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Implementing the possibilities

Why should the industrialized countries help the poorer countries to feed themselves? Who should do the work? And how could it be organized?

DURING THE PAST 15 years many conferences, symposia and collections of essays have been organized on the population explosion, and during the past seven many on the ways in which food supplies could be increased. There has been so much publicity that people in countries with adequate food supplies may reasonably be becoming a little bored with these subjects and have begun to assume that, with so many experts taking an interest in them, and with so many sensible suggestions being made, all that is now called for is action by governments or by the various international agencies that seem to be charged with dealing with this sort of problem. And yet the position slowly gets worse. Food production is undoubtedly increasing and the rate of population growth is diminishing in some countries, but the rates of change are such that the amount of food per head is not increasing—at present indeed it seems to be diminishing. As Mark Twain grumbled about our attitude to the weather “Everyone talks about it, but no one ever does anything about it”.

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The articles that accompany this one have considered what could be done. Three questions remain. Why should we, in the industrialized countries, do anything for the welfare of the rest of the world? By whom should the work be done? And how could it be organized?

A QUESTION beginning with “Why?” presupposes a human motive. Any answer is therefore a statement of opinion and will be acceptable only to those who share similar opinions. Several non-conflicting answers may therefore be outlined in the hope that at least one will prove acceptable. Charity, the simple ethic that has characterized most philosophies and religions, is the simplest motive—when people are in distress one offers help. So long as the period of distress is likely to be short, that is to say, when it is caused by flood or earthquake, charity is reasonable and existing surpluses should be distributed. They are not, however, as large as is sometimes imagined. The ‘carry-over’ of wheat in the United States is much less than the annual harvest and there has been an unusual run of favourable weather. The farmers in the United States could, if suitably encouraged, produce more than they do, but it is unreasonable to expect any country to change its agricultural practice so that it is able permanently to feed some other country. Even when food shipments are maintained for a few years only, they

breed an unwholesome attitude of dependence among the recipients and make it very difficult for local agriculture ever to get properly organized in face of competition from gift food. Furthermore, the logistic problem of moving much more food than is now being moved would be formidable. About five per cent of India’s food is imported and it is said that her ports could hardly carry more.

The direct supply of food is not the only form of charity. It is more useful to supply equipment, to build roads and irrigation works, and to teach improved methods. All these things are being done both by voluntary organizations, such as Oxfam and Voluntary Service Overseas, and by international bodies. In the present state of world tension the latter are preferable. The real motives of any group from one country may, however unjustly, be suspect. Senator Fulbright remarked that he had yet to hear of a country that was painting up the slogan “World Bank Go Home”.

For 200 years the developing countries have been getting capital and skilled people from many of the countries that are now wealthy and these wealthy countries have profited greatly from this process by getting cheap commodities. The process is not yet at an end because the developing countries are still in a poor bargaining position. The *Financial Times* (July 19, 1965) calculated that the prices paid for primary products declined so much since 1957 that the indus-

industrialized countries made a saving of \$7000 million and an extra profit of \$3000 million because of the increase in the prices of the manufactured goods exported. The developing countries thus lost \$10,000 million in that eight year period which was about as much as the total of 'aid' from commercial, private and international sources. So far, therefore, we in the industrialized countries have not made much restitution—it could be argued that it is time we started.

Leaving the ethical plane, there is a 'hard-headed' reason for trying to organize a tolerable standard of living for everyone on Earth: if this is not done the present unsettled period is likely to last indefinitely. At one time, people in the developing countries knew little of the standard of life of people elsewhere. Thanks to films, newspapers and travel they are now aware of the disparities and with that awareness goes discontent. Professor P. M. S. Blackett suggested, in his presidential address to the British Association in 1957, a one per cent levy on production in the industrialized countries as a means of getting rid of the causes of discontent. It is a modest proposal; perhaps too modest. Even if a larger sum were needed it

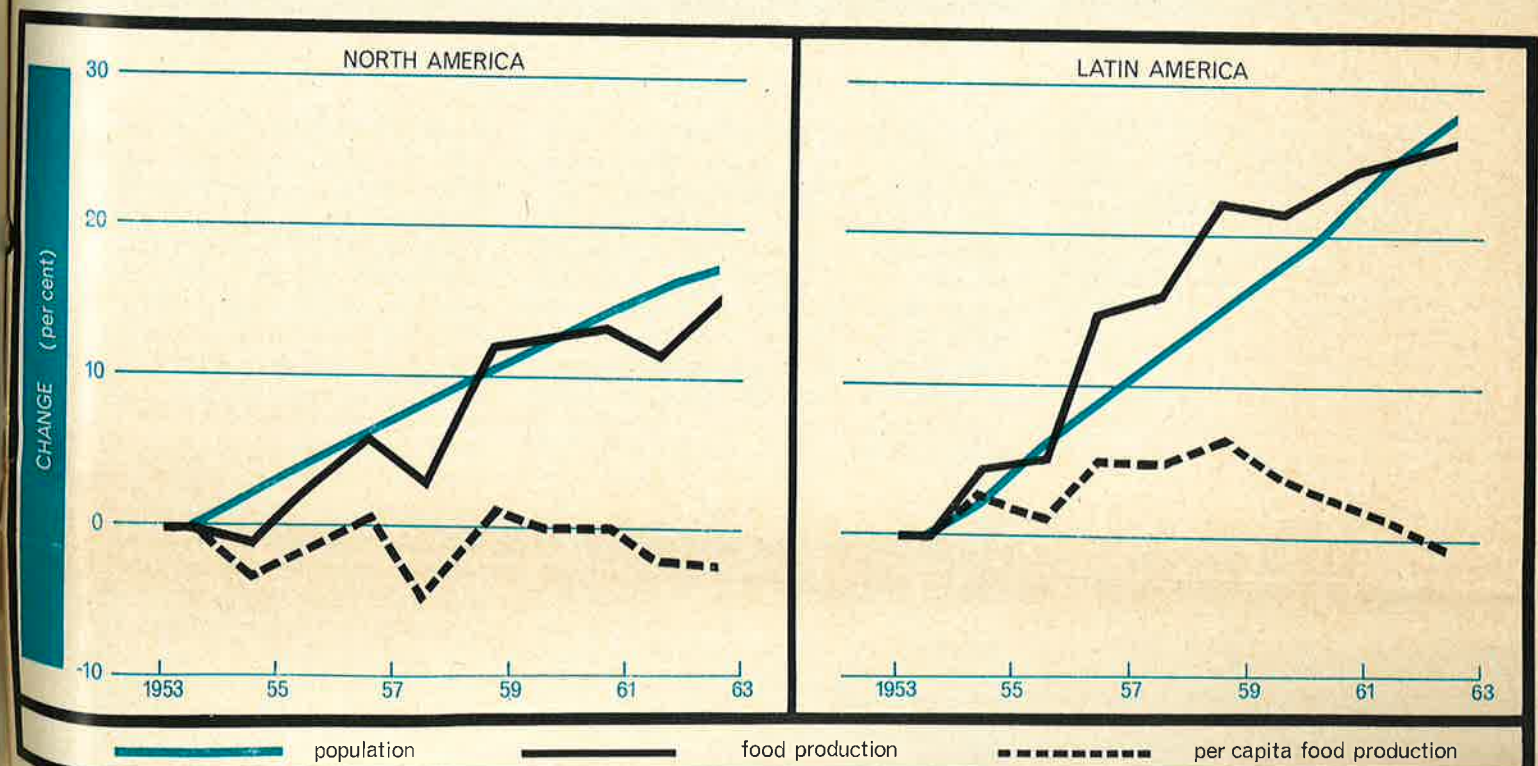
would certainly be cheaper than indefinitely continued attempts to suppress discontent.

If shipments of food were the only thing needed to get rid of food shortages in developing countries, the work would be done by people with skill in organization and distribution and they do not need prolonged training. I have suggested that this is not a permanent solution. What is needed is a radical reform of the methods of agriculture. Even in countries with an intensive and up-to-date system of agriculture, skilled farmers get from similar land two to four times the yield got by the unskilled. The gap is often greater in developing countries. One reason for this is that only 5 to 20 per cent of the working population is engaged in actual farming in industrialized countries whereas in developing countries 90 per cent may be so engaged. When there is choice of occupation it is reasonable to expect that it will be people with some flair for farming who will take to it. When only 5 per cent farm, the average skill is likely to be greater than when 90 per cent do. The first steps towards increasing food production in a developing country can therefore be taken by getting the more skilled farmers to teach the others their methods. This will not be easy because of the combined effects of secrecy, obstinacy and the tendency among even sophisticated gardeners and farmers to attribute success to practices for the efficacy of which there is little or no scientific justification. During a phase of rural self-help the important thing is that outsiders should not intrude in any way that will lower the prestige of the skilled farmer. So long as the probably ineffective

part of the technique is only a small proportion of the whole it would be prudent to leave it uncriticized.

Further improvement depends on the use of improved crop varieties, tools and methods. It depends on improving the endowment and status of agricultural colleges and, at first at any rate, on augmenting their staffs with people from countries where agriculture is progressive. In general, however, advice is most willingly taken from people who not only are but also appear to be familiar with the local problems. The appearance is obviously most convincing when they are local people. Expatriate teachers should therefore concentrate on teaching those who will in turn become teachers. Inevitably this will cause delay because the first generation of pupils, instead of getting into the field, will stay in the classroom. A similar delay arises in the introduction of equipment and materials such as fertilizers. The quickest way to get them into use is to import them; the cheapest and most effective is to learn how to make them. As early as 1958, Professor R. C. Mahalanobis, the Director of the Indian Statistical Institute, summed the position up concisely. For £340 million, India could buy the grain needed to satisfy her need immediately; for £100 million, fertilizer could be bought that would produce the grain next year; for £75 million, fertilizer plants could be imported that would be a permanent asset but only after five years; and for £10 million, engineering works could be set up that would make the plant during ten years and be another permanent asset.

FOOD PRODUCTION has increased in both North and South America in the past 15 years and the rate of population increase has begun to be diminished. Nevertheless, the position is deteriorating as the per capita food production seems at the moment to be diminishing quite markedly





THE ANSWER to the question "By whom should the work be done?" is therefore "To the greatest extent possible, and as soon as possible, by the people of the developing country". People have to be integrated into projects rather than bullied or manipulated. This can be very exasperating but it can also be entertaining. Thus, in one country, the farmers would not buy an improved variety of seed, they would not even use it when it was given away, but when not very adequately fenced demonstration plots were set up, enough seed got stolen at the end of the year to open the way for general improvement. This was the technique that Parmentier had used to introduce potatoes into France. Two points arise from these stories. The advantages of any change that is proposed should be manifest, and it is vital that the experts should test their ideas on an adequate scale in every new environment in case there is some unforeseen hazard. Secondly, some changes can be as effec-

tively made at the bottom of the social pyramid as at the top.

It is obvious that some processes, electrical generation and the fixation of nitrogen for example, are best done on a large scale. But there is no obvious reason why the manufacture of a farmer's tools or the milling of his flour should be done in an urban factory. It may seem to be a little cheaper there, but only if the social costs of urban transport and housing are not counted. A third of the world's urban population is at present living in stinking hovels in shanty towns on the urban fringes; if the current trend continues, the proportion will increase. Village industry—what is called Intermediate Technology—not only helps to prevent the drift to the towns, it also forces more people to think and organize for themselves rather than become hands in a factory (see "How best to help", SCIENCE JOURNAL, March, 1968). It is often more important that everyone should produce something,

SHANTY TOWNS—like this one on the outskirts of Tocopilla in northern Chile—result from the notion that all industry is best centralized in urban areas; one third of the world's urban population is now living in shanty towns. One solution is to promote village industry and thus slow down the drift of population to the towns

rather than that a few should produce a great deal.

The assumption that developments along these lines will produce all the food that is needed depends on the further assumption that we already know, in each developing country, what ought to be done. The latter assumption is widely made. If it were valid it would presuppose that it is essentially a coincidence that the worst fed parts of the world now lie in the wet tropics. It seems more likely that this is no coincidence but proof that we do not know how to farm those regions so that their inhabitants can, from their own fields, produce an adequate diet. A great deal of research has been done in the wet tropics on the agronomy of cash crops for export; work on food crops, especially on those rich in protein, remains to be done. So the developing countries will need scientists as well as administrators and teachers before their condition can be improved.

Scientific genius may be rare, but scientific talent is probably widespread—it is possible that it is nearly universal until the processes of education, upbringing and domestic discipline have ironed it out of most children. The main difference between scientifically productive and unproductive countries does not depend on the incidence of genius in them but on the extent to which they are successful in combing their populations for talent. There is, as yet, not objective way of doing this, for no physical or psychological correlates of talent have been recognized. The only available method is to educate as large a proportion of the population as possible and to keep access to the scientific profession open for as long as possible throughout the educational period. In the United Kingdom, and in countries that have come under its influence, the educational system operates in a manner that is likely to discourage potential scientists. By erecting a series of barriers, such as the 11+ examination (now fortunately disintegrating) and university entrance restrictions, a premium is put on precocity. It is undeniable that many scientific geniuses have been precocious, but equally undeniable that many have been late developers who, but for luck, parental money or influence, would never have had their latent capacities recognized. For every Faraday that the contemporary examination and scholarship comb finds, 20 are probably missed. Few countries can afford universal education, but matters would be greatly improved if transfer from one branch of study to another were actively encouraged instead of being made nearly impossible. Thus, at any period during school and university education, students who wish to give up the arts subjects, in which they may hitherto have specialized and shown proficiency, should find that such a change is welcomed.

The worst way to try to solve the problem of higher education in a developing country is to rely on sending students for a complete education in universities elsewhere. This dissatisfies them with conditions at home and acts, though this may be unintentional, as an economical way by which the industrialized countries can recruit for permanent jobs a considerable proportion of the ablest students from the countries that are ostensibly being helped. This is the original and most pernicious form of the 'brain drain'.

Having trained scientists, and persuaded them to remain in their countries of origin instead of accepting more comfortable and lucrative posts in industrialized countries, they must be made to feel, and to be, useful. The feeling is as important as the actuality, for frustration is a common cause of emigration. There is a great deal of misconception about applied research and it is often undertaken in a narrowminded and shortsighted way so that projects are frowned on unless they seem likely to produce practical results immediately. Medical research should be taken as a model. It is thoroughly practical in aim, but most of those who control it have the wisdom to see that a detailed, almost academic, study of the general biology of a pathological state, or of an infective agent, is a necessary prelude to prevention or cure. It may be that this comes about because medical research is controlled by medically educated people; it is to be hoped that a similarly broad minded attitude towards other forms of research will develop when all civil servants have had some scientific education.

Although the last paragraph suggested that much practically useful research can and will be done in the universities, they cannot assume responsibility for all of it because it is important that the freedom of university scientists to pursue those research projects that excite them should be respected. Furthermore, applied research should be integrated with practice and publicity; neither of these is the job of a university. Nevertheless, the pursuit of academic purity can become a fetish. It is a pity that so few members of the staffs of universities in developing countries realize that work directed towards a useful end can be just as interesting and scientifically significant as work along conventional, or 'prestige', lines.

ULTIMATELY, even in communist countries, food is likely to move from the producer to the consumer through commercial channels. Scientists involved in the production of new foodstuffs are therefore often told that the work they are doing should be undertaken commercially rather than in an endowed institute. There is substance in this suggestion. But only a very farsighted commercial concern would do this work because, as a rule, the people it is designed to benefit

have so little money that profits would come in unusually slowly. There are other factors that confuse the position. The fundamental trouble with industrial research is not that it is done for profit but that the reasons for starting and stopping it are not publicly stated. Obviously, not all the reasons for doing a piece of academic work are always clearly stated. It, too, can have a mercenary background—work on a specified subject may be the only job available, or it may involve work with an influential scientist. Work may be undertaken because that line is traditional in a certain laboratory and the new worker is too lazy or unimaginative to think up a line of his own. Or the worker may welcome the opportunity of collaborating with a stimulating, or attractive, colleague. There are many other reasons and they all apply equally to commercial and academic work. In commercial work, however, there are additional factors. Work may be done, and publicized, as a smokescreen to delude competitors into thinking that a certain domain is important. It may be done to impress shareholders so that they retain their confidence in the management and resist the blandishments of would-be launchers of take-over-bids. And work may be stopped because its success could lead to the development of techniques that would undermine an established process in which the company or its associates have an interest. It is widely stated that firms buy up patents to suppress them. Clearly it is hard to get evidence; but they would be foolish, commercially, if they did not. Valuable as commercial research is, and essential as commercial co-operation will be when research comes to be used, research cannot be entirely left to industry. The US President's Science Advisory Committee did not, understandably, analyse commercial research in quite those terms. But it reached similar conclusions and the report of its panel on the world food supply (May 1967) stated: "no significant agricultural development has been achieved by any country without very substantial publicly financed and administered programs of agricultural research".

There are ethically more acceptable, but still unpublicized, reasons why research may be stopped although it is being successful and is, in principle, useful. It may appear, in the course of the work, that there are side issues beyond the competence or capacity of even a large commercial concern. Outstanding among these is the risk of actions for damage. Many traditional foods are obviously, or probably, poisonous. This is a matter of degree, and foods are accepted either because the signs of poisoning are shown only when improbably large amounts of the material are eaten, as with spices, or because they manifest themselves very slowly so that the connection between the final effect and intermittent consumption is not



BORGO A MOZZANO, a small Italian community, increased its crop yields two to four fold during a development programme lead by Shell Italiana. Improved roads and equipment helped but the change was made mainly by example. During the programme the community increased its consumption of oil products ten fold. Industry has a vital part to play in orthodox development along these lines

easy to establish conclusively. Thus we may suspect that some forms of cancer are caused by our processes of cooking and smoking foods, but a cancer victim would not be likely to succeed in an action against a kipper smoker. With a novelty the position is quite different. Once even the remote chance of a product being harmful is established, a commercial concern selling the product is at risk. Thus aflatoxin (present in some consignments of mouldy groundnuts) is carcinogenic. It is traditional to eat groundnuts so no one could claim damages from a farmer. But anyone making a novel food based on groundnuts would be vulnerable if a regular consumer of his product developed a tumour and could demonstrate that some samples of the product that had been eaten contained aflatoxin.

It may be unreasonable to rely on industry for the basic research on revolutionary methods of food production, but it has an important part to play in development along orthodox lines. A notable example is the achievement of various branches of Shell in raising the standards of agriculture in communities in Italy, Nigeria and Venezuela. This was done by example—changing the habits and customs—rather than by supplying equipment and capital. Other firms should follow this method because an Italian community, while increasing its crop yields two to four fold and its income per man-hour 2.5 fold, increased its consumption of oil products ten fold. Developed communities make the best markets.

THE INTERNATIONAL AGENCIES, especially the Food and Agriculture Organization (FAO), collect and publish statistics on food production and food needs in the different regions of the world. This is extremely valuable and is an essential prelude to further work but is not all that was envisaged when FAO was established. Lord Boyd Orr, the first Director General of FAO, hoped it would play a more positive part in world nutrition. He remarked in his autobiography ("As I Recall", 1966), "The hungry people of the world wanted bread, and they were to be given statistics". FAO has also given advice, it has been active in sending experts to assess the potentialities for orthodox methods of agriculture in developing countries, and it has advised the United Nations Special Fund on the allocation of the money needed for various agricultural improvements. By 1960 it became apparent that this was not enough and FAO launched the "Freedom from Hunger Campaign" which, besides organizing publicity, collects and distributes money to support projects that will produce more food. By 1963 the idea was accepted that research on new methods was needed, and an FAO conference stated, "Although FAO was not currently involved

in any activities concerned with the production of food, particularly proteins, by unconventional methods, more direct participation in this work would be desirable, if these foods became of practical importance. The Committee noted that recent developments in protein production from leaves, through culturing *Chlorella*, growing micro-organisms on petroleum products and from other sources would require FAO's continuing attention in order to determine whether and when such processes become suitable for large scale economical production of food". That seemed encouraging but nothing further happened. Admittedly some of the possible novel methods for producing more food in areas of need are now regularly mentioned in FAO reports, but interest in them is hastily dispelled by tendentious and often inaccurate statements about the possible difficulties that will be encountered. Indubitably there are difficulties, but no sensible Department of Agriculture, if it relied exclusively on statements emanating from FAO, would ever embark on the research needed to surmount them. This is unfortunate because, in the long run, developing countries will have to depend on their own efforts.

The United Nations Economic and Social Council convened an "Advisory Committee on the Application of Science and Technology to Development"; this issued a report (May 1966) in general terms; in the course of this the importance of increasing the world's protein supplies was stressed. The Advisory Committee chose from its members a working group which, in May 1967, issued a report called "Increasing the production and use of edible protein" and accompanied the report with an annex called "The protein problem" by three experts with experience of industrial production. Although this report makes no novel proposals, it contains a valuable set of estimates of the probable cost of the necessary research and development. To cope with this one facet of the world's food supply, capital expenditure of \$50-60 million and an annual expenditure of \$28 million is suggested. Biologists are not accustomed to having their needs so realistically assessed. If all the other facets of the food supply get similar treatment, there will be cause for optimism; it is too early to say whether the optimism is justified.

If money from the wealthy nations is made available through FAO, or if the Foundations (Ford, Rockefeller, Wolfson and so on) increase the world's existing indebtedness to them, radical research on methods of food production attuned to the world's expanding population and expectations can be started. The immediate need is for some new Institutes of Food Technology in developing countries. These should be run in conjunction with, or at any

rate alongside, Institutes of Agriculture and at least one of them should be in the wet tropics. They would undertake fundamental and applied research on the production of food, particularly protein-rich food, from local products for local consumption, and each should work on as many different methods of production as is climatically reasonable. In this way, the different possible methods will be assessed comparably and judgement will not be confused by interinstitutional rivalry. Setting up a research institute will not solve the food problems of a developing country for many years, but unless research is started these problems will never be solved.

The main obstacle preventing a radical attack on the world's food problem is that too few people see that a radical approach is needed. The hungry are far away, and consciences, if they should stir, can be stilled by subscribing to Oxfam or contributing to a symposium such as this. The most important person now is the one with an idea about a better plant, an unused animal, or a by-product that could be turned into food. There are many of these people and they are almost all underendowed while money is squandered on projects with little bearing on the world's real needs. We could learn much from people in developing countries. They often lack information and technical skill but, equally often, they have a shrewder appreciation of the relative importance of different objectives than we have.

FURTHER READING

by M. G. Candau (in *W.H.O. Chronicle* 21, 508)

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SCIENCE AND DEVELOPMENT by N. W. Pirie (in *Political Quarterly* 38, 62)

FOOD: POSTWAR EXPERIENCE SHOWS IT WAS LATER THAN WE THOUGHT by J. Walsh (in *Science* 152, 896)

TOOLS FOR PROGRESS: GUIDE TO EQUIPMENT AND MATERIALS FOR SMALL-SCALE DEVELOPMENT (*The Intermediate Technology Development Group Ltd., London*)

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Diagrams p 102 courtesy of FAO

Photo p 103 courtesy of Oxfam

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