

Burman landlord and the floating Indian population that supplies labour for all agricultural operations.

For one thing we may note in passing that this stronghold of Buddhism has very nearly solved the knotty question of elementary education and antagonism of interests between the classes and the masses. She is rapidly changing and should soon establish an Agricultural College for which conditions were not found suitable a few years ago.

The Government of India have agreed to release four  
Wheat  
Export. lakhs of tons of wheat for export from Karachi before the end of March 1921. This export is contingent on the crop being big enough to keep the wheat prices at or below Rs. 5—8—0 a maund at the Lyallpur market.

---

### . **The aid of Science to Indian Agriculture.**

---

The application of science to industry during the last few years has produced revolutionary changes in the industrial world. New industries have been created and the old ones have had their production increased and improved. This development has produced a wonderful change in public sentiment towards science.

In Britain a generation ago what was termed the practical man regarded the scientist with a degree of suspicion, and this is the case now in India. To-day in England all the great industries look to the Universities for their experts, and most of the large manufacturing firms have their own research departments. It is more and more being recognised that scientific methods pay, and that the sums spent on scientific research are a trifle compared with the results obtained.

With the exception of improvements in machinery, which are largely the gifts from the Engineering World, one can boldly say that no advance or improvement towards increased production has been made in India. As an explanation, it might be argued—and indeed the opinion is widely held—that agricultural production is limited by certain natural factors excluding the possibility of such increased production as is obtained in manufacturing industries, and that, consequently the science is of limited application to agriculture and of little value to the practical farmer.

This view is rapidly disappearing in Britain, but I am afraid that in India there are very few who realize the fact that there is hardly a branch of pure science with which agriculture is not connected. The problems of the soil are problems of Physics, Chemistry, Geology and Bacteriology. Agriculture is without doubt the most scientific of all vocations.

In almost every country much advance is being made in every branch of science and it would be contrary to all experience for any marked advance in pure science not to be accompanied sooner or later by an advance in applied science. The probability is, that there is an accumulation of scientific information which has not yet been applied on the farm with the same diligence as it has been in the work shop.

It is very instructive to note what has been done in other countries, and how the recent development of agriculture in Germany has increased production.

Yield per acre per annum.

	England and Wales.		Germany.	
	1885-89	1909-13	1885-89	1909-13
Wheat (Bushels)	29·5	31·2	19·8	31·6
Barley ( „ )	32·4	32·7	22·7	36·7
Oats ( „ )	38·8	39·0	25·7	44·6
Potatoes (tons)	5·9	6·2	3·4	5·4

It will be seen that in England the yield has been practically stationary, despite the fact that ground was going out of cultivation. In Germany, the production per acre has increased by over 50% and in every case except potatoes is now actually higher than that of England. The increase in yield is not to be explained by the assumption that the yield in England in 1885-89 had already reached a maximum and that the improvement in Germany was due to the fact that during the above period, German farming was in backward condition and that in the interval she had improved her methods of farming to the level of English methods. It is not so. Sir T. H. Middleton discusses this point and shows that the soils and climate of Germany are inferior to those of Britain, and surely not so well suited for the growing of large crops of grain, potatoes etc. He says "If a full discussion were possible it could probably be shown that the production of the two countries in the eighties is a closer index to the natural advantages enjoyed by cultivators in each than the production in the period immediately before the war." This shows how the Germans having unfavourable natural conditions were yet, through the increase of scientific research, able to produce more than a country which has more favourable conditions.

Again in meat and milk production, Middleton shows that for every 100 acres of cultivated land Germany produces 4.27 tons of meat against Britain's 3.9 tons and 28.1 tons of milk against Britain's 17.4 tons.

It is worth while considering how this ascendancy has been achieved. Firstly, *the Government had a definite Agricultural policy and the farmer had confidence in the Government.* The ends desired were increased food production and the maintenance of a rural population.

The means whereby these ends were obtained may be summed up in the three words, Research, Organization and Education. What has crowned the Prussians with success was the policy of concentrating first on research and higher education. And even the Germans knew it as Von Rumker says that the "great progress that agriculture has attained in Germany during the last quarter of a century is the

result of the Union of *practice with science*" and even goes to prove that money spent on research and education brings in a high rate of interest.

Education, unless based on research, is sterile, for unless new information is obtained there is nothing for the teacher to demonstrate. There can be no doubt that the recent progress made by the Germans is a demonstration on a big scale of the value of the application of science to practical farming.

In America the belief in the value of research in agriculture is greater still. Research institutions in that country surpass in number and size, those of any other country. The experimental stations there enjoyed a total revenue of £. 5,642,149 equivalent to Rs. 11,754,477. The activities in which this money is expended are research, dissemination of information and administration of statutes.

To enter into the question as to whether research in agriculture is profitable, it is best to take some of the main lines of investigation and indicate the results of economic value that have already been achieved by scientific research.

In arable farming two of the fundamental factors that determine yield are seeds and soils. It is a known fact that these can both be improved but the degree to which improvement can be carried is not yet thoroughly appreciated by all concerned, at least in this country. One example from the continent of Europe and one from America will suffice to show the possibilities of research in plant breeding.

In 1875, 11½ tons of sugar beet were required to make one ton of sugar. By 1910, the quality of the plant had been so improved that 6 tons alone were needed! At the Montana Experimental Station, United States of America in 1917 a strain of oats was isolated which gave 10 bushels or 420 lbs. more than the original variety. The same results can be got if the number of plant-breeding stations was increased and more research men, employed for crops like Paddy, Chulam, Sugarcane; and when one considers the several million acres devoted to the cultivation of these crops, some idea is obtained of the economic value of this line of work.

The soil is the fundamental raw material of farming and its quality is one of the most important factors upon which the crop yield depends. The quality is not a fixed constant. Among the uninitiated there seems to be an idea that all the information that is needed about soils can be obtained in a short time by a Chemist armed with a test-tube and a few reagents. Chemistry is of limited application. The micro-organisms in the soil and its physical condition are as important as its chemical constitution. The problems of the soil are of the utmost complexity and require a well-equipped and well-staffed institution before they can be investigated with any hope of success.

Soil problems are being investigated at Rothamsted in England and in several places in America. At the experimental station at Georgia (United States of America) it has been found that a change in the method and time of application of the manure from that commonly practised gave 13.4% increase in the crop. At Rothamsted researches have shown the possibility of effecting a saving of the waste of farm yard manure and of increasing its value to the land. The worth of this scientific work can be appreciated only when we realise that this commodity is produced in India to the value of several millions of rupees, and it is estimated that about half of its most useful constituent is lost. Unfortunately results obtained in soil investigations in other countries do not always apply to our country with its different soil and climatic conditions; consequently there is a great need for a research station in every representative agricultural tract.

Stock-farming presents as promising a field for the application of science as arable farming. The great advances made during the past few years in the Medical Schools in Science in relation to disease and nutrition are in a large measure still waiting to be applied to agriculture.

The value of research in agriculture is not a matter of academic speculation that awaits demonstration and proof. In Britain in the end of the 18th and beginning of the 19th century the epoch-making lectures on agricultural chemistry by Humphrey Davy and the work of J. Tull and others enabled much progress to be made.

To secure an equal stand with other nations, the first requisite is a settled Government policy, that will give security and confidence to the farmer, and induce him to adopt a continuous system of farming that will lead to increased production. The second requisite is a wide extension of agricultural research and education.

When there is a settled agricultural policy, applied research and absorption in practice of the results of research will undoubtedly lead to increased production of food stuffs and continued prosperity for the agricultural community. A relatively large rural population and an abundant home-produced food-supply are now recognised as being essential for the welfare of every country. If research in agriculture can assist in attainment of this, it will repay the nation, in a manifold measure, its comparatively trifling cost.

Wake up, ye Young sons of mother India.

C. B. Samuel.

---

### **The economic situation in Europe.**

---

*An address delivered at the Geneva Meetings of the Central Committee by  
Mr. E. F. Wise, British Representative on the Supreme  
Economic Council.*

Sir William Maxwell introduced Mr. E. F. Wise, who was present at the invitation of the Executive, to give to the Central Committee at Geneva some idea of the economic situation in Europe and to indicate the means by which International Co-operation could assist in its amelioration.

Mr. Wise said that it gave him very great pleasure to accept the invitation to address this Committee, and still greater pleasure to have the opportunity of attending this meeting and of meeting the Co-operative representatives of so many countries, many of whom were already friends of his, and with many of whom he had had most pleasant relations in the past. He realised that, in asking him to attend, the Committee were asking him, not as a British official, but