SOILS AND FERTILISERS IN 1927.

IN "Agricultural Research in 1927" Sir E. J. Russell reviews the scientific and economic work carried out on soils and fertilisers during 1927. In addition to an account of the fertiliser situation and an outline of the results of agricultural research work in the British Isles during the period, the report embodies the results of agricultural experiments carried out in 1927 in Australia and New Zealand, which countries the author toured in 1928. Reference is also made to agricultural work in foreign and tropical countries in so far as it is of interest to agriculturists in the British Isles. In this summary, only the results of work which has a bearing on agriculture in the tropics will be dealt with. The following are topics which should be of interest to agriculturists in Ceylon generally.

The Effects of Superphosphate on Soil Reaction and Crops in Relation to Climatic Conditions. In this connection the author states: "There is an idea current among farmers that superphosphate makes the soil acid. The chemists have been unable to find any evidence of increased soil acidity. A considerable numbr of tests have been made by the Rothamsted staff in different parts of the country, but even the most delicate methods failed to reveal any increase in acidity that could possibly affect the crop. However the idea arose, it appears to be inaccurate." The same conclusion, that superphosphate is incapable of causing soil acidity, was arrived at by Kappen in 1926. This fact should be borne in mind by those recommending the use of superphosphate in manure mixtures for tea and paddy in Ceylon.

Another interesting point about superphosphate is that its effectiveness is greatly modified by seasonal and climatic factors. In Australia, it has been found with cereals that the worse the season the better in general is the response of the crop to superphosphate, and that it reduces the amounts of water needed by crops besides considerably increasing the yields. Again, experiments in India with paddy have shown that in years of deficient rainfall, superphosphate was particularly helpful in maturing the crop which would otherwise have suffered from a shortage of water.

Soil and Fertiliser Conditions as Affecting the Composition and Quality of Crops. The composition and quality of crops may be affected by soil and fertiliser conditions in two ways (1) by altering the rate and habit of growth, (2) by changing the composition of the crop. "The composition of a crop depends on the composition of the soil, which regulates the amount of a constituent in the whole crop, and on the conditions of growth, which determine whether the additional constituents will cause a corresponding increase in the crop. The *total amount* of any soil constituent in the crop depends on the total amount present in the soil." The old idea held by agricultural chemists that the analysis of a plant furnished a complete guide to its manurial requirements is incorrect, for "the plant has no power of choosing what is beneficial and rejecting what is useless; it absorbs some of every thing in the soil water, though not necessarily in the proportions in which they occur."

Factors Influencing the Percentage of Nitrogen and Phosphorus in the Crop. "The chief factors determining the amount of nitrogen in the crop are (1) the amount of nitrogen in the soil, (2) the time of sowing of the crop and the rainfall in the early part of the crop's growth." These two points apply to annuals, *e.g.*, barley. When a dressing of a nitrogenous fertiliser is given to a crop, the nitrogen thus added to the soil need not necessarily increase the nitrogen in the crop. If it produces more growth and an

increased crop, as it generally does, the additional nitrogen is distributed over the whole crop and its percentage may fall. In the case of barley, it has been found that small nitrogenous dressings increased the crop and not the percentage of nitrogen in the grain, but large dressings increased both crop and nitrogen content.

The same applies to the amount of phosphorus in the crop. It is well known that the soil and grass of fattening pastures contain more phosphorus than the soil and grass of non-fattening pastures. "In Hawaii, the phosphorus in the juice of the sugar cane was found to be greater on soils containing much phosphorus than on soils containing less. The addition of phosphatic fertilisers in amounts usual in practice may increase the crop, but does not usually increase the phosphorus content of the cane. This appears to hold for other crops as well. It is therefore a question of the amount of phosphorus added. A relatively large dressing of the fertiliser will probably affect both the yield and the percentage of phosphorus in the crop. There have been cases recorded of the simultaneous increase of crop and constituent. The increase of the phosphorus content of fodder crops is a point of great practical importance to stockbreeders in Ceylon. It has been found as a result of numerous analyses that our soils are dificient in phosphoric acid and that our grasses both cultivated and uncultivated suffer from a corresponding deficiency. The lack of sufficient phosphoric acid and lime in the diet of farmstock has been found to affect adversely the health and vitality of the animals. By the application of large quantities of phosphatic fertilisers, it is possible to increase both the amounts of fodder and the quantity of phosphorus in it and thus its value as a food for livestock. Another satisfactory remedy is to supply the animals with phosphorus in the form of licks.

In connection with the importance of minerals in animal nutrition, reference is also made to the work of Aston in New Zealand. Sheep in certain areas of that country suffer from a wasting, non-transmissible disease called "bush-sickness." The disease was ascribed to a deficiency in iron and can be treated by "administering iron to the animal in the form of iron ammonium citrate or by top dressing the pastures with sulphate of iron or spent oxide of iron."

The Economic Utilisation of Soil Moisture. "The soil water problem in dry districts can be met in four ways: (1) wherever possible and necessary by irrigation, (2) by reducing loss of water from the soil, (3) choosing varieties of crop that need very little water, (4) growing these crops in such a way as to minimise the amounts of water needed." As regards irrigation, serious difficulties are known to arise soon after irrigation begins. The land often becomes sterile as a result of the salts contained in the irrigation water which affect both plants as well as soils, especially clay soils containing replaceable sodium or underlain by pan. The surest methods of avoiding the trouble are, says the author, (1) to reduce the water to the minimum required for good growth; (2) to avoid seepage as far as possible by, *e.g.*, using concrete channels whenever necessary and practicable; (3) to keep the soil as permeable as possible by the use of gypsum, by green manuring, by occasional deep cultivation to break through any pan or impervious layer, and by maintaining an adequate system of drainage; (4) to keep the water table as low as possible. Even then salt patches may appear in unexpected places. Local investigations are then necessary.

Cultivation as a Means of Saving Soil Moisture.—In dry regions a bare fallow is a good method of saving soil moisture. This has been found to hold in the case of wheat in the dry regions of Australia. "The effect of the fallow is to keep down weeds, to maintain a mulch on the surface, and to increase

nitrification." Recent work, however, has shown that for certain soils a mulch is not advantageous.

The Effect of Seasonal Factors on Crops.—A fact of some importance to agriculturists in Ceylon, and one which might help to throw some light on yield figures of Ceylon crops, has been disclosed by agricultural research workers in Australia and Russia, viz., that in a wet season the amount of water taken by a crop (cereal) is less than in a dry one. "In a drought year cereals require 546 parts of water: in a moister year only 273. This means a double disadvantage during the dry seasons; the crops need more moisture and they have less. Work at Rothamsted has shown that both sunshine and rainfall affect the efficiency of fertilisers for crops to a very appreciable extent."

Soil Micro-organisms.—"The Rothamsted workers showed some years ago that bacteria of the soil are preyed upon by protozoa, especially amoebae. Recent work has shown that some bacteria are better food for the protozoa than others, causing more rapid multiplication, so that whenever they are present the protozoa increase greatly in number. When they are absent, the increase is much less. This discovery helps us to understand the great daily fluctuation in the numbers of amoebae and bacteria observed in field soils." Reference is also made to the work of Rege who has shown that some of the organisms responsible for the efficacious decomposition of organic matter in the soil grow best at fairly high temperatures (60°C). The conditions necessary for the decomposition of resistant organic materials were also indicated by this worker. The conversion of sawdust to artificial manure has not yet proved successful, but the problem is nearing solution. The slow decomposition in the soil of certain leguminous crops when compared with straw in spite of the high nitrogen contents of the former, has been shown to be due to their high lignin content. This is a matter of some importance to Ceylon planters. Green manures should not be left to get too woody before they are lopped. Working on paddy soils, Subrahmanyan showed that the production in these soils of ammonia, in which form paddy chiefly takes its nitrogen, is probably the result of enzyme action and not of micro-organic activity.—A.W.R.J.

ANIMAL DISEASE RETURN FOR THE MONTH ENDED 28th FEBRUARY, 1929.

Province, &c.	Disease	No. of Cases up to date since Jan. 1st. 1928	Fresh Cases	Recoveries	Deaths	Balance Ill	No. Shot
Western	Rinderpest	698	360	71	555	28	44
	Foot-and-mouth disease	10	...	10	...	...	...
	Anthrax	...	...	...	...	...	...
	Piroplasmosis	1	...	...	1	...	..
	Rabies (Dogs)						
Colombo Municipality	Rinderpest	1014	339	75	916	23	...
	Foot-and-mouth disease	1	...	1	...	...	...
	Anthrax	...	...	...	...	...	...
	Rabies (Dogs)	10	5	...	...	...	10
Cattle Quarantine Station	Rinderpest	44	7	22	17	5	...
	Foot-and-mouth disease	7	7	7	...	...	...
	Anthrax	...	...	...	...	...	...
Central	Rinderpest	43	10	...	42	...	1
	Foot-and-mouth disease	411	169	250	2	159	...
	Anthrax	...	...	...	...	...	...
	Black Quarter						
	Rabies (Dogs)	7	1	...	6	...	1
Southern	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	787	...	607	26	154	...
	Anthrax	...	...	...	...	...	...
	Piroplasmosis						
Northern	Rinderpest	4	...	3	...	...	1
	Foot-and-mouth disease	150	150	80	70	...	...
	Anthrax	...	...	...	...	...	...
Eastern	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	8006	13	7851	155	...	...
	Anthrax	...	...	...	...	...	...
North-Western	Rinderpest	23	23	...	11	...	12
	Foot-and-mouth disease	...	...	...	...	...	...
	Anthrax	...	...	...	...	...	...
	Piroplasmosis	1	1	...	...	1	...
North-Central	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	26	...	26	...	...	...
	Anthrax	...	...	...	...	...	...
Uva	Rinderpest	...	...	...	...	...	...
	Foot-and-mouth disease	303	139	216	1	85	1
	Anthrax	...	...	...	...	...	...
Sabaragamuwa	Rinderpest	58	24	19	36	2	1
	Foot-and-mouth disease	3297	1586	2327	67	903	...
	Anthrax	...	..	...	...	...	...
	Haemorrhagic Septicaemia	7	...	...	7	...	...
	Pleuro-Pneumonia (in Goats)						

G. V. S. Office,
Colombo, 22nd March, 1929.

G. W. STURGESS,
Government Veterinary Surgeon.

METEOROLOGICAL

FEBRUARY, 1929.

Station	Temperature: Mean Daily Shade	Temperature: Difference from Average	Mean Humidity	Mean amount of Cloud 0=clear 10=overcast	Mean Wind Direction during Month	Daily Mean Velocity	Rainfall: Amount	Rainfall: No. of Rainy Days	Rainfall: Difference from Average
	°	°	%			Miles	Inches		Inches
Colombo Observatory	79·0	0	78	5·4	NW	96	1·78	6	— 0·31
Puttalam	79·0	+1·0	74	3·7	NNE	113	0·57	4	— 0 72
Mannar	80·1	+0·7	72	4·8	NE	192	2·25	2	+ 0 92
Jaffna	78·2	—0·4	76	3·4	E	79	0	0	— 1·32
Trincomalee	79·0	+0·4	76	3·9	ENE	121	1·56	3	— 0·6
Batticaloa	77·8	—0·8	82	4·4	NW	180	7·33	7	+ 3·91
Hambantota	79·4	+0·3	76	4·0	ENE	295	1·29	4	— 0·13
Galle	79·4	0	80	5·8	Var.	108	5·14	7	+ 2 27
Ratnapura	81·0	—0·1	74	4·8	—	—	10·23	17	+ 5·78
Anu'pura	78·0	0	68	5·2	—	—	0·14	2	— 1·41
Kurunegala	80·3	+0·4	64	5·7	—	—	0 40	2	— 1·29
Kandy	76·4	+0·3	66	3·9	—	—	0·42	5	— 1·86
Badulla	70·3	—0·1	80	4·1	—	—	2·02	9	— 0·92
Diyatalawa	64·9	—0·3	72	6·0	—	—	1·95	6	— 0·40
Hakgala	60·8	+0·6	74	5·8	—	—	2.61	10	— 0·71
N.' Eliya	56·0	—1·5	72	5·6	—	—	2·52	7	+ 0·49

In the south-west of the Island, the rainfall has been, on the whole, above the average for the month. Elsewhere it bas been generally below average, the most striking exception being a narrow coastal strip running south from Batticaloa. A number of stations, chiefly in the Northern, North-Western, and North-Central Provinces, had no rain at all during the month.

Only one station reported as much as 5 inches in any one day, Periyakulam recording 5·13 inches on the 7-8th.

Temperatures have, in general, shown no marked deviations from average. The minimum air temperature at Nuwara Eliya fell below freezing point on 5 days, the 24th-28th inclusive, the lowest reading recorded being 28·7, on the 24th.

The mean relative humidity has generally lain between 70% and 80%, three stations recording less than 70%. Wind velocities have been about normal, and wind directions usually between east and north. Barometric pressure has been below normal.

D. T. E. DASSANAYAKE,
for H. JAMESON,
Actg. Supdt., Observatory.