problem. But there is certainly an advantage in the application of bonemeal although the effect is not very perceptible. It was found that in the case of single crop lands the increase in yield by the addition of bonemeal and potash was only slight but in double crop lands the addition of bonemeal at 1 cwt. per acre gave a slightly better yield than green manure alone. But the residual effect of phosphatic manures was always evident in the succeeding crop.

Bone guano and Kossier phosphate were compared with bonemeal to supply the phosphates to paddy and bonemeal was found to be superior to the other two by about 4%.

In order to see if better varieties could be substituted for the local varieties, several experiments were carefully conducted in different seasons. At present Aduthurai No. 12 for the first crop season, G. E. B. 24, Local garudan samba No. 43 and Aduthurai Nos. 1 and 2 for the samba season and Coimbatore No. 2 for the second crop season are being introduced and are finding much favour with ryots.

The Deputy Director of Live-stock informs us that the cow No. 95 H. bred by the Agricultural Department died at the Guntur Veterinary Hospital on the 2nd April 1937. She was reported to be the best milker among the Ongole cows milk yields of which have been recorded so far.

Her history is given below

Born	...	...	18—10—1925.
Sire	...	...	No. 20.
Dam	...	...	No. 32.

Yields :—

Lactation.	No. of days in milk.	Milk Yield lb.	Daily average lb.	No. of days dry.
1st.	342	4260·4	12·5	189
2nd.	213	5510·5	17·6	90
3rd.	334	7190	21·5	60
4th.	348	5765·6	16·6	220
5th.	219	4075·8	18·6	139
6th.	266	4841·7	18·2	160
7th.	157	2843·3	18·1	...

EXTRACT

Science and Practice of Agriculture in India. (Extract of the Presidential address given at the Agricultural Section of the Indian Science Congress 1937). By Rao Bahadur B. Visva Nath, F. I. C., F. N. I.

Soils. The work on soils has for its ultimate object the maintenance of the high productive capacity of soils which are rich, the restoration to normal those whose capacity has been reduced and to effect an appreciable increase in the yield of soils which are naturally poor. * * * * *

The important and common characteristics of the majority of the soils are that they are old, have reached a stage of minimum cropping capacity, are subject to intense sunlight and extremes of temperatures and are alkaline in reaction. Soil work in the beginning was, as would be expected, confined to problems of soil fertility. In recent years, the scientific study of the soil has received considerable attention. The work and experience of over a quarter of a century have brought into prominence certain factors which are of special interest.

In the majority of cases, the characteristics and reactions of soils are determined more by climatic factors than by geological origin. For example, the

so-called black cotton soils, though of different geological origin, have several important soil characteristics in common. The soil profile does not appear to have the significance that it has elsewhere, probably due to age and to the fact that the majority are transported soils. In several cases, the surface horizons are missing, due probably to erosion through centuries. The profile study is, however, of considerable importance in the field study of the soil as a whole. Such a study has been able to solve the puzzle in regard to the downward movement of water in stiff black cotton soils. It has been ascertained that minute cracks are responsible for the downward and lateral movements of water.

* * * * *

Soil-Cultivation. We were taught in the olden days that surface cultivation helps to decrease evaporation and on this basis the better growth of crop in cultivated fields was explained. Recent research has shown that surface cultivation does not help to conserve moisture, but does not explain its effect on crop growth. Likewise, the object of deeper cultivation was stated to be better aeration of soils. Leather's work shows that gaseous exchange occurs in soils normally to a depth of one foot. * * * There is evidence that frequent and deep cultivation is harmful to the soil and to the crop. This is in opposition to what we have been taught but is in agreement with the practice of the cultivator who, except at great intervals of time, does not ordinarily cultivate his soils deeply, nor is he willing to carry out too frequent cultivations of the surface soil. * * * * Recent experience in England also has raised doubts whether deep cultivation or intensive cultivation is really and always good. In an experiment in 1932 in England, neither potato nor sugar beet responded to more intensive cultivation than was necessary to keep down weeds. Indeed, further cultivation beyond this minimum amount did more harm than good. * * * * The effects of cultivation must, therefore be looked for elsewhere. One accepted advantage of cultivation is that it contributes to tilth and crumb structure in soils. The satisfactory formation of soil crumbs due to the aggregation of smaller particles by cultivation depends on the stability of these aggregates towards water. The more stable they are the better they will be from the point of view of crumb formation. In the light of modern work on soil clay, crumb formation and its stability depend on the cationic composition of the clay. It is greater and better for calcium clay than for other clays. The water relationships that exist between clay and water and the salt content of the soil and clay, exercise a direct or indirect influence according to conditions. The intermediate stages between complete calcium clay and sodium clay may have varying degrees of moisture requirements for the use of the plough. The more we understand these factors under different conditions of climate and cropping, the better we shall be in a position to deal with problems of soil cultivation.

Soil-Base Exchange and Related Phenomena. Soil workers are familiar with base-exchange phenomena in soils. This is the greatest achievement of modern soil research which has brought about a revolution not only in the study of the soil, but also in the practical aspects of soil management and amelioration. The conception of the reactive soil particle and of its exchange processes as ionic interactions has given us valuable information in the study of our soils and in understanding their behaviour, particularly in regard to irrigation and the formation and amelioration of alkaline soils. We now know how irrigation water and fertilizer salts can influence the composition and the properties of clay and the soil. We also know that in soils with adequate reserves of calcium, the intensive use of ammonium sulphate does not induce soil acidity. It is on the relative proportions of exchangeable calcium and hydrogen and not on their absolute quantities that the properties of a soil depend and by measuring the degree of saturation, it is possible to assess the field behaviour of a soil under

irrigation or during the rainy season. Attempts to correlate base exchange capacity with crop performance are not yet successful.

* * * *

The composition of the clay complex with respect to cations is of primary importance in determining the soil's ability to absorb water. When saturated with different bases, the moisture holding capacity varies with the base in the descending order, Na., Ca., Mg., and K. The ability to part with water will be in the reverse direction.

The implications of these observations in experiments dealing with water requirements of crops or in the amelioration of alkaline and saline soils is obvious. In the case of the former, the critical and total water requirements of crops will vary even if every other variant except the soil is kept constant. Depending on the nature and quantities of the salts present the amount of water that will be available to the plant will vary. In a salty soil, maize and jowar wilted at over 12 per cent. moisture content in the soil, while in a salt free soil the wilting point under identical conditions was at 7·6 per cent. moisture. In the presence of about 2 per cent. organic matter on the weight of the soil, the position was considerably altered. The difference in moisture content at the wilting point in the two soils was narrowed down to below 1·5 per cent.

The swing of the soil's reaction depends on the degree of moisture in the soil. With soils above pH 7 alkalinity will be in evidence under wet conditions while under dry conditions the same soil will show diminished alkalinity and increaed salinity. From theoretical considerations any calcium salt would be able to effect the necessary exchange reaction but in practice cost decides what should be used. In any case, the presence of organic matter is necessary. From these considerations molasses mixed with any available calcium compound is capable of bringing about the necessary reactions.

Fertilisers and Manures. * * * * The Imperial Council of Agricultural Research has recently collected and collated all the available data on fertilizer and manurial experiments carried out in India in the past. The study of the data on experiments which are sufficiently comprehensive and long enough to justify the view that the results are truly representative, warrants certain broad conclusions. The evidence establishes the suitability and, therefore, the importance to the great majority of Indian soils of indigenous organic manures like cattle manures, green manures, bone manure and fish manure and oil cakes; artificial fertilizers are of importance, but only of secondary importance by themselves, and they show themselves at their best in conjunction with organic manures or when the soil is normally rich in organic matter. In areas of precarious rainfall or inadequate irrigation facilities, artificial fertilizers almost invariably failed to be useful while the effect of organic manures was erratic. With assured moisture supply in the soil, the performance of artificial fertilizers was distinctly better and, in many instances, as good as and sometimes even better than organic manures, according to the nature of the crop.

Among the fertilizers the returns were greatest generally with nitrogenous fertilizers in almost all parts of India. The action of phosphates was evident generally but it was considerable in the crystalline tracts of peninsular India. The response to potassic fertilizers was not appreciable. Of the nitrogenous fertilizers, ammonium sulphate was the most satisfactory but not to such an extent as to rule out concentrated organic manures like oil-cakes, fish manures and hoof-meal. Superphosphates and ammonium phosphates showed themselves to be useful phosphatic fertilizers in combination with organic or inorganic nitrogenous fertilizers. Superphosphate was generally as efficacious or was even superior in some instances to bone meal, but when used alone the action of superphosphate was erratic. Potassic fertilizers were not used to the same

extent as nitrogenous and phosphatic fertilizers. On the few occasions on which they were used, the response was either feeble or none at all, and this experience was perhaps a sufficient deterrant.

In several cases, the continued use of artificial fertilizers only led to bad residual effects on the soil. When used in combination with organic manures, however, the effect of artificial fertilizers was almost the reverse of that when used alone. Higher dosages did result in higher yields, but these were not commensurate with the expense incurred. The evidence in regard to the time of application of fertilizers is neither extensive nor conclusive. What little there is, indicates that the fertilizers are best applied generally in one application at the time of planting for crops other than sugarcane, which prefers applications in two instalments. The next line of investigation should be an experiment and research on the internal and external effects of time of application to the crop. We have as yet not enough data on the proportionalities of N, P, and K, suited to different soils and crops and of the proportions in which organic and inorganic manures should be used.

The average nitrogen content of Indian soils is 0·05 per cent. and of organic carbon content is 0·6 per cent. Similar figures for European soils are 0·15 per cent. nitrogen and 3 per cent. organic carbon. European soils are five times as rich in humus contents and still the demand there is for organic matter. * * The needs of Indian soils are evident and the data from manurial experiments portray the requirements correctly. Cattle manure, green manures and other organic manures are valuable to soils because they supply what is popularly known as humus which is so essential to maintain soil fertility. The cry for organic manures for Indian soils is even stronger and more imperative because the disruption of organic matter is faster at the high temperatures obtaining in India. The rate of destruction can be imagined when it is stated that a soil receiving cattle manure at 10 tons per annum in two instalments continuously for over 20 years, contains only 0·74 per cent. or organic carbon as against 0·59 per cent of organic carbon in a soil that received no organic manure at all.

The theoretical possibilities of artificial fertilizers are almost limitless, but their achievement on the majority of Indian soils is limited by climatic factors and economic considerations. In India the major part of its agriculture depends on the monsoon, and therefore the supply of moisture in the soil is the foremost limiting factor in production. The control of monsoon is beyond our power, but surely we can better conserve and regulate moisture in soils by husbanding the existing resources of indigenous organic manures and using them properly.

* * * *

Soil organic matter is the life of the soil. It improves the physical condition of the soil; it provides organic colloidal material which plays a very important part in absorption and exchange, possessing four to five times the exchange capacity of inorganic colloids in the soil. * * * * Time was when it was supposed that artificial fertilizers had substituted and would continue to substitute natural organic manures, especially farmyard manure, with equal and even greater efficiency. It is now universally recognized that organic manures, exemplified by cattle manure, are necessary for maintaining soil fertility and that no combination of artificial fertilizers can exercise the steadying effect on crop yields from year to year. * * * *

The effect of farmyard manure is seen not only in the total crop yield but also in the higher ratio of grain to straw compared to artificials. In regard to the composition of the crop, there is no significant variation in nitrogen and potash but striking difference is noticed in the phosphate content of the crop from mineral and organic manured plots.

The most striking difference is in the quality of grain as *seed* and food. Ten years ago attention was called by Viswa Nath and Suryanarayana, and McCarrison and Viswa Nath to this important and till then unsuspected aspect of manuring crops. It will be instructive and useful to examine the evidence that has accumulated in this regard since then and to define the position as it now stands. With your indulgence I propose to discuss the work in a little more detail than it has been possible to discuss other lines of activity.

It is interesting to note that although the mechanism of action and the agents responsible for it are under debate, the evidence in the main lends support to the earlier observations on the effect of manurial and fertilizer treatment given to the crop. Repeated experiments by Viswa Nath, subsequent to the first publication, confirm the previous findings in showing that the crop producing quality of the *seed* is influenced by manurial treatment. When seeds from differently manured plots are sown in a soil of moderate fertility the resulting crops are different. The seed from a plot continuously manured with cattle manure gives a better crop than that manured continuously with artificials or not manured at all. Kottmeier (Kuhn, Archiv., 1927) carried out trials to determine the effect of different fertilizers on the *seed* value of potatoes and found that the worst quality *seed* was obtained with physiologically alkaline fertilizers like calcium cyanamide and sodium and potassic manures, while the best all round effects were obtained with farmyard manure or physiologically acid fertilizers like ammonium sulphate. Tallarico (Mem. R. Accad. Ital., 1931) has found that seeds from plants that are overnourished have less vitality than seeds from poor soils.

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Animal nutrition experiments by McCarrison with the identical grains (millet and wheat) as were used by Viswa Nath and Suryanarayana for vegetation tests, showed that grains grown with cattle manure possessed better nutritive value than crops grown with chemical manure or with no manure and that the crop grown with chemical fertilizers was superior to that from an unmanured soil. Subsequent experiments also pointed to the same result. * * * *

The probable causes for the superior effect of organic manures may well be either in the relatively high vitamin contents of the produce, or in the better metabolism in the crop under better moisture conditions due to manure. In some experiments with herbage, Viswa Nath (Annual Report, 1930–31) found that the digestive co-efficients varied with the nature of manuring; herbage raised with cattle manure had a protein digestion co-efficient of 74 per cent., while the figures for the crops raised with mineral manure and no manure were 70 per cent. and 62 per cent. respectively. The animals were fed on equivalent protein basis. Cattle manured herbage had the lowest total nitrogen and soluble ash content. The quantitative effects of nitrogen and mineral contents of the feeds having thus been ruled out, the high protein digestibility of cattle manured herbage points to better availability of proteins and other constituents. In certain preliminary experiments, grain from the unmanured plot yielded the largest quantity of prolamin and that from cattle manured plot yielded the least. The values for the grain in the mineral manured plot have been intermediate. Similar proportionalities have been observed by Bishop whose findings are that low nitrogen content of grain is associated with low prolamin and high salt soluble protein content. It would appear possible that protein metabolism in the plant varied with manurial treatment. * * * *

It would thus appear that if we neglect organic manures and fail to build up the humus content of the soils we shall be doing four things.

Firstly, we shall not be able to maintain the fertility of the soil.

Secondly, we shall not be using artificial fertilizers to the best advantage.

Thirdly, we shall be failing to keep up the inherent cropping power of our improved seed and run counter to the good work of the plant breeder.

Fourthly, we shall be producing food deficient in nutritive value.

* * * * It is therefore justifiable to expect a unanimous acceptance of the proposition that at the back of all improvement lies that of the soil whose organic matter content should be built up by all means in our power.

The Nitrogen Cycle. Soil nitrogen in its several phases has been receiving attention in many laboratories. The results of recent work bring into review the whole of the nitrogen cycle both from the scientific and practical points of view. Dhar and his collaborators have made the important observation and brought forward evidence to show that photonitrification occurs in soils. * * *

An important point on which there is however unanimity of opinion is in regard to photo-denitrification. * * * *

There is besides a considerable volume of evidence in India and elsewhere that loss of nitrogen occurs from the soil in ways other than through drainage and the consensus of opinion is that the loss occurs in the form of elemental nitrogen under dry and swampy conditions. * * In comparative experiments in the field the loss was the greatest with ammonium sulphate, least with cattle manure and intermediate with green manure. The loss was, however, not a continuous process. It was a series of periodical gains and losses of varying degrees of intensity, depending on the nature of the material. The position in the end was that a net loss in total nitrogen was registered with ammonium sulphate, and a net gain with cattle and green manure, the gain being greater with the former. The presence or absence of crop did not make any difference in the nature of the reaction, although there was difference in the magnitude of the fluctuation.

Nitrogen fluctuations in the soil are usually explained in terms of the effect of carbon-nitrogen ratios on the biological processes which begin to operate immediately the requisite nitrogen is either put in the soil or is obtained from the atmosphere and any defect in nitrate nitrogen is placed to the credit of the concerned micro-organisms. On this basis it is difficult to explain the loss of total nitrogen. * * * *

Some recent laboratory investigations with soil cultures using sugar only in one set and nitrate only in another and a third in which sugar and nitrate are used together, show that regardless of the initial C : N ratio, the loss of carbon is fairly constant amounting to about 70 to 80 per cent. of added carbon, the ratio ultimately assuming a value round about 10. With sugar alone, loss of carbon was associated with gain in nitrogen, the latter obviously being obtained by fixation from the atmosphere till the ratio reached 10. With only nitrate the changes in the carbon and nitrogen were too small to be significant. When, however, sodium nitrate was substituted by ammonium sulphate, it was converted into nitrate with a loss of ten per cent on the total nitrogen. * * * *

What is the meaning of all these changes? What is the significance of nitrification? If crops feed in the form of nitrates, why should there be loss of nitrate and nitrogen? Is it possible that the capacity for nitrification is simply an index of the soil's respiration efficiency? What is the relationship between nitrification and nitrogen fixation? Can it be that nitrogen fixation is more intimately connected with the direct feeding of crop and nitrification is a means of rendering oxygen available, and what part does sunlight play in this? Do the results of recent experiments by Subrahmanyan on the action of inorganic oxidizing materials give any clue? These are all intensely interesting questions that arise from a critical study of the recent results and require an answer.

Meanwhile we may examine with reference to practice the problem. Nitrogen is the most expensive of the fertilizer constituents to buy It is surely bad business if it is to be bought and put into the soil only to be entirely or partly lost into the air. Fortunately, however, it is capable of replacement in the soil by natural means. * * * * Comprehensive studies by Rao Bahadur Sahasrabudhe, in the field and in the laboratory, establish that considerable nitrogen fixation occurs sufficient to maintain the fertility of the soils of the arid and semi-arid tracts in the Deccan. * * * Joshi has computed from field experiments at Pusa that under favourable conditions as much as 360 pounds of nitrogen per acre, including that removed in the crops, is gained in the cold and hot seasons.

It is natural to enquire that if such large nitrogen gains are possible, where then is the necessity for adding nitrogenous fertilizers and how additional crop responses are possible on the mere addition of 20 or 30 pounds of artificial nitrogen. If the conditions in the majority of Indian soils are favourable for nitrogen recuperation, the same conditions, namely sunlight and temperature, help to destroy the organic matter of soil which produces a disturbed physical condition in the soil soon to be followed by all other inevitable consequences. Under such circumstances the addition of small amounts of artificial nitrogen probably helps, partly at least, in assisting the recovery of physical and biochemical conditions. The natural process of nitrogen recuperation depends for its success on the sufficient organic matter-supply in the soil.

Recent experience at the Kansas Experiment Station points in the same direction.

The Problem of Organic Matter and Manure Supply. * * * * It is computed that under our conditions about 75 per cent. of the fresh organic matter added to the soil and about thirty per cent. of the stabilized humus are destroyed annually. The position calls for investigations on the means both for conserving organic matter that is already in the soil and for increasing our resources of organic manures.

By carefully storing the dung, urine, litter and other refuse material, it is possible to conserve this source of supply. * * * * However carefully it is preserved and its quality improved, we cannot get enough of it to meet the requirements. Composting all waste vegetation is another means by which the supply of farmyard manure can be supplemented.

The problem of composting has been receiving considerable attention at the hands of agricultural workers in India. These endeavours have always been to develop a technique suitable to Indian conditions. * * * * The changes in the details of the technique during the last few years are indicative that the process of composting is still open to further studies.

It would appear that it is the organic matter of the compost or of the manure that is more important than its nitrogen components, its loss of nitrogen does not seem to be an avoidable factor which depends on the initial richness of the basic material used for the compost. It would also appear from a study of temperatures that the process is both chemical and biochemical consisting of a low temperature period of chemical oxidation and a high temperature period of biochemical oxidation. Both the processes proceed side by side, the one or the other being a predominant feature for the time being. The low temperature fermentation seems to be more in evidence after the high temperature fermentation is over and when the apparent stabilized stage is reached. It is possible that the reinforcing of these composts with nitrogen and phosphate at the end of the fermentation period is likely to render fertilizer usage more valuable than it is now. * * * While many of the methods proposed are workable on plantation basis, their suitability to the peasant cultivator is doubtful. If composting is to form a regular agricultural practice in India, it is necessary that

efforts should be made to make the method simpler and cheaper than what it now is.

* * * * The possibilities of utilizing the vegetation of forest areas for supplying cheap fuel in the shape of charcoal and compressed briquets of composted humus, without affecting the requirements of the forests themselves, is a problem worthy of investigation. Vageler has estimated that the yearly production of fresh organic matter in the primaeval or rain forest at one hundred tons per acre as a cautious estimate. For the monsoon forest the estimate is about 20 tons to the acre. The problem is, how much can be spared for the plains. The problem should be viewed and be considered on the analogy of irrigation by which waters from areas of plenty are carried to areas of scarcity.

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Problems of Food and Nutrition. * * * * *

A W. Flux, in his presidential address to the Royal Statistical Society (June, 1930) on 'Our food supply before and after war', fixed 86·5 grammes of protein per head per day in England. This is equivalent to 14 grammes of nitrogen per head per day. For India, I have assumed that the food requirements are lower and have taken an everage of 75 grammes of protein consumption per head per day. This is equivalent to 12 grammes of nitrogen. On this basis, the annual requirement of nitrogen, necessary for feeding a population of 353 millions, works out to 1,522,312 tons of food nitrogen for the whole population or 9 66 pounds of nitrogen per head per year. From the 247,000,000 acres under cultivation with various food crops, a total of 1071,138 tons of food nitrogen are available. Thus, we are short by roughly 500,000 tons of food nitrogen. In other words, we are at present producing food sufficient for the proper feeding of only two-thirds of the population.

The supply of food has to be increased by increasing the outturn per acre and by bringing more land under cultivation. With high yielding strains of crops and suitable soil management, it should be possible to increase production sufficient to meet the needs. Our botanists can and are producing high yielding strains which, on the average, give 10 to 15 per cent. increase in yield. A quarter of a century of experimental work has demonstrated that by rational soil management and manuring a further increase of 10 to 15 per cent. can be expected. The results of recent sugar-cane growing competition under the auspices of the Maharashtra Chamber of Commerce, Bombay, show that large increases are not impossible. In these competitions, the Kalamb Sugar Factory harvested as much as 104·28 tons of cane to the acre. Several other factories recorded 80 to 100 tons of cane to the acre as against the normal average of about 40 tons to the acre.

Conclusion. In this brief sketch I have endeavoured to draw attention to some of the outstanding problems, the solution of which intimately concerns agricultural practice. * * * * Great as has been our achievements in the past, we have only laid the foundations for the future. The scientific study of the soil will doubtless enable improvements for the future as it has done for the past, but the utilization of this knowledge to the full will be in proportion to our ability to build up the reserves of organic matter in the soil.

Indian agriculture is one of great antiquity and many of the present-day practices are the outcome of experience through at least fifty centuries. * * * The effect of intensive cultivation and the intensive use of fertilizers in India without the necessary accompaniments is obvious.

Research should concern itself more with details of existing practices than with the evolution of wholly new methods and should aim at building up on the existing system a state of agriculture to suit the condition of the soil and the resources of the cultivator.

Reviews.

Booklet on " Beekeeping " in Tamil by S. Gopalakrishnan, Madras.

The booklet is on the whole well written, presenting the salient points of the subject, in a concise form, with a few illustrations. Its get up is quite attractive and the low price (four annas) as compared with the information contained, is bound to make it quite popular.

The subject is dealt with in 11 chapters, commencing with beekeeping—new and old. The subsequent chapters contain information regarding the life history of the honey bee, the different indigenous varieties, hives and appliances, care and management of bees, swarming, enemies, etc. Information on hiving wild colonies and details of the bee hive are given in two appendices.

As the booklet is expected to serve as a useful guide to amateurs, the following few suggestions, to make it more useful to the public, are offered. A few facts on the bee pasturage plants, breeding season, economics, may be given in the booklet. There are certain statements such as the capacity of the queen to lay 3000 eggs per day, of the capacity of the bees to travel up to 2 or 3 miles, the massacre of the drones, which are not quite correct in the case of the Indian bee. The statement that the pollen basket is in the second joint of the hind leg needs correction.

The portion dealing with the care and management of bees must be more comprehensive, giving fuller details of the various operations including uniting bee colonies, introduction of queen in a queenless colony, which are often necessary while managing an apiary. The portion on swarming—the most important aspect—is too meagre. The portion on bee enemies is too short. The wax moth especially deserves a more detailed treatment and the remedy suggested by the author will hardly be of any use to the amateur. The method advocated by the author for hiving swarms and capturing wild colonies do not seem to be quite practicable ; at any rate, there are better methods which can be suggested.

M. C. C.

Rural Reconstruction. N. G. Apte, B. Ag. (Dairy).

The book is a collection of a few notes and articles prepared by the author at different times during 1931—34 as a result of his investigations into the rural life of Maharashtra. Mr. Apte has spared no pains in making the investigation as thorough as circumstances permitted and as far as it goes the book gives a fair idea of the present-day conditions which rural workers are faced with. The only portion however which will interest the general reader is, in our opinion, that which deals with the possibilities of starting " Fruit preserves " industries wherever facilities exist.

As regards the rest we do not certainly see eye to eye with the author especially regarding some of his generalisations about the causes of the present unenviable position of the Indian villager. Nor are the remedies proposed as convincing as the author tries to make out. The chapter on the village water supply is, if at all, of only local interest.

As a faithful record of the investigations carried out by an enthusiast we commend the book to all those interested in the work of rural reconstruction.

The publication is priced Rs. 2—8 and is available with R. K. Rao, Pallipat, Nagari Ry. Stn., Chittoor Dt.

M. U. V.