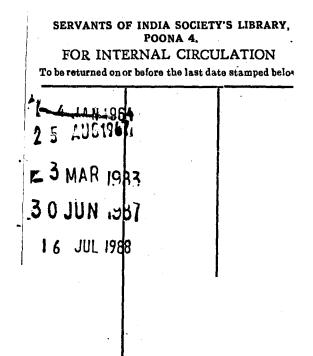
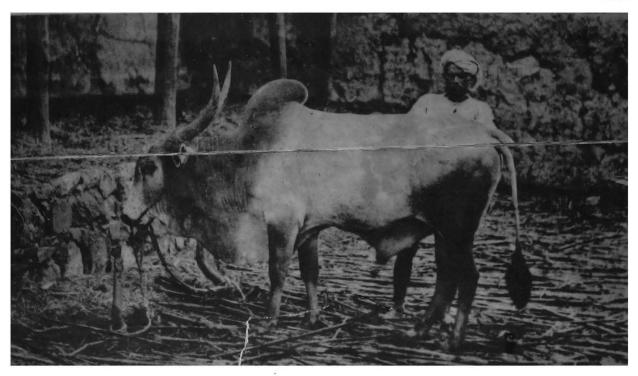
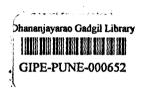
652 Wallace

India in 1887





MYSORE BULL.



INDIA IN 1887.

INDIA IN 1887

AS SEEN BY

ROBERT WALLACE,

PROFESSOR OF AGRICULTURE AND RURAL ECONOMY IN THE UNIVERSITY OF EDINBURGH.

With Plates and other Illustrations.

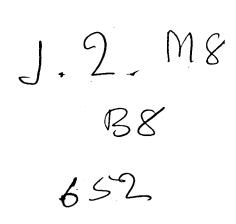
EDINBURGH :

OLIVER AND BOYD, TWEEDDALE COURT.

LONDON: SIMPKIN, MARSHALL, & CO.

LCUTTA : THACKER, SPINK, & CO. BOMBAY : THACKER & CO., LIM.

1888.



OLIVER AND BOYD, EDINBURGH.

.

Dedicated, by permission,

то

LIEUT.-GEN. H.B.H. THE DUKE OF CONNAUGHT, k.g., k.t., k.p., g.c.s.i, g.c.m.g., g.c.l.e., c.b.,

COMMANDER-IN-CHIEF OF THE BOMBAY ARMY.

PERSONAL AND INTRODUCTORY.

SIX years ago I was appointed Professor of Agriculture at the Royal Agricultural College, Cirencester. During my term of office, which extended to fully three years, until my removal to Edinburgh University, I had in my classes four English civilians and eleven native scholars, who had come from India on the strength of Government scholarships to study English Agriculture.

The application and ability of these men placed them at all times high up in the College honours list. My object in going to India was not altogether confined to a desire to extend my knowledge of the Agriculture of the British Empire, but to learn in an unmistakable manner what fruits the Cirencester College training had borne. I felt that my own reputation as a teacher and the English system of agricultural education were both on trial, and it naturally was a matter of the deepest interest to me to discover how my former pupils had been dealt with by Government, and what facilities had been afforded to them of extending their knowledge of the agricultural practices of their own or. their adopted country, and of calling into requisition the results of an English theoretical training.

From my detailed statement it will be gathered how

much cause I had to regret the position of all but a few of those in whom I was interested, and how necessary it is for the credit of the teachers who had been involved, that at least a protest should be lodged against the action, or rather want of action, of Government in this matter.

My going was entirely a matter of my own seeking, of my own free will, and for my own ends, although these were largely in the interests of the country. I landed in Bombay on the 10th of May, and left it on my return on the 13th of September. I was thus fully four months in the country. During that time I travelled over 13,000 miles by rail. Those who know what it is to travel in India during the heat of summer will at least give me credit for sincerity of purpose, whatever verdict they may pronounce upon the work which I accomplished. My route and most of the numerous centres visited are shown by red lines on Map No. 1. I have intentionally omitted to mark a few places where a halt was made, because in giving what I consider an unbiassed description of my experiences I have had to say in some instances what might, if names were added, wound the feelings of some of my friends, though it is in no way my desire to do so. From Bombay my course was northward-Simla and Lahore being the extremities in a north-west direction. Calcutta and Dárjiling were subsequently reached in the east. The return from the north was by Jabulpur, and Nagpur in the Central Provinces.

Southern India was traversed by way of Madras and the S.I. Railway, which may be said to hug the eastern shore. From Tuticorin, the most southerly point of my journey on the Continent, I passed by steamboat to Colombo. I returned after spending ten days in Ceylon. The course of the northward return journey was more towards the west; but owing to the railway connexion on the western side not being complete, it was necessary to double back from Utakamand and Bangalore to Madras on the way to Dharwar, Poona, and Bombay.¹

I took occasion, at the first suitable public opportunity after my return, to express the great sense of gratification which I felt at the kindness and courtesy shown to me by European residents in India and by natives whom it was my good fortune to meet. For the above reason I do not now enter into details in this matter, although the lapse of six months has in no way impaired my recollection of the attention shown me.

Those who have not visited India cannot fully comprehend how well and devotedly the duties of our European officers are performed under difficulties of climate, of which in this country we have no concep-The standard of work in matters of administration tion. (the great business of our countrymen in India) is excellent, and the amount performed is quite wonderful. The fabric of the constitution of the Government of India-that institution which dispenses justice and brings peace and prosperity to millions by a mere handful of educated British gentlemen-is one of the most extraordinary that could possibly be imagined. It is quite impossible to detail the reasons for its success, but amongst them all stands out prominently the innate love of justice, which is the birthright of every true-born Britisher. In India we are trusted and respected. I could feel that time is surely deepening the impression in the minds of all thoughtful natives that the future welfare of India is irrevocably

¹ The date of my arrival at each of the main points named I here subjoin :---

Bombay, 10th May. Simla, 29th May. Lahore, 8th June. Calcutta, 14th June. Dárjiling, 15th June. Jessor, 24th June. Nagpur, 20th July. Madras, 4th August. Tuticorin, 12th August. Colombo, 13th August. Utakamand, 28th August. Bangalore, 31st August. Dharwar, 2nd September. Poona, 6th September.

2

bound up in the existence of British rule, which is a synonymous term with British freedom.

I have been careful in acknowledging my sources of information where this was possible or expedient, but should any of my many esteemed friends be inadvertently omitted, I hope they will be generous enough to forget and forgive my shortcoming as an oversight. I hope, too, that the consistent omission of the prefix "Mr" will not be thought in any sense to lack courtesy.

I have to apologise to my readers for the condition of a number of the collotype plates representing cattle. The defects are not attributable to Waterlow & Sons, London, who printed them, but to the poor and, in some instances, very imperfect negatives which I supplied. Nearly all of the original photographs were taken by myself in India. [Those borrowed I have acknowledged elsewhere.] I feel that I may claim indulgence on the ground, that five days before I left Edinburgh for India I knew nothing practically of photography,¹ and of the difficulties in India for a beginner, in the shape of moisture and the inconveniences arising from keeping constantly on the move, with the impossibility of being able to find a dark room or even a dark corner. For weeks I had nightly to change my plates (adjusting them altogether by touch) under the folds of my traveller's blanket. To succeed in developing negatives myself was impossible under the circumstances.

I now gratefully acknowledge the valuable assistance in this matter rendered by Baldwin in Cawnpur, Skeen in Colombo, and Hughes in Madras, all of whom were pleased to devote themselves to my assistance.

In determining what plates should appear in my work, I sank the idea of ornament altogether in favour of anything which might serve to elucidate a point which required

x

¹ My painstaking instructor was the Secretary of the Edinburgh Amateur Photographic Society; W. Forgan, Bristo Place, to whose tuition I am indebted for the ability to bring home anything worthy of being reproduced.

more than a written explanation. The consequence is that a number of plates which appear are, from an artist's point of view, quite inexcusable; still they are, from my own point of view, instructive.

My sojourn in India was a great source of pleasure and gratification to me; and the work of arranging my facts and views for publication has been no less enjoyable and edifying.

The letterpress was practically completed within twelve months from the time I landed in Bombay. My best thanks are due to my friend Hugh Cameron (who acted for Oliver & Boyd, my printers and publishers) for the expedition with which it has been made ready for the public, and for the care displayed in executing the details of the work.

The maps were designed and prepared under the personal superintendence of my friend J. G. Bartholomew, Edinburgh, and the reproduction by lithography of the grasses and crop plants ¹ was also executed under his orders to my complete satisfaction.

The execution of the mango coloured plates by Waterston & Sons was equally satisfactory.

In describing the leading crops, I have omitted the growing of opium and cotton, besides many others for which there was no room. The former is a necessary evil, of which the less said the better. About cotton, again, every one knows as much as I should have been able to tell in the space I had at my disposal.

It may be said, and perhaps objected to, that I have devoted a large share of my attention to cattle. There is, however, no subject of greater importance in India than that of cattle, and it is a fact, and one after all not to be wondered at, that, from the peculiar and special nature of the study of it, there are few subjects which are less under-

¹ The originals were borrowed by permission from Duthie and Fuller's Field and Garden Crops, and Duthie's Indigenous Fodder Grasses of the Plains of North-Western India.

stood by European residents. I think I may safely say that, with the exception of the excellent little book by Dr Shorte, which only refers to a small number of breeds, and is limited in other respects, there is no work which deals in a comprehensive manner with the cattle of India. I do not claim that what I have done has exhausted the subject; but my object will have been gained if my efforts are great enough and successful enough to rouse Government to the knowledge of the importance of it.

Let those who criticise me remember it is just possible that the difference between their own opinion and that expressed by me may arise from their knowledge of certain facts being local. India is a very great country, and there are few officers indeed who possess much knowledge of matters of detail beyond their own immediate neighbourhood. There was nothing that struck me so much in passing from one part to another as this limitation of knowledge, and the likelihood of mistakes arising from it when local facts are stated as generally applicable to the Empire.

Let those who would severely criticise me on account of my short sojourn in the country, look to the discoveries which I record relating to the colour of the skins of cattle¹ and to the influence of early castration, and ask themselves if it is not just possible that those who, with daily opportunities for observation, have yet failed to notice these matters, might not also have overlooked other points which in a greater degree demand special knowledge rather than time for their study. Naturally, many of my outspoken remarks will be assailed; but I leave it to a discerning public to infer that the necessity of bringing the subjects criticised before their notice bears some proportion to the severity of the attacks which may be made upon my rendering of them.

My object in writing an account of my Indian experi-

¹ Professor Huxley, in writing to me on this subject, says, "The fact you mention is of very great interest as showing a hitherto unsuspected relation between colour and climate."

PERSONAL AND INTRODUCTORY.

xiii

ences, beyond the personal gratification of doing so, is to induce Government to alter its plans as regards an Agriculture Department, and to see that ground which has been lost by inexperienced officers is yet capable of being regained by efforts made in the right direction. One of the most hopeful signs that my desires in the matter of an Agriculture Department in India may be realized is the promise of our home Government to create a Minister of Agriculture and a special Department of Agriculture for Great Britain. Arguing in the abstract—if this country, with all its wealth and the greatness and variety of its resources, requires such an organization, what must India require within her narrow grooves of commercial life, with the evils of an over-crowded population at no great distance, and periodical famines staring her in the face?

CHAPTER I.—CATTLE.

General Description—Objects for which Cattle are kept—Points relating to Form—Colour of Hair—Colour of Skin—Influence of Black Colouring—Temper and Disposition—Horns—Size—Voice—"Escutcheon" or "Milk-Mirror"—Nimburi—Conclusion—Principles of Breeding— Family Resemblance—Force of Inheritance—Constitutional Weakness —Imagination affecting Colour—Crossing and "In-and-in-Breeding" —Atavism—Barrenness,

CHAPTER II.---CHARACTERISTICS OF BREEDS OF CATTLE.

Mysore Cattle—Their Origin—Names—Original Type—Distinguishing Features—As Milkers—Plates I., II., III., and IV.—Early History of the Amrit Mahal Breed at Hunsur—Early Castration—History (continued)—Early Castration—Restoration of the Herd—Recent History—Leading Strains of Mysore Blood—Village Cattle—Punganur Variety, 20

CHAPTER III.-CHARACTERISTICS OF BREEDS OF CATTLE.

Kistna River Breed-Gujarát Talabda Breed-Breed Degenerating-Kankreji Breed-Nagar or Wagad Breed-Sind Breed-Hurrianah Breed -Gir or Junágadh Breed-Vadhial Breed-Nellore or Ongole Breed -Two Varieties-Breed Degenerating-Malwi Breed-Deccan Breed -Southern Maratha Breed-Konkan Breed-Kaneverya Breed-Goranea Breed of Bundelkhand-Bagondha Breed-Madras Red Breed-S. Madras or Trichinopoli Breed-Dishorning-Influx of Good Bullocks-Kangam Breed-British Cattle-Imported Cattle-Aden Breed-Cinhalese Breed-Shoeing in Ceylon-Indian Village or Local Breeds-Mountain Breeds, Dárjíling and Solon-Boyrup River Cattle and their likeness to the Channel Islands' Breeds-Cattle in the Gangetic Basin-Santal Country Breed-Mysore Village Cattle --- The Purbi of Allahabad, . . . 33

PAGE

I

PAGE

CHAPTER IV.—CATTLE—GENERAL OBSERVATIONS.

Housing of Cattle—Sanitation — Distribution and Pasture of Cattle— Feeding—Examples of Feeding—Bhusa—Ages judged by the Teeth —Other Indications of Age—Branding—Bulls—Bulling—Forcible Counexion—Brahmani or Sacred Bulls—Sacred Brands—Castration— Indian Methods and their Advantages—The Effect of Early Castration —Ignorance of Europeans in India regarding Castration—An Alternative for Early Castration—Hobbling—Driving—Native Drivers and their Pride in Ornamental Decoration—The Panjrapol, . 61

CHAPTER V.-DUNG.

Fuel-Manure-Fermentation of Manure-Rothamsted Experiments-Uses of Dung peculiar to India-Storing-Excuse for Carelessness -Nitrification-Conclusion, 79

CHAPTER VI.-GOVERNMENT CATTLE.

Artillery and Army Transport Bullocks—Their Management, Age, and Condition—In the Bolon Pass—Experimental March—Assisted by Elephants—Trial March—Food of Bullocks at Allahabad—Quality of Cattle—Changes necessary: (1), Average Age Reduced; (2), Cattle Trained to Work—Unsuccessful Attempts; (3), System of Feeding Reformed—Functions of Food in the Animal Economy—Government Cattle Farm, Hissar—Management—The Breeding Stock—Shoeing, and how accomplished, 85

CHAPTER VII .--- MILK.

Milking—Distribution of Milk—Disposal of the Calf—Milk as Food— Buffalo Milk—Goat's Milk—Disease resulting from Want of Milk— Vield of Milk and Butter—Colour and Quality of Buffalo Milk and Butter—Products of Milk—Butter used Fresh and as Ghi—Buttermilk —Curd in Various Forms—Clotted Cream, . 101

CHAPTER VIII .- CATTLE DISEASES.

Important Diseases – Foot-and-Mouth – Anthrax – Rinderpest – Cattle Disease Prevention Act – Government Interference, Suitable and Unsuitable – Inoculation – Fencing – Breeding Centres Increased – Poisoning of Cattle, Intentionally and Accidentally, . 106

xvi -

CHAPTER IX.—BUFFALOES.

Habitat—Aquatic Habits—Effects of Heat and Disease—General Points— Colour of Skin and Hair—Intelligence—Affection—Jealousy—Varieties of Buffaloes—Jafarabadi or Wadhiali—Kundi—Madras—Ramnad— Cinhalese—Talabda of Gujarát—Palia—Common Long-Horned or Bombay—Nagpur—Jowari of S. Maratha Country—General Management—Shaving—Attention to Breeding—Males—Solid Excrement of the Horse Eaten as Food—Philosophical Explanation of the Practice —Corresponding Practices among Cattle and Pigs, 116

CHAPTER X.-HORSES.

CHAPTER XI .- HORSE AND MULE BREEDING.

Demand for Mules—Horses from New South Wales—Method of Breeding in India—Variety of Classes of Animals wanted—Vital Importance of Securing Foals at Weaning—Native Objections to Mule Breeding— Horse and Mule Rearing Farms—Importance of Training Animals to Eat Varieties of Food—Additional Conspicuous Advantages of a Good Method, 141

CHAPTER XII .- SHEEP, GOATS, AND PIGS.

Sheep—Varieties—Earth-red, Hairy Sheep—Eat Excrement—Black Sheep —Coimbatore Sheep—Sheep seen near Baroda—The Gangetic Valley and Dárjiling—Smallpox—Goats—Group at Tuticorin—The North-West Goat—Goats widely Distributed—Active and Restless Disposition—Objected to in a Forest—Utility of the Goat—The Flesh of Goats and Sheep—Their Skins—Pigs—Black in Colour—Imported White Pigs in Ceylon, 147

CHAPTER XIII .--- SOILS.

Area of India—Distribution of Soils according to Geological Formations— Alluvium—Deccan Trap—Archæan Rocks—Gondwana Rocks—Vindhyan Rocks—Alluvial Soil—Black Cotton Soil—Hardness of Soils—

PAGE

Stones-Question of Exhaustion-Action of Rain-Water-Support of the Annual Yield of Crops-Temporary Fertility: its Importance-Drains upon the Resources of Temporary Fertility-Exportation of Bones-Organic Matter in Soil-Supply of Combined Nitrogen from the Air-Influence of Lightning-Humus-Usar or Reh Soils-Their Remedies-Explanation-Usar at Cawnpur,

CHAPTER XIV.-NATIVE IMPLEMENTS.

Ploughs — Cinhalese — Kudávana — Hand-Plough — Konkan Plough — Negalu—Nangar—The Yoke and various Parts of a Plough—At Work — Effects — The Importance of Tilth — Iron Ploughs — Varieties — "Watt's" — "Stormont's" — "Swedish" — "Hindustan" — Working Rice Land—General Remarks on Improvement of Indian Ploughs — Action in the Soil—Other Actions causing Circulation of Soil—Introduction of Iron Ploughs into Scotland—Substitution of Wooden Mould-Boards—Reasons for Approval of Native Ploughs and Practices, I

CHAPTER XV.—NATIVE IMPLEMENTS.

Harrows-Construction-Character of Work-Bullock Rake-Roller or Clod-crusher-Levellers-Plank Harrow-Seed Drills-Names and Construction-Method of Working-Cotton Seed Drill-Miscellaneous Tools-Sledge-Hand Rakes-Digging Hoe-Weeding Hooks-Reaping Hooks-Sundries,

CHAPTER XVI.—IRRIGATION.

Importance of—Area Irrigated—Sources of Water Supply—Excellence of Native Water-lifts—The Persian Wheel—The Mohte or Bag—The Double Mohte—Dhekudis and Budkis—Counterpoise Lift—The Picota —Tripod Scoop-lift,

CHAPTER XVII.-ROTATIONS AND MIXED CROPS.

CHAPTER XVIII.—CROPS.

xviii

РA

CHAPTER XIX.-CROPS.

Millets—(a) Juár, (b) Bájra, (c) Ragi—Common Gram—Horse Gram— Múng Bean—Lentil—Cajan Pea—Oil Seed Crops—Do. by Bhimbhai —Sugar Cane—"Beheea" Sugar Cane Mill—Evaporating Pans, 21

CHAPTER XX.—CROPS.

CHAPTER XXI.—CROPS.

Wheat—Races of Common Wheat—Spelt Wheat—First Arrival of Indian
Wheat in England—Favourable Conditions for the Growth of Wheat—
Wheat-growing Areas—Statistical Returns—Time and Method of
Planting—Failure of English Wheat-growing Experiments—Average
Crops per Acre—O'Conor's Review of Trade—The Marketing of
Soft and Hard Wheats—Nisbet on the Various Kinds and Qualities
of Wheat from India—Hard Wheats—Their Weakness—M'Dougall
Brothers' Report of Experiments—Exports—Difficulties in Growing
Wheat—Decreased Yield—Other Grains Exported—Wheat Impurities
—Dell & Son's Method of Cleaning—Sources of Impurities—Pulling
in Harvesting—Storing in Pits—Five per Cent. of Refraction—Cost
of Production—Shipment from India in Bags,

CHAPTER XXII.—THE CURRENCY OR SILVER QUESTION

CHAPTER XXIII.-GRASSES AND GRASS LAND.

Indian Grasses different from European Grasses—Duthie's Books—De Laune's Paper—The Natives' Power of Observation—Help given to the Author by Coldstream, Wingate, and Meagher—Numbers of Grasses—Names, Descriptions, and Characters of Prominent Indian Grasses—Experiments on the Culture of Grass Land—Allahabad Grass Farm—Objections to Indiscriminate Grass-Cutting—Cutting by Hand—Mowing Machines—Quality of Hay—Silage—Johnson's En-

PAG

CHAPTER XXIV.-FORESTRY.

Importance—Commencement—German, French, and British Schools— Dehra Dun—Denudation—Dangers to Agriculture through Forest Conservancy—Forest Fires—Influence in keeping down Insect Croppests and Fungi, including Ergot—The best Interests of the Empire--What India wants—Conclusions arrived at—Pellagra—Cause of Native Discontent—European Systems of Forest Conservation unsuitable, 294

CHAPTER XXV.—CHEMISTRY.

CHAPTER XXVI.---VETERINARY SCIENCE.

CHAPTER XXVII.—A DEPARTMENT OF AGRICULTURE.

Unsuccessful Efforts to Improve Indian Agriculture-The Result-Suitable Agriculture Officers - Test Examinations - Examiners - Misapprehensions relating to "Cirencester Graduates"-Value of an Agriculture Diploma-Work of an Agriculture Officer-Salary-Objections to this Proposal - Preparation of Reports - Text-books - Moral Influence-Recommendation of an Agriculture Department by the Famine Commissioners-Land and Statistics and Revenue Department, Bombay-A Degree in Agriculture-Employment of "Cirencester Graduates "-Spurious Advice given to Government-Necessity for Skilled Advice-Experiment as a Means of Improvement-Difficulties-Ozanne's Experiments-Allen's Experiments-Agricultural Shows-Honorary Distinction given as Rewards for Publicspirited Conduct-Development of Local Effort-Improvement of Crops-Duties of an Agriculture Department-Quotations-Minute of Lord Mayo's Government-Report of the Famine Commission-Suggestions by Col. P. Dods-Conclusion-Reduce Grants to other Departments, including Education-Churchill the Public Works Department-Injury done by it as at present Constituted-The Remedies. 315

хx

PAGR

LIST OF ILLUSTRATIONS.

CATTLE.

CATTLE.			
PLATE	_		PAGE
1. Mysore Bull,	Fro	ntispiece	
• 2. Mysore Cow and Calf,	•	•	2 I -
3. Mysore Trotting Cattle,	•		24
(a) Heads of Mysore Bullocks,	•		26
 4 (a) Heads of Mysore Bullocks, 4 (b) Heads of Mysore Bullocks, 	•		26
5 ${(a)$ Punganur Bull, 5 ${(b)}$ Country Bullocks, Bangalore, .	•	•	32
$\mathcal{O}(b)$ Country Bullocks, Bangalore, .		•	32
6. Kistna River Bullock,		•	33
7. Gujarát Bull and Cow,	•		33
8. Gujarát Bullock and Head of Kankr	eji Bul	llock,	34
∫ (a) Gujarát Bullock, ^r			36
9. { (a) Gujarát Bullock, ". (b) Kankreji Bullock, .	•		36
10. Nagar Bullock and Buffalo Calf,	•	•	36
$\begin{array}{c} \text{II.} \begin{cases} (a) \text{ Sind Bull and Cow,} \\ (b) \text{ Sind Bullock,} \\ \end{array}$	•	•	38
(b) Sind Bullock,	•	• .	38
12. $\begin{cases} (a) \text{ Hurrianah Bullock,} & . \\ (b) \text{ Gir Bull,} & . \\ \end{cases}$	•	•	40
	•		40
$\begin{array}{c} \mathbf{I}_{3} \\ (b) \\ \mathbf{V}_{a} \\ \mathbf{C}_{b} \\ \mathbf{V}_{a} \\ \mathbf{C}_{b} \\ \mathbf{V}_{a} \\ \mathbf{C}_{b} \\ \mathbf{V}_{a} \\ \mathbf{C}_{b} \\ \mathbf{C}_{b} \\ \mathbf{V}_{a} \\ \mathbf{C}_{b} $		•	40
(b) Vadhial Cow,	•		40
14. Milking Cows, Bombay Esplanade,	•	• .	41
15. $\begin{cases} (a) \text{ Nellore or Ongole Bull,} \\ (b) \text{ Nellore Bullock,} \end{cases}$	•	•	42
	:	•	42
(a) Nellore Cow, with Dindigal Cast	tle in	the	
16. deckground,	•	•	43
(b) Nellore Cow and Milkman,	•	• •	43
$\int (a)$ Malwi Bullock fattened for showing,	* .		44
 17. { (a) Malwi Bullock fattened for showing, (b) Malwi Cow, also unusually fat,* 	•	•	44
18. $\begin{cases} (a) \text{ Deccan Bullock,} \\ (b) \text{ Deccan Cow,}^* \end{cases}$	•		45
(b) Deccan Cow,*	•	•	45

* Taken from Photographs lent by Ozanne.

xxii LIST OF ILLUSTRATIONS.

PLATE		PAGE
$\int (a)$ S. Maratha Bull—A young Culprit ! .	•	46
19. $\begin{cases} (a) \text{ S. Maratha Bull} & \text{A young Culprit !} \\ (b) \text{ S. Maratha Bullocks,} & . & . \end{cases}$	•	46
(a) Kaneverya 2-year old Bull,		47
20. $\{a\}$ Kaneverya 2-year old Bull,	•	47
- 21. Madras Red Trotting Bullock,		49
22. S. Madras Bullock and Cow,		50
23. Trichinopoli Cart Bullocks, with Carts and Bags	of	
Grain,		50
(a) S. Madras Bull,		51
24. { (a) S. Madras Bull,		51
(a) Women planting Rice Seedlings,		52
(b) Ploughing under Water in preparing La	nd	-
25. (b) Ploughing under Water in preparing Law for Rice - Rice - planting in the base	ck-	
ground,		52
(a) Shorthorn and Deccan Cross Bullock,		53
$\mathcal{L}(b)$ Konkan Bullocks,		53
		54
$ \begin{array}{c} \overline{27}, \\ \begin{pmatrix} (a) \text{ Aden Bull,} \\ (b) \text{ Aden Cow,} \\ \end{pmatrix} \\ \end{array} $		54
28. Cinhalese Trotting Bullock in Native Cart,		55
(a) Cinhalese Bullock,		56
29. (b) Mountain Cattle near Simla eating tree-lea	ves	•
from broken boughs,		56
		60
$30. \begin{cases} (a) \text{ Diminutive Bullock}_r & . & . \\ (b) \text{ Diminutive Bullock}_r & . & . \end{cases}$		60
(<i>(a)</i> Diminutive Bull,		60
$3^{I} \begin{cases} (a) \text{ Diminutive Bull,} \\ (b) \text{ Semi-Diminutive Bullock,} \end{cases}$		60
32. Diminutive Bulls in Native Cart, .		61
Buffaloes.		
(a) Jafarabadi or Wadhiali Buffalo,	•	120
(b) Buffalo Louse, Hæmatopinus tubercula	lus,	
Piaget. Enlarged \times 8,		120
(c.) A Tick, one of the Ixodidae, possibly H	ya-	
33. lomma marginatum, Koch., enlarged X		
Probably not a true parasite, nor		
exclusively confined to the Buffalo dur	-	
the period when it is parasitic,		120

•	LIST	OF	ILLUSTRATIONS.

PLATE				,
205	(a) Raminad Buffalo Cow and Calf,	•	•	:
34.7	 (a) Raminad Buffalo Cow and Calf, (b) Gujarát Talabda Buffalo Cow, . 	•	•	:
35-	Deccani and Nagpur Buffaloes work	ing a We	:ll , .	1
26 S	(a) Deccani Buffalo Bull,	•	•	;
30.7	(a) Deccani Buffalo Bull,(b) Deccani Buffalo Cow,	•	•	
	Horses.			
	(a) Manipur Pony,			
31.5	 (a) Manipur Pony, (b) Káthiáwár Horse, 		•	
	(a) Bhutia Pony,			
30.7	(a) Bhutia Pony,(b) Yorkshire Hackney Mare (Ladyb)	ird), No.	177,	
	Sheep and Goats			
39.	Red Sheep and a Goat show	ing Pap	o-like	
	Pendicles,	•		
40.	Goats in Jungle (Tuticorin), .	•	•	
	IMPLEMENTS.			
		m and (<u>م</u>	
41.	The Director of Agriculture, Bomba	iy, and C	Лпсе	
	Staff, Native Indian Ploughs,*	•	•	
42.		•	•	
43.	Harrows, Rakes, and Clod-crushers,* Native Seed Drills,*	•	•	
44.	Miscellaneous Implements and Hand	· d Tools i	•	
45.	Water-lifts,	u 100is,	•	
46.	•	•	•	
47•.	Picota Water-lift,	•	•	
	CROP PLANTS.			
48.	Maize, Zea Mays, L.,	•		
49.	Rice or Paddy, Oryza sativa, L., .		•	
50.	Juar or Great Millet, Sorghum vulgar	e, Pers.,		
51.	Bajra or Spiked Millet, Pennisetun		leum,	
5	Rich.,	•	•	
52.	Ragi, Eleusine coracana, Gærtn.,			
53.	Gram or Chicken Pea, Cicer arietinum	n, L.,	•	
54·	Lentil, Ervum lens, L.,	•	•	:
55.	Sugar-Cane, Saccharum officinarum, I			
22.				

хxі	v LIST OF ILL	USTRAT	TIONS.			
PLAT	E					PAGE
56.	Indigo, Indigofera tinctoria,	L.,	•	•	•	232
57.	Mangoes,	•		•	•	244
58.	Mangoes,		•		•	245
	Gra	SSES.				
50.	Pennisetum conchroides,	•				280
	Panicum sanguinale, .	•		•		,,
	Andropogon pertusus,		•			,,
	Andropogon laniger, .		•			,,
	Andropogon muricatus,					,,
64.	Sporobolus orientalis,					,,
65.	Iseilema laxum, .	•	•			,,
66.	Heteropogon contortus,			•	•	,,
67.	Elionurus hirsutus, .	•	•	•		,,
	Eleusine ægyptiaca, .	•	•			,,
	Eleusine flagellifera, .	•	•	•		"
	Cynodon dactylon,	:	•	•	•	282
71.	Spodiopogon pilosum,	• .	•	•	•	283
	Electr	OTYPES.				
Bra	nds on Sacred Bulls, .					68
Wir	e Fencing,			· ·		113
Pos	ition of the Humerus and Sca	<i>pula</i> in	a Horse	e, 13	9 and	140
Nat	ive Hand Hoes, .		•	•	•	189
	eheea" Sugar-Cane Mills,		•		•	227
	eat Washing and "Whizzing'				•	259
	omatic Grain Drier and Conc			•	•	260
	uble Brush Scourer and Polis	her (Wh	eat),	•	•	261
Joh	nson's Ensilage Stack Press,	•	•	•	•	290
	- Ma	PS.				
Ind	ia : Chief Characteristics of L	and Sur	face,			
"	Orographical Features, .					;
,,	Political Divisions,		•	•	•	1

Erratum.

Page 69, footnote, line 8, for "sun-wheat," read "sun-wheel."

ciences bearing on the subject. This is, I think, almost the only method which has not had a trial in India, and it is the only one which could be successful.

Matters have at present come to such a deadlock that something extraordinary must happen before any improvement can be brought about. The confidence of Government in the possibility of agricultural improvement is thoroughly There is an impression widely abroad that the shaken. Indian ryot knows much better than we do how to work his land and grow his crops. Assuredly he knows much more than any European whose business is not agriculture, and there is no one whose business is agriculture that I could point to in India; but the ryot certainly does not know more than a Scotchman or an Englishman would who had been selected for his proficiency in the science and practice of British agriculture, and whose duty it had been for a term of years to make himself thoroughly acquainted with everything connected with Indian agriculture. I am speaking advisedly when I say that no such individual has ever held a position in the employment of the Indian Govern-Failure on a gigantic scale, more especially when ment. carried out at great expense, and with disastrous consequences to the country, is regrettable, but to the initiated there is nothing disheartening in failure when it is known to be the direct result of disregard of the elementary principles which govern all human undertakings. The drowning of a thousand men who could not swim in the effort to cross a river is in no way a proof that one good swimmer would not cross it with the greatest ease and without the slightest fear of the consequences,¹

The important questions arise—What class of men should be employed to form the Agriculture Department in India? · How many are required? And where shall we

¹ The foregoing portion of this chapter is taken, with some few verbal alterations, from the Introductory Lecture by the Author to the Agriculture Class in the University of Edinburgh, delivered in October 1887.

INDIA.

go to find them? There never was at any previous period a better opportunity of supplying this prospective demand from the ranks of the hereditary farmers.

The men suitable for the purpose are well-educated sons of gentlemen farmers, brought up in the country and accustomed to mix freely with the lower classes, so that they are more able to understand and sympathize with them than the sons of men in the higher spheres of life, who have never been really in touch with individuals far beneath them in rank.

Young farmers with a good general education, and who have been trained from their youth in those details of agricultural practice which can only be acquired by early association with a farm and its purtenances, have within recent years been induced to undertake scientific study and research, in many instances with the object of becoming land-agents, and in other cases so that they might be more able to contend with the increasing complications of the times, which have often proved too much for the oldfashioned farmers working according to old lights.

To make certain that the best men available in all parts of the country are secured, some such arrangement as the following might be adopted :—

(1.) There should be a minimum test and competitive examination in the subjects of (a) English,¹ and (b) Agriculture. The latter to be made so thoroughly practical that no one could pass who had gained his knowledge and experience solely from books.

(2.) The educational qualification, which it should be imperative for a man to possess before going forward for the final examination, should be a Degree in Agriculture, or the Diploma of one of the leading Societies or Associations offering such in Agriculture and the collateral sciences.

By this system the best candidates could be secured, and much expense in examining would be saved, as com-

e ordinary subjects of an English education, but excluding Literature.

A. Act, Cattle Disease Prevention, 110. Aden breed, 51, 54. Ages of cattle, 65. Agriculture, Bombay Presidency Dep: efforts to improve, 315. ,, examiners in, 319. " experiments in, 333. " reports on, 323. " text-books on, 323. " Ain tree, 209. Albuminoids, 95. Alexandrian laurel, 223. Allahabad Grass Farm, 92, 286. Aloes, 113. Alvat, 187. American trotter, 136. Amrit Mahal, 22, 25, 114. Anthrax, 107. Cape, 133. ,, in horses, 132. ,, prevention of, 108. ,, treatment of, in horses, 133. ,, Apoplexy, splenic, 107. Arab horses, 127, 131. Arachis hypogæa, 63. Area of India, 156. Army transport bullocks, 85.

Artillery, 85. Atavism, 18. Aut, 184.

В.

Bachardas Viharidas, 238. Bagondha cattle, 49. Bájra, 201, 215, 216. Bájri, 216. Bandy, 25. Bangles, 76. Barb horses, 131. Barbs, wire, 113. Barley, 201. Barrenness, 18. in mares, 134. ,, Bassia latifolia, 63. Beheea, 226. Betel vine, 198. Bhusa, 64. Bhutia pony, 128. Biga, 236. Birdwood, Sir George, 68. Black colouring, 10. quarter, 107. ,, soil, 180, 192. ,, Bombay buffalo, 123. Presidency Agriculture Depa ,, Bos bubalus, 116. Bos Indicus, 1. Boyrup river cattle, 58. Brahmani, 68. Brahmin judge, 325. Branding, 57, 66, 68. Braxy, 108. Breed, Aden, 51, 54. the Broach, 40. ,, the Deccan, 45, 53. ,,

348

Breed, the Gir (Junágadh), 40.

- " the Goranea of Bundelkhand, 48. 🗕
- " the Gujarát, 34, 40, 98.
- " the Hurrianah, 40.
- " the Kaneverya, 47.
- ,, the Kangam, 51.
- " the Kankreji, 37.
- " the Kathiawar, 40.
- " Madras Red, 49.
- " the Malwi, 44.
- ,, the Nagar (Wagad), 38. ---
- ,, the Nagore, 98.
- , the Nellore or Ongole, 40, 42, 98.

٠ ر

- " Santal Country, 59, 63.
- " the Sind, 38, 98.
- " the Surat, 40.
- " Trichinopoli, 50. –
- " Vadhial, 41. –

Breeding, in-and-in, 17.

" principles of, 15.

Breeds, local, 57.

- Bridle, the, 75.
- British cattle, 52, 126.
- Broach breed, 40.
- Broken wind, 131.
- Broom rape, 237.
- Bubalus arni, 116.
- Buck, Sir Edward, 248.
- Buffalo, 116.
 - " the Bombay, 123.
 - " the Cinhalese, 122.
 - " the Jafarabadi, 119.
 - ,, the Jowari, 123.
 - " the Kundi, 120.
 - ,, the Madras, 120.
 - " milk, 103.
 - " the Nagpur, 123.
 - , the Palia, 122.

Buffalo parasites, 124. the Ramnad, 121. " the Talabda, 122. ,, Buffaloes, castration of male, 124. food of, 125. ,, intelligence of, 118. ,, jealousy of, 119. " management of, 124. " Bull, Hissar breeding, 39. Bulling, 67. Bullocks, army transport, 85. Purbi, 59. ,, trotting, 63. " Bulls, 67. sacred, 68. ,, Bundelkhand, 48. Butter, 103, 104. Buttermilk, 104. C. Cajan pea, 219. Calf flesh, 143. Calotropis gigantea, 166.

Canals, 191. Cane, sugar-, 223. Cape anthrax, 133. Carbohydrates, 95. Castes, milkmen, 105. Castor seed, 223. Castration, 69, 70, 98, 124, 133. disadvantages of, 133. •• Durrant's method, 134. ,, effects of, 25, 27, 29, 7 ,, Catch crops, 195. Cattle, 1-3. ages of, 65. "

" Bagondha, 49.

Cattle, Boyrup river, 58.

" British, 52, 126.

- " Channel Islands', 58.
- " Cinhalese, 55.
- " diminutive, 60.
- " Disease Prevention Act, 110.
- " diseases, 106.
- " distribution of, 62.
- " driving, 74.
- " Farm, Hissar, 97, 113.
- " Gangetic Basin, 58.
- " general observations on, 61.

" Government, 85.

- " Green Country, 40.
- " Gujarát, 34, 40, 98.

" hill, 57.

- " hornless, 49.
- " influence of soil on, 47.
- " imported, 53.
- " Jowari, 46.
- " Konkan, 47.
- " mountain, 58.
- " Mysore, 20, 98.
- " Mysore village, 59.
- " Nepálese, 58.
- " poisoning, 114.
- " Sikim, 58.
- " Southern Maratha, 46.
- " voice of, 13.

Ceylon, 75, 116, 154.

Channel Islands' cattle, 58.

Chemistry, 233, 308.

Chen, 186.

Cholum, 216.

Church, 218.

Churchill the Public Works Departme

Cicer arietinum, 218.

Cinhalese buffalo, 122.

Cinhalese cattle, 55. Cirencester graduates, 319. Cleveland bay, 136. Clodcrushers, 184. Clotted cream, 105. Cocoa palm, 222. Cocum tree, 222. Codia, 170. Coffee, 203. Colour of eye, 117. hair, 5, 24, 53, 55, 5; ,, skins, 7, 115. ,, Colouring, black, 10. Cotton seed, 64. Cow milk, 103. Crops, 195, 200. Crossing, 17, 53. Cruelty, 75. Cubbon, Sir Mark, 26. Curd, 105. Currency question, 265.

D.

Dahi, or curd, 105. Dal, 219. Dangi cattle, 57. Dantal, 186. Dárjiling, 58, 201. Darrma, 245. Darwin, 11, 115. Dátále, 188. Datura, 114. Deccan breed, 45, 53. Degeneration of breeds, 29, 36. Degree in agriculture, 329. Dewlap, 5. Dharwar, 63.

INDEX.

Diminutive cattle, 60. Dindigal, 240. Discus, 68. Diseases, cattle, 106. Disfiguration, 51. "Dished" faces, 49. Dishorning, 50. Distribution of cattle, 62. Dods, Lieutenant-Colonel, 341. Dolichos biflorus, L., 96. Drivers, native, 76. Driving cattle. 74. Dumb-martin, 19. Dummy calf, 102. Dumg, 79, 82, 209, 211.

E.

Ears, 5. Education Department, 342. ,, technical, 242. Elephants, 87. Eleusine coracana, 103. Ennurrua, 244. Ergot, 301. Escutcheon, 14. Evaporating pans, 229. Examiners in agriculture, 319. Excrement as food of buffaloes, 125. Experiments, Rothamsted, 81.

F.

Famine Commission, 315, 325, 338, 341. Farms, advantages of, 146.

, functions of, 145.

" grass, 286.

" horse and mule rearing, 144. Faseolus mungo, 198.

2 Y

Feeding, 62, 63, 89, 130. Fences, 74, 112. Fermentation, 81, 83. Food, 89, 93, 94. Foot-and-mouth disease, 107. Forestry, 294. Founder, 131. Fowler & Co., 182. Free-martin, 19. Fuel, 79.

G.

Gangetic Basin cattle, 58. Geology of India, 156. Ghánio, 186. Ghase, 188. Ghi, 96, 105, or Ghee, 128. Ghi and Spices, 128. Gir breed, 40. Gloss-anthrax, 107. Goats, 147, 151. utility of, 153. ,, skins, 153. ,, Goat's milk, 103. Gobinpur sindurea, 244. Goranea breed, 48. Government cattle, 85. Ground-nut, 220, 221. Grains, food, of India, 96. Gram, horse, 89, 96, 218, 219. Grass cutting, 288. Grass Farm, Allahabad, 92. 28 Grass land, 276. Grass-level, 94. Green Country cattle, 40. Gugras, 101. Gujarát cattle, 34, 40, 98.

H.

Hackney stallion, Yorkshire, 136. Hair, 118. Hand tools, 188. Hariali, 169, 281. Harrows, 184. Hay, Colonel, 27. Hay, quality of, 288. Helmholtz, Professor von, 11. Hemileia vastatrix, 203. Hempel, John, 240. Hill cattle, 57. Hindustan plough, 178. Hircus, 147. Hissar breeding bull, 39. Cattle Farm, 97, 113. ,, Hobbling, 73. Hoes, hand, 188. Hornless cattle, 49. Horns, 12, 22, 76. Horse gram, 89, 96, 218, 219. Horses, 127. breeding of, 128, 135, 14c ,, methods of feeding, 130. ,, Howard, James, M.P., 139. Humerus, horse's, 139. Hump, the, 3. Humus, 162. Hunam, 20. Hunsur, 25. Hurrianah breed, 40. Huxley, Professor, 11.

Imported cattle, 53. In-and-in-breeding, 17. I.

Indian corn, 201. Indicus, Bos, 1. Indigo, 231. Inga dulsis, 32. Inoculation, 112. Intelligence in buffaloes, 118. Irrigation, 191.

J.

Jafarabadi buffalo, 119. Jealousy in buffaloes, 119. Joke, 83, 238. Jowári buffaloes, 123. ,, cattle, 46. Juár, 201, 215, 217. Juning, 212. Junágadh breed, 40.

К.

Kaneverya breed, 47. Kangam breed, 51. Kankreji breed, 37, 42. Karabdi, 184. Káthiáwár breed, 40. horse, 127, 131. ,, Ken, 186. Kerosine oil, 221. Kharif, 195. Khilari, 21. Khoa, 105. Khodálí, 188. Kistna, 33. Koimbatur, 51. Kolea, 7. Konkan cattle, 47. Krishná, 33. Kudávana, 168.

356

Kulthi, 145. Kumri, or Dalhi, 212. Kunda, 169, 283. Kundi buffalo, 120. Kurpa, 282

L.

Ladybird, mare, 138. Lamp oils, 223. Leeches, 54. Lentil, 219. Leprosy, 8, 305. Level, grass-, 94. Linseed, 222. Local breeds, 57. Lucerne, 232, 284.

М

M'Dougall Brothers, 253. Madar, 166. Madras Red breed, 49. Madras, Southern, breed, 50. buffalo, 120. ,, sheep, 147. ,, Maize, 201. Malai, 105. Malwi breed, 44. Mamledars, 327. Mandua, 217. Mango, 243. twig in milk, 102. ,, Manipur pony, 127. Manitoba, 79. Manure, 80, 224, 285. Maratha, Southern, cattle, 46. March, experimental, 87. Martin, dumb, 19.

357

Martin, free, 19. Marúa, 217. Marwa, 63. Marwar horses, 131. Masur, 219. Materials, rab, 82, 208. Maunds, 236. Mayo, Government of late Lord, 33 Meat eaten, 2. Medicago lupulina, 145. Milk, 101. buffalo, cow, and goat's, 103. •• Milking powers, 40, 51, 54. Mill, sugar-cane, 226. Millets, 201, 215. Mohte, 193. Mountain cattle, 58. Mule breeding, 141. Mung bean, 219. Mylne, Mr, 226. Mysore cattle, 20, 98. village cattle, 59. "

N.

Nachni, 217. Nagar (Wagad) breed, 38, 98. Nagli, 217. Nagore breed, 98. Nagpur buffaloes, 123. Nangar plough, 170, 176. Nariad, 238. Native drivers, 76. ,, implements, 167, 184. *Nature*, 9. Negalu, 169. Nellore breed, 40, 42, 98. Nepálese cattle, 58. Niger-seed, 221.

Nimburi, 14, 44. Nitrification, 83. Nitrogen, 80, 81.

0.

Oat anna, 175. O'Conor's review, 1886-87, 220. Oil as food, 93, 95, 96, 221. Oil-seed crops, 220. Ongole, 42. Organic matter in soil, 162. Origin of species, 115. Ovis, 147. Ozanne, E. C., 213, 224, 246, 334.

· P.

Paddy, 203. Palia buffalo, 122. Panjeti, 188. Panjrapol, 76. Pasture, 62. Patel, 327. Pea-nut, 63, 220. Pellagra, 305. Persian wheel, 192. Pheepree, 106. Picota, 194. Pigs, 115, 126, 154. Pitcher, Colonel, 284. Ploughs, 167.

- " at work, '172.
- " introduction of, into Scotland,
- " iron, 174.
- " varieties of iron, 176.

Poisoning of cattle, 114.

Potato, 202.

Public Works Department, 342. Pulses, 201, 217.

Funganur, 32. Purbi bullocks, 59. Purpura hæmorrhagica, 133. Pusa, 235.

R.

Rab, 82, 208, 213. Rab materials, 82. Rabi, 195. Rabri, 105. Ragi, 103, 201, 208, 215, 217. Rakes, 184, 188. Ramnad buffalo, 121. Ramp, 184. Rape seed, 222. broom, 237. ,, Reform, 91. Reins, the, 75. Reports on agriculture, 323. Reward of excellence, 336. Rice, 200, 203. Rinderpest, 109. Rotations and mixed crops, 19 Rothamsted experiments, 81.

S. .

Sacred bulls, 68. Sáfed, 245. Safflower, 222. Sanitation, 61. Santal Country breed, 59, 63. Scapula, horse's, 139. Seed drills, 187. Sesame, 221. Sheath, 5. Sheep, 147. ,, breeds of, 147.

Sheep skins, 153. Shiyali, 63, 178. Shoeing cattle, 56, 100. Shoulders, horses', 138. Shows, agricultural, 335. Sidapet Farm, 114. Sikim cattle, 58. Silage, 289. Silver question, 265. Sind breed, 38, 98. Siva, 68. Skin diseases, 103. Skins, colour of, 7. sheep and goat, 153. ,, Smallpox in sheep, 150. Soils, 156. temporary fertility, 160. ,, influence on cattle, 47. ;, Southern Madras breed, 50. Southern Maratha cattle, 46. Splenic apoplexy, 107. Stormont plough, 176. Suffolk punch, 138. Sugar, 201. Sugar-cane, 223. Surat breed, 40. Sus Indicus, 154. Symonds, W. P., 326. Swedish plough, 177.

т.

Talabda buffalo, 122. ,, cattle, 34. Tea, 202. Temper, 11. Terai, 235. Terminalia tomentosa, 209. Text-books of agriculture, 323. Thoroughbred horses, 136. Throwing, method of, 100. Til, 220. Tilth, importance of, 173.

Tobacco, 234.

" bird's eye, 239.

" flavouring, 240.

Tonga ponies, 129.

,, food of, 130. Transport, army, bullocks, 85. Trichinopoli breed, 50. Trident, 68. Triticum repens, 284.

Trotting bullocks, 63.

U.

Usar, 163.

v.

Vadhial breed, 41. Vanjaries, 44. Vein of the nose, 37. Veterinary science, 312. Vijalis, 117. Village cattle, 32, 59. Vishna, 68. Voice of Indian cattle, 13.

w.

Wadhiali, 37. Walers, 128. Watt American plough, 176. Weed, 131. Wells, 191. Wheat, 201, 246. ,, cleaning, 257.

362 ்

Wheat, cost of producing, 263.

- " drawbacks and disadvantages, 255.
- " exports, 254.
- " hard Calcutta, 251.
- " impurities, 257, 262.
- " shipped in bags, 264.
- " soft red Calcutta, 251.
- " spelt, 246.
- " varieties of, 251.

Y.

Yoke, 171.

Yorkshire Hackney stallion, 136.

Z.

Zebu, 1.

PRINTED BY OLIVER AND BOYD, EDINBURGH.