

THE CONTRIBUTION OF INDUSTRY TO AGRICULTURAL DEVELOPMENT IN SOUTH AFRICA

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I was recently fascinated by an article on the changes which have taken place to give us the world of today. The main theme of the article was that 85% of all man-made articles known to us today did not exist 50 years ago. At first sight I regarded this as a rather foolish statement but, eventually, I had to agree that there was a lot of truth in this. The past 50 years may be regarded as a second industrial revolution in which man has mastered many aspects of science and technology to improve his living conditions. Consider the development of the internal combustion engine, the petrochemical world and everything that goes with the modern space age. A few years ago the President of the Du Pont Chemical Corporation stated that it was essential for his company to spend many millions of dollars on research simply because 75% of all their products produced today would be obsolete within 20 years.

The tremendous development in industry frequently over-shadows what is happening in agriculture. The farmer, on the other hand, prefers to regard his enterprise as a way of life and does not necessarily wish to be associated with the hurly-burly of industry. I believe that this concept is incorrect and that agriculture depends on the *triangle of progress*. This triangle should be pictured as having the practical farmer at the apex; research at the bottom right and the industrial contribution at the bottom left. I shall endeavour to prove that success in agriculture depends on the interplay of these three major factors.

The modern industrial revolution has penetrated deeply into agriculture – the main source of food, fibre and raw materials essential to human life. The importance of all fields of agricultural production can never be stressed sufficiently when considering factors such as the population explosion. During the time that you will be listening to me, no less than 900 babies will come into the world. In the past 24 hours, 350 000 babies have been born and, during the past year 125 000 000 babies have seen the light of day. Although approximately 50 000 000 people die each year, 75 000 000 have been added to the world's population. In South Africa, the annual increase in population is in the vicinity of 2.95%. This rapid increase in the world population cannot be ascribed to a higher birth rate since there is a general decrease in the overall birth rate in the world. The basic cause is the drastic decrease in the death rate which has resulted from a higher standard of living and the spectacular progress made by medical science.

The following are some of the implications of the population explosion. It is said that more than half of the world's population is undernourished. In order to maintain even the present unsatisfactory level of nutrition food production

will have to double every 35 years. Should a satisfactory nutritional level become a reality by the end of the century, it would be necessary to treble the food production in the next 28 years. These facts indicate that agriculture faces the greatest challenge in the history of human endeavour.

Before assessing the part played by industry in agriculture, we should consider the potentially arable land of the world. In 1955 Charles Kellogg, the soil scientist, summarised certain conclusions that he and others had put forward in a Unesco report issued several years earlier. He said that "with the general adoption of practices already being used by good farmers occupying various kinds of soil, the acreage of crop land in the world could be increased by more than 50%, or from a thousand million hectares to one thousand five hundred million hectares. While a part of this additional land lay in the temperate regions, most of it lay in the tropics of South America, Africa and some of the large islands". Kellogg added that "the estimates of the available soils for agricultural use and the production possible from these soils are considerably higher than the prospective population of this century." It therefore appears that agriculture and the vast challenge of food production is not limited by natural resources but depends upon the ingenuity and endeavours of man – the agriculturist or farmer.

I now wish to refer again to the "triangle of progress". At its apex is the practical farmer, the main actively engaged in all branches of agriculture, in the earliest human societies he was responsible for the subsistence of his family by hunting and gathering. About ten thousand years ago he began to domesticate plants and animals, the first of which was the goat. Radio-carbon dating indicates that plant and animal domestication was underway at Jarmo in Iraq by 6 000 B.C. and at Jericho perhaps 1 000 years earlier. From these areas farmers migrating carried plant and animal husbandry to western Europe and to the rest of the world. The farmers of old used a digging stick and a hoe to cultivate small plots of land. The stick was the ancestor of the pick, the spade and the fork. The plough is believed to have originated in the eastern Mediterranean some 3 000 years BC. The use of the plough marked the beginnings of land tenure and the development of a more complex form of agriculture.

Very much later the industrial and agricultural revolutions which hit Europe had a twofold effect. Not only were the products of industry and agriculture made available in large quantities but many of Europe's people sought release from economic, religious and other restraints. They emigrated and took with them the skills, the enterprise and the enthusiasm needed in their new world. These people, mostly farmers, were of a special breed of man and established a distinct way of life

whereas they settled.

As the demand for food, fibres and other agricultural products grew, farming activities were forced to spread to less favourable areas. In order to exploit the areas efficiently the need for *research* in many fields of agriculture became essential, to the farmers and the agricultural scientist began to evolve. It was at this stage that Governments voted funds and agricultural research became established. In the United States, the first money or funds for agricultural research was voted in 1862. At this time, similar funds were voted in Britain and the developed western countries. Agricultural research has helped to provide people of the world with better food supplies, nutrition and a host of new products from life-giving drugs to frozen orange concentrate. It has led to greater efficiency in crop and livestock production, higher yields per acre, more eggs, milk and meat from less feed, more effective control of diseases and pests, better use of land and water and improved methods of harvesting, storing, processing and marketing of farm products.

The results of agricultural research can only have value if they get back to the practical farmer. In many instances this is possible through a direct route from the research worker to the farmer. More often, however, results must be exploited, processed by *industry*, before industry, to my mind, takes its place on the left hand lower point of the agricultural triangle. It has been responsible for great advances through its own utilisation research programmes aimed at improving and extending the markets of existing foods, fibres and other farm products and finding new uses for farm output, including wastes and residues. The frozen juice industry was developed by utilisation research in industry, as were improvements made in dried eggs. Soybeans would not have become a major crop had it not been for the new food and industrial uses which were developed. Improvements in turpentine manufacture ushered in a new era in pine farming. Finding uses for agricultural and industrial wastes such as corn cobs, vegetable tops, inedible fats and a host of other products has fallen to industrial initiative and a whole new science of chemurgy has developed.

The industrialists' contribution to South African agriculture has been most significant over a very wide field of activities of which the following are amongst the most important:

1. *Mechanisation of Agriculture* It is my firm belief that the large scale introduction of the tractor in the late thirties and post war years was without any doubt the greatest single contribution made by industry to agricultural advancement. In our country, where climatic conditions are more trying than in Europe and many parts of the U.S.A., the tractor ousted the ox and horse and, for the first time, soil preparation was correctly and efficiently done. I remember the days when scrawny oxen were used to plough after the first spring rains fell in this country.

The result was slow and shallow ploughing when usually one-third of the land was ploughed too wet, one-third at the correct moisture content and the last third when the soil was getting dry. Mechanical power in the form of the tractor gave our farmer the opportunity to prepare his soil during the dry season, thus greatly increasing the overall moisture content of the seed beds; planting was undertaken timeously and scientifically and weed and insect control became a regular and easier practice. With power contour walls, levelling of lands and the control of flood erosion became possible on each farm. The rate of crop production, with all the resultant advantages, increased by 50 to 100% over 10 years. It is estimated that our farmers have in excess of 10 million horse power at their disposal. The figure in the U.S.A. is 7 000 million horse power in agricultural equipment.

2. *Water Conservation* Without water we cannot produce essential food. Here too mechanical power, explosives, cement, steel piping, pumps and many other products of industry made water storage possible – from small dams to the Hendrik Verwoerd project.

3. *Commercial Availability of Hybrid Seeds* Here the results of basic research have been exploited by industry to the advantage of the farmer and have resulted in phenomenal increases in the yields of various crops per acre.

4. *Chemical Contribution*

- (a) *Fertilizers:* We are using more than one million tons per annum and this is just the beginning of a new era in the Republic.
- (b) Pesticides.
- (c) Effective anthelmintics.
- (d) Other chemicals, e.g. herbicides.

5. *Special Animal Feeds and Nutritional Compounds*

A few of the important developments are

- (a) Rumen stimulants, e.g. Urea, Biuret.
- (b) Industrial proteins.
- (c) Growth stimulants.

6. *Industrial Processing of Perishable and Non-perishable Agricultural produce*

- (a) Food canning
- (b) Fruit juices
- (c) Dehydration
- (d) Glucose and starch production
- (e) Fermentation – alcohol, acetone, butyl alcohol, etc.
- (f) Plastics – from proteins.
- (g) Furfural – from chaff.

7. *Credit* The success of agriculture is ensured where all three forces in the triangle co-operate. Does this happen in South Africa? I believe this to be partly true, but there

is much room for improvement. In South Africa agricultural research is largely a function of the state, and excellent work has been done and is still being done by the Department of Agriculture, but I suggest that there exists a strange and traditional reluctance on the part of the researchers in the Department of Agriculture to co-operate fully with the private sector. Even in my day (many years ago) commerce and industry were regarded as being removed from the glories of research, I believe that there are many ideas and research results hidden within the Department of Agriculture which could be exploited by industry to the advantage of all concerned. I would like to suggest:

1. A much closer liaison between agricultural research and industry.
2. Results obtained by workers in the Department of Agriculture should be patented where possible and then licensed to industry as oc-

curs in the U.K.

3. The Department of Agriculture should undertake research projects for industry (cf. C.S.I.R.). My company would sponsor many projects which could result in a closer co-operation between agriculture and industry and ensure better utilization of our limited scientific manpower.
4. The registration of products under the Farm Feeds and Fertilizer Act of 1947 should be streamlined for greater efficiency. To achieve this consideration could be given to different groups of industrialists establishing test units co-operatively with the Department of Agriculture on a contract basis for the work in hand. For instance mastitis remedies could be tested by a team of scientists from industry and a team from the Department of Agriculture.