

years old and in her first month of lactation. In order to make use of this chart, then, we proceed to make a mark upon it for each individual cow, each mark corresponding (vertically) to a particular age, and (horizontally) to a particular month of lactation; and this has been done in our figure for two distinct and separate herds, one of fourteen, the other of eleven cows. In short we note upon the chart the cow's age and period, and are then able to read off the corresponding "efficiency" which we are entitled to expect of her. It only remains for us to add up the number of cows (of each separate herd) in each zone or "efficiency class," and then to proceed as follows, by the simplest arithmetic:—

Comparison of Herds A and B.

Efficiency class Per cent.	Herd A		Herd B	
	No. of cows	Total efficiency Per cent.	No. of cows	Total efficiency Per cent.
85 ...	2 ..	170 ...	3 ...	255 ...
75 ...	— ...	0 ...	4 ...	300 ...
65 ...	— ...	0 ...	1 ...	65 ...
55 ...	2 ...	110 ...	3 ...	165 ...
45 ...	2 ...	90 ...	— ...	0 ...
35 ...	3 ...	105 ...	3 ...	105 ...
25 ...	2 ...	50 ...	— ...	0 ...
	11 ...	525 ...	14 ...	890 ...
Average efficiency per cow, 47.7 p.c.			... 63.6 p.c.	
Total yield of milk per day, 260 lb. 290 lb.	
Average " " per cow, 23.6 " 20.7 "	
Standard yield at maximum efficiency		$\frac{100}{47.7} \times 23.6 = 49.4$ "	$\frac{100}{63.6} \times 20.7 = 32.5$ "	

The value which we obtain as our final arithmetical result, viz. 49.4 lb. and 32.5 lb. respectively, for our two herds, may be called the "standard of efficiency," or "standard yield at maximum efficiency," or (for short) the "specific standard" of the herd.

In practice we should have to take into account (as we have not here done) cows that have gone dry, though of an age and period when they should still have been milking; this would introduce a further, but very slight, complexity. Apart from this, and as our broad and simple result, we see (1) that Herd B was operating at a higher efficiency than Herd A, i.e. the cows in B were in the better state as regards age and period; but nevertheless (2) Herd A was actually yielding 23.6/20.7, or 14 per cent. more milk per cow; and (3) the most important thing, that Herd A was giving a yield which, when reduced to standard (as though every cow were five years old and newly calved), would be equivalent to 49.4/32.5, or no less than 52 per cent. more milk than Herd B under similar standard conditions. Herd A was one of the best herds of pure-bred Holstein-Frisian cattle in the State, while B was only a fair average or dairy herd.

It is obvious that we may use the same method (with the help of equally easy arithmetic) to determine the value or "efficiency," in comparison with the herd as a whole, of any individual cow. For instance, after we have determined the standard efficiency, or standard yield at maximum efficiency, of Herd A to be 49.4 lb. of milk daily, then a cow the age and period of which place it in the 55 per cent. zone should be yielding something between 50 per cent. and 60 per cent. of that amount, say from 25 lb. to 30 lb. of milk daily. She is not doing her duty by the rest of the herd, and may be weeded out accordingly, if her daily yield of milk be found to be below this quantity.

D'ARCY W. THOMPSON.

NO. 2500, VOL. 100]

AGRICULTURE IN MADRAS.

FEW aspects of Indian administration have manifested more satisfactory advancements than that of agriculture. Since the date of reorganisation of the department into provincial sections (acting under effective Imperial control), since the date when the bulk of the officials under these became expert agriculturists, the improvement has been both substantial and far-reaching. The keynote, moreover, seems to have been the separation of agriculture from revenue. But one can imagine the old Bengal civilian turning in his grave with horror at the abolition of his "Revenue and Agricultural Department," the "et cetera" of former times. To-day the people of India can receive the agricultural official as a friend, free from suspicion of mercenary (revenue) alternatives. No better manifestation of this improved relationship could be given than the appearance of the Madras Agricultural Calendar.

A double page is devoted to each month, from April to March (the official year), and these twelve tables set forth the phases of the moon, the constellations of the stars, the feasts, fasts, festivals, the fairs, shows, exhibitions—all matters of more than ordinary interest to the Indian cultivator. Between the pages of monthly records are interspersed instructive, brief, but practical, chapters on various useful subjects, written by the director, the assistant director, the various deputy directors, and other officials of the department.

The purpose of the Agricultural Department is lucidly set forth; the importance of water to the farmer fully expounded; the merits of the specially selected and improved cotton-seed (here called Sircar cotton) explained and offered for sale; the properties of the Monsoon plough exemplified; the value of superphosphate as a manure for rice explained; then follow suggestive and instructive essays on agricultural engineering; on the conditions under which agricultural loans can be made by the Government; on special crops, such as ground-nuts, guinea-grass, indigo, senna, etc. Next there are given chapters on the improvement of pasture lands, on the Veterinary Department, and on the diseases and pests of crops. The Calendar then supplies particulars of the Agricultural College, the Research Institute, etc., and finally gives a complete enumeration of the departmental and other publications likely to be of value to the farmers.

We commend this excellent little publication (78 pages) as a model of public utility, the more so since it is offered for sale at the humble price of one anna (one penny), and is printed both in English and in the chief vernaculars of the province.

SCIENCE AND INDUSTRY IN SOUTH AFRICA.¹

OUR Government, I am afraid, has not always fully realised in the past the powerful aid of science and scientific research in general and industrial development. It has been following too much the lead of Great Britain, and has been perhaps too much inclined to regard the scientific departments of the Government as not of primary importance, since they are not immediately productive in the commercial sense. The totally inadequate salaries paid to the personnel of Government scientific departments is perhaps an indication of the place which their work has occupied in the general plan of the nation. Only recently a protest was made

¹ From the Presidential Address delivered at the Stellenbosch Meeting of the South African Association for the Advancement of Science, on July 2, '17 Prof. John Orr.