisfactory accommodation and many more are under construction.

4. It was stated in any Circular No. 1 of 1906 that the most important feature of the scheme for veterinary development was the systematic and regular supply of bulls with a view to the improvement of agricultural cattle. A scale of 7 or 8 good Government bulls per tahsil was aimed at or, say, 800 or 900 for the Province. There are now 472 Government bulls against about 200 in 1906. Having regard to the fact that a number of old animals have been replaced and that casualties have been made good, the scheme of supplying one bull per tahsil per annum has been more or less adhered to. The standard has been exceeded in some districts, while, in others, very little has been done. The matter has received careful consideration in every district, and deficiencies are often due to special circumstances.

5. The annual grants to hospitals have been increased and their equipment has been placed on an excellent basis. A certain number of horse and donkey stallions have been purchased.

6. There is ample evidence that the Department has made great strides in securing the confidence of the people. The success of inoculation against rinderpest has contributed most towards this end. But the professional efficiency of the veterinary assistant has also increased and agriculturists who reside within a reasonable distance of a hospital are very willing to bring in their animals for medicinal as well as for surgical treatment. The services of veterinary assistants were in extraordinary demand last year during the outbreak of foot and mouth disease. The greatly enhanced prices of all agricultural stock are making cattle-owners give much more thought than before to their breeding and management. The agriculturist's cattle are of the very first importance to him, and there is every indication that nothing will be more appreciated by the agricultural population than well considered measures for the benefit of their stock.

7. The following suggestions are now made as regards the application of the new grant :—

- (i). *The improvement of the breed of cattle.*—I consider that this should still have the first place in the programme of veterinary improvement. The experience of the last four years has shown that circumstances vary in different tracts and that there are often special reasons which account for the small number of bulls issued in some districts. In the Central and East Punjab, it is generally easy to let a bull loose in a certain area under the supervision of some trustworthy agriculturists. The bull is maintained by the cultivators, and receives kind and considerate treatment. But the case is different in the South-West and North-West where grazing on crops is resented and where it is difficult to get a bull kept free of cost. It is anticipated that the whole question of breeding will be taken up shortly on the appearance of the Provincial report on the cattle industry of the Province, materials of which were collected under instructions issued in my Circular No. 5 of 1909.

In the meantime, the policy of a systematic and regular supply of bulls should be adhered to wherever this is practicable. I consider, however, that claims that District Boards should meet the cost of the up-keep of bulls should be resisted. If the people of a given tract really desire to have a good bull, they should be prepared to at least feed it or to pay for its services. The policy of the future where free up-keep cannot be obtained, should probably be to encourage private persons to keep good bulls at stud and to charge for their services. At the outset, it might be necessary to assist the movement by providing a part of the cost of such bulls from Local Funds.

- (ii). *The construction of veterinary hospitals.*—The present cost of a complete veterinary hospital on the standard plan is Rs. 6,634. The importance of good buildings cannot be exaggerated. They inspire confidence, and agriculturists cannot be expected

to bring in their animals from a distance unless there is proper accommodation for them. The hospital stables should furnish an object lesson in sanitation. It is hoped that the building programme will be persevered with steadily. In many districts this will make heavy demands on the grant for two or three years more.

- (iii). *Equipment and annual up-keep of hospitals.*—These matters have been placed on a routine footing.
- (iv). *Any other suitable veterinary objects.*—These include the expansion of the scale of stallions.

Summing up, the grant which is now continued is urgently needed in most districts for the completion of the building programme, and, by the time this has been finished, it will doubtless be desirable to embark on a comprehensive scheme for the improvement of cattle.

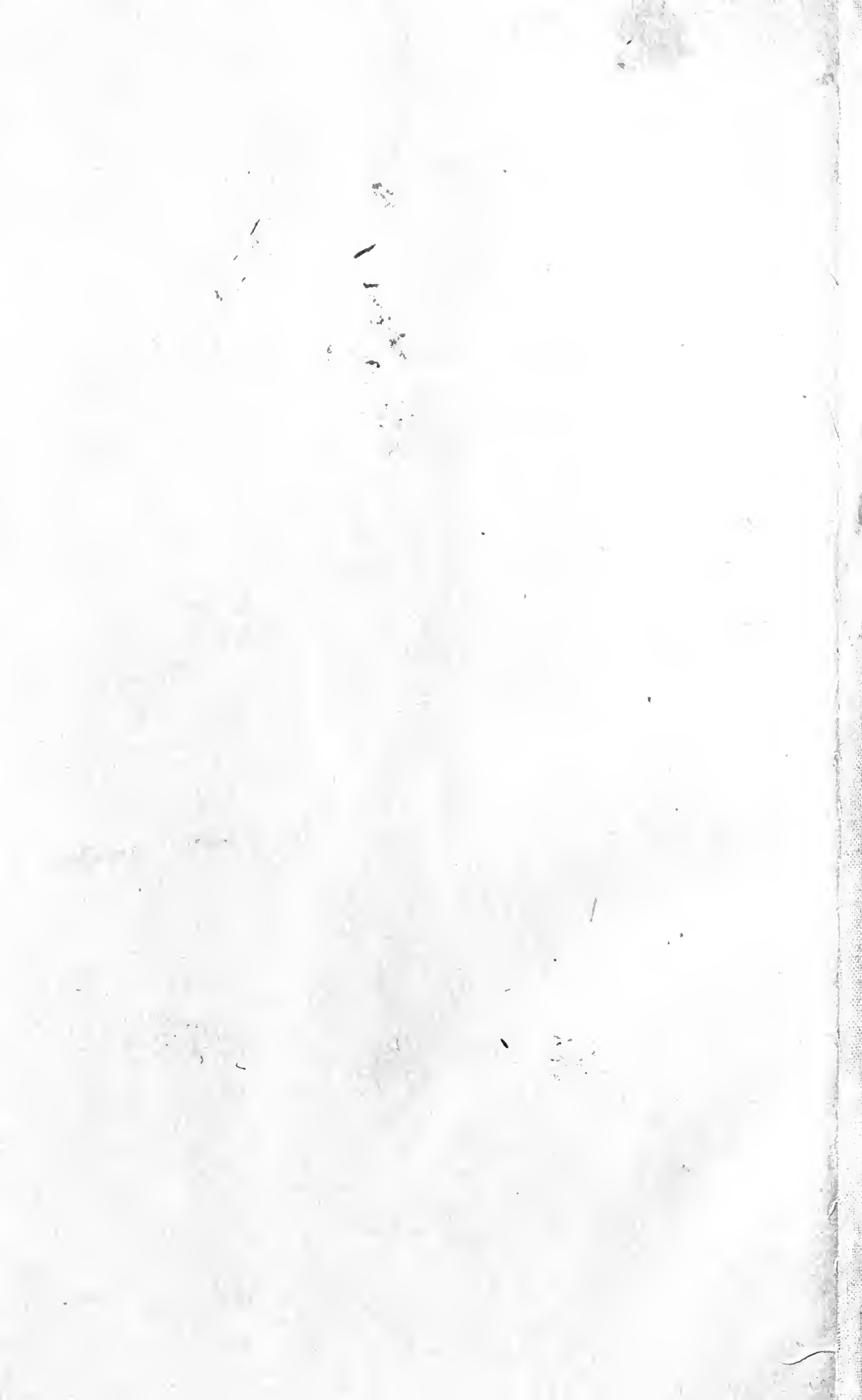
8. It is unnecessary to continue to send me annual accounts of expenditure. The Superintendents, Civil Veterinary Department, will, as before, discuss the arrangements for the utilisation of the grant with the Deputy Commissioners in the course of their tours. The Superintendents maintain rough check accounts and will draw my attention to cases in which there are balances which are not likely to be utilised.

9. The annual report referred to in para. 15 of my Circular 1 of 1906 should also be discontinued as the information is obtained through the Superintendents, Civil Veterinary Department.

I have, &c.,

W. C. RENOUF, C. S.,

Director of Agriculture, Punjab.



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