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# Food and Population: Priorities in Decision Making

Report of a Meeting  
of the International  
Conference of Agricultural  
Economists, Nairobi, August 1976.

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# Increasing agricultural production on the small farm and motivating for family planning

F.C. Sturrock

In considering this subject, let us start with the basic facts. In 1970, there were estimated (World Economic Survey 1973, UN), to be 1,730 million people in the developing countries. Of these, 1,264 million or 73 per cent were rural – most of them living off the land. Overall, the population was growing at 2.7 per cent a year. The growth rate in town and country is however quite different. In rural areas, the annual increase is 2.8 per cent, reduced to 2.1 per cent because of migration to the towns. In towns, the growth rate is 2.5 per cent, increased to 4.3 per cent by migration.

In most developed countries, the growth rate is less and migration to the towns more than takes care of any natural increase. In consequence the rural population is declining and there is an incentive to save labour. There is therefore a tendency to amalgamate farms and mechanise cultivation so that output can be maintained with a smaller labour force. Output per man in agriculture is therefore increasing and the rural standard of living is rising steadily.

The developing countries have a much more difficult problem. The growth rate is much greater and on average only a quarter of the rural increase in population is being absorbed into the towns. As a result, the rural population is increasing and will continue to do so for many years to come.

Suppose that we project the figures already given. In twenty-five years, the national population will double and the town population will treble. The rural population will grow by 65 per cent but if they are to feed the towns they must double their output. To put the matter in another form, three rural workers are at present feeding themselves and one town dweller. In twenty-five years, the three rural workers will be feeding two town dwellers in addition to themselves.

If the population doubles in twenty-five years, how is it to be fed? Let us take first of all those countries fortunate enough to have land to spare. In many cases the land belongs to the tribe rather than the individual, but each family has a recognised area on which it can grow crops. If numbers increase a young couple can start a new household and expect to be given enough fresh land that they can clear and cultivate.

Thus if there is land to spare, food production increases automatically with population and food supplies present no problems. In these conditions there is no incentive to limit the size of the family because an extra child is not a burden. In the tropics very little clothing is required and it is easy to grow an extra row of maize or cassava to supply extra food. With aunts and grandparents at hand, the child can be cared for if mother is ill or attending to her market stall. Even when

he is quite young, a child can be useful and can help to weed the crops. Within a few years, he is doing a man's work and as the parents grow old, they will depend on their children to look after them. The child is thus an asset, and propaganda for family limitation will have little effect on the farmer.

By contrast, a young married couple who migrate to the town are in a different position. If they are ambitious to raise their standard of living, children are a liability. Special food and clothing must be purchased and, in many countries, school fees must be paid. If there are no relatives nearby the whole burden of rearing children is thrown on the mother who has little freedom. Money spent on a child competes with furniture and even the possibility of a motor car. Thus at least amongst the more affluent and ambitious town dwellers family planning is more likely to appeal.

So far we have been dealing with countries with land to spare. Now we come to those that have little or none. If the farmer has a large family, two consequences may result, the farm may be kept intact or it may be divided amongst the children. If it is kept as a unit children that cannot be supported by the farm will have to migrate to the town. This may not however induce the farmer to limit his family.

If, on the other hand, the farm is small and is divided amongst the children, it will be broken up into tiny fragmented holdings that will not support a family. In these conditions, a farmer with his children's welfare in mind may deliberately limit the size of his family. Equal division of property amongst children was part of the Code Napoleon and there can be little doubt that the birth rate amongst peasant farmers in rural France declined in the nineteenth century for this reason.

With this one exception, we must therefore expect the increase in rural population to continue. In areas where there is land to spare such as South America, parts of tropical Africa and parts of South East Asia this may not produce any acute problem – at least not yet. In other areas where there is no land to spare, increased food supplies must come from higher yields on land already under cultivation.

As most of the farm land is in the hands of the small farmer, it is he who must learn to increase production. Is he likely to succeed? There are two opposing theories of the effect of population pressure on agricultural productivity. One theory propounded by W. Allan [1] assumes that if population exceeds a certain 'critical density', crop and livestock yields will decline. There is evidence to support this point of view. In much of tropical Africa, the farmer clears a piece of forest and grows crops for two or three years. Yield per hectare declines however as humus in the soil is exhausted and weeds increase. If the rainfall is high, plant nutrients are washed out and erosion may take place. Cultivation is therefore abandoned and the forest is allowed to regenerate. It may however take ten years or more for the fertility to recover. This system works reasonably well but if the population increases and land is scarce, the farmer is compelled to clear the land after a much shorter period before the soil fertility has recovered. Much the same is true when the number of grazing livestock is increased beyond the

capacity of the pasture. The livestock may then eat the pasture down to the roots and destroy the plants.

The opposite theory is proposed by Ester Boserup [2] who believes that population pressure forces farmers to adopt more intensive forms of agriculture. Over the long period, this is certainly true. Less than 1,000 years ago, Europe was farmed with shifting cultivation and supported only a small population. As numbers grew, more intensive methods were eventually devised and most of the land is now cropped continuously. The same is true of China and some other parts of Asia where highly intensive forms of cultivation have been evolved and the land carries a very large population.

It would be foolish, however, to assume that intensive systems will automatically appear to feed a steadily growing population in any part of the world. In the instances quoted, the population increase was very slow, often far less than 1 per cent and this allowed ample time – often many centuries – to devise more intensive systems. One must also add that there are many areas with severe physical limitations to intensification such as drought, or cold, that are likely to make intensification impossible or prohibitively expensive. Even apart from such limitations, there are substantial differences in the inherent fertility of agricultural land. The Ganges basin in India is very fertile and has ample water below the surface that can be used for irrigation. The land can thus carry a huge population. Most African soils are less fertile and it is doubtful if many of them could ever carry as many people.

Unfortunately if the population is likely to double every twenty-five or thirty years, it may not be possible to discover and adopt productive new systems in time. If so, land will be overcropped and overgrazed as Allan has suggested.

It is sometimes assumed that even if the system does not change, more labour on the land will help to increase yields. In fact, once there is enough labour to plant, weed and harvest the crop at the proper season, the marginal productivity of extra workers soon falls to zero. Indeed it becomes negative because they consume food that would otherwise be available for sale.

Increases in output and in population are essentially a matter of balance. A successful example is Japan. In the last 100 years, population has grown by less than 1¼ per cent a year. This was sufficient to supply the workers needed for industry. The rural population remained almost static and as there was very little extra land to be reclaimed, the farm size remained at about one hectare. There was however sufficient time to adopt more intensive cultivation and in spite of a huge increase in population Japan is still largely self sufficient in rice, the staple food. Although the farms are small, the farmers now enjoy a surprisingly high standard of living.

Unbalanced growth, on the other hand, can go badly wrong. When potatoes were introduced into Ireland in the eighteenth century, they produced a large increase in food. Unfortunately, there was a population explosion and the rural population grew as fast as potato growing spread. In the 1840s, the outbreak of a new disease, blight, (*Phytophthora infestans*), caused the potatoes to rot and

there was widespread starvation. Millions fled to Scotland, England and the United States and the population is believed to have fallen from eight to three million. This is an example worth study by those who believe that a population can never outgrow its food supply.

To return to the present day, the problem is to increase production. This means more output per farmer and more output sent to market. It also means as the stock of land becomes used up, more output per hectare. This is the task that confronts the family farmer who is in charge of most of our agricultural land. Can he meet this challenge? The official answer is that we must rely on the scientist to breed better varieties, to combat pests and diseases and so forth. We must then rely on the extension services to carry the results to the farmer. Sometimes the system works with a fair degree of success. At other times we must confess that the results are often disappointing. Farmers are reluctant to cooperate and are branded by the extension officer as stubborn and ignorant. In some cases this is true, but in other cases it is not the farmer but the advice that is at fault. He will not apply fertiliser because he doubts whether the increased yield will pay the cost. He will not sow a cash crop early enough because he is giving first priority to the food crops on which his family depends. He refuses to grow a new crop altogether because he is not convinced that it will pay better than the crop it displaces. In many cases the misunderstanding is because the extension officer looks for technical perfection — the farmer is more interested in the economics of production and in spite of his lack of education, his judgement is often surprisingly shrewd. This is where the agricultural economist should come into the picture. Unfortunately he is often of little help to the adviser. Whereas the extension officer has research stations and experimental farms to back him up, the agricultural economist usually has very little authentic data on which he can rely. Many excellent economic studies have been made but they are usually on too small a scale and they lack continuity. Thus although one might have data to cover one group of villages, the economist would hesitate to apply the results fifty miles away where conditions might be quite different. As a result, the agricultural economist plays only a very minor role in advisory work.

It may be of interest to note that the same problem arose in developed countries and efforts were made to overcome them. Let me quote the United Kingdom because I know more of the details there. The extension services there were rudimentary until the outbreak of war in 1939. There was a threat of starvation and the extension services were built up rapidly to encourage food production. For this reason accurate information was necessary on farmers' costs and returns so that prices could be manipulated to encourage maximum production of the foods most urgently required. To do this a national economic survey was rapidly set up. The government chose to use university economists to do the field work because they were already conducting surveys as part of their research. The government could however have organised the work themselves.

These farm income surveys covered the whole country and have continued ever since. Indeed, from the beginning they were an integral part of the process of

formulating agricultural policy. More recently, a similar system has been adopted throughout the EEC and data from all the nine member countries are now assembled in Brussels. The data from such surveys are equally useful as an aid to the extension services. As soon as the war was over, attention in Britain was turned from maximising production to increasing efficiency and for the first time, the agricultural economics departments were brought into the advisory field. Since then, they have collaborated closely with the extension services providing them with efficiency standards, planning handbooks and the like.

It seems to me that the time has come to apply the same methods in developing countries, but so far as I am aware, they have not been backed up by continuous national surveys based on random samples. It is true that extension officers try to do small surveys to collect information but in most cases the data would not stand up to any statistical test of representativeness. As a result, the budgets they prepare to persuade farmers to adopt certain improvements are often unrealistic and hopelessly optimistic. Any farmer misled by such advice will be doubly suspicious next time — and not without justification.

Three years ago, I took some sabbatical leave and was invited by FAO to lead a team to Ghana to help to organise a planning department in their Ministry of Agriculture. It seemed to me essential to planning to have a national farm income survey. After some experiments we mounted one, and carried it through. We were told that farmers would refuse to cooperate. In fact, we had very few refusals. Not surprisingly the farmers did wonder why we were asking them questions about money. We answered them quite frankly as follows:

‘The government in Accra has to make decisions — the prices you are to get, the seed and fertiliser you may need. They cannot do this sitting in an office in Accra, so we have come to find out how farmers are getting on. We cannot visit all the farms so we have chosen a few and you are one. We are relying on you to tell us about your farm.’ This seemed to work, especially as we were prepared to listen to their grievances.

The survey was carried out on a random sample of 1,300 farms. We also decided to prepare a farm classification based on the crops and livestock that the farm produced. One problem was that most fields contained a mixture of three or four crops. We did however devise a system to deal with this.

We now have trading accounts giving details of receipts, payments and produce used for each type of farm by size and region. This information is of immense value in formulating policy. If, for example, the government wished to encourage farmers to grow more maize, we could estimate whether maize at the price offered would compete with existing crops on the farms concerned. We could also estimate the number of maize specialists to whom the price is of vital importance and the number of mixed farms growing some maize who could be persuaded to grow more if the price was high enough to tempt them to change their cropping.

Information of this kind is equally useful to extension officers in planning new campaigns. They can prepare realistic budgets based on what really happens on farms. Presented in this form, advice can be far more palatable to the farmer.



Budgets showing the effect on farm income of the project concerned are of course normally included in projects for the World Bank. A ministry of finance should insist on similar estimates for schemes submitted for internal financing. In the absence of accurate data on which to base cost benefit exercises, there is a strong temptation for a director of agriculture to spend lavishly on a scheme that will produce something spectacular, such as a dam that will impress the ministry concerned and appear in the newspapers.

Of even more importance, farm income surveys should be used to monitor projects already in operation. Using results from the farm incomes survey as a yardstick, he can assess the increases in productivity shown by government schemes such as state farms, irrigation schemes and resettlement programmes. He can set the increase in output against the capital expended to see whether a worthwhile return is being shown.

It is worth noting that an agricultural economist in government service could easily make himself unpopular if he criticises projects being conducted by other sections of his ministry. Such comment should not of course be in public. It is thus desirable that the agricultural economist in public service should be able to report in confidence to his minister or permanent secretary in charge of the ministry.

An even more severe test would be to set the cost of the extension services in an area against the increase in production in the area.

There is another service that the agricultural economist could make to farm improvement — detailed studies of the family farm as an economic unit. It is a far more rational organisation than many economists realise. Indeed after centuries of trial and error, one would expect that the systems in operation were well chosen given the inputs and constraints with which the farmer had to operate. This is not to say that technology could not effect improvements. But before we ask the farmer to do something new we must be quite sure that when the new technique is fitted into his farm routine, it will really give him a worthwhile return. There have been dozens of ingenious farming schemes that looked plausible on paper but which failed in practice. The usual reason is that the farmer was expected to adopt a difficult and expensive technique that saddled him with debt payments that swallowed up most of the gain. To quote a simple example, farmers are still urged to give up crop mixtures and grow single crops in neat rows. So far as we could find, crop mixtures nearly always had a higher output per hectare than single crops. Mixtures are not of course suitable for tractor cultivation but these farmers cannot afford tractors and have enough labour to cultivate by hand.

At first sight mechanisation seems to have no place on small farms. Tractors save man hours but if the rural population is increasing, labour is not a scarce resource. There are however seasonal peak demands and if work is delayed, the yield suffers. A tractor that hastens land preparation and the sowing of crops at the beginning of the wet season can increase output per hectare. If the small farmer cannot afford a tractor, who is to supply it? One solution is the ministry of agriculture. A disadvantage is that if the tractor is used only for part of the year

the service may lose money. Another alternative is that somewhat larger farmers with twenty hectares or more can buy a tractor and can do work on contract for their smaller neighbours.

One fact that quickly emerges from a study of individual farm records is that some farmers are much more successful than others. The best consistently make five or even ten times as much cash profit as others with the same resources. Successful farmers are well worth study because the reason is not always apparent. It may be something obvious such as the use of good seed or fertiliser but usually this is only a small part of the story.

It is also worth recalling that farmers can be innovators. The introduction of cocoa farming into Ghana eighty years ago is a well known example but there are many others. Once an innovation of this kind is accomplished, the scientists can help it on by improving varieties, finding the right fertilisers and pesticides to use. The extension officer can however perform a service by recognising and publicising new ideas that do not necessarily come out of a textbook.

One must admit, however, that one of the greatest handicaps to progress is the public image of the family farmer as a poor and ignorant peasant. He is often despised – not least by his own children whose ambition is to get away from farming as soon as possible. This is unfortunate because it means a drain of the most able children from this important industry. One way to change the image is to encourage larger commercial farms. Let me make it clear that I am not thinking of large plantations but of a much more modest size. If, for example, the typical small arable family farm is one to four hectares, the size I have in mind might be around five to twenty hectares. These are genuine commercial farms employing labour and with an appreciable amount of capital.

We have studied such farms particularly in Uganda [3] and Ghana. It might be thought that the best apprenticeship for such an undertaking would be a life time of farm work. We found that although many of these commercial farmers had been born on a small farm, they had often also worked elsewhere. A man might for example start with a market stall, then buy a truck to transport produce, then build up a trading business. As he accumulated capital he had a hankering to return to his own village. He then acquired land and planted trees. As the trees came into bearing he moved on to the farm and as he prospered he built himself a fine house. He was then a man of substance. Some large farmers were former civil servants, teachers or army officers. They knew less about farming but possessed capital or knew how to borrow it. Many of them started new enterprises such as dairy farming in Uganda where their education helped them to master the quite difficult technique of producing milk for market in a hot climate. Others bought tractors and after cultivating their own land, did work on contract for neighbours. Some were failures and lost their money, but others were very successful. One notable point was that although a knowledge of farming was an advantage, a knowledge of how to handle capital and labour was even more important. I should add that most of these larger farms were on newly cleared land – they were not formed by displacing small farmers.

A small class of more affluent commercial farmers can be an asset. They can become leaders in the community, helping to organise cooperatives and dealing on fairly equal terms with traders. They can ask the extension services far more sophisticated questions and expect a practical answer. Above all, their presence shows that farming can be an outlet for an intelligent boy with ambition.

To sum up, what should be our objective in improving family farms? Is it output per acre or output per man? We have a choice. If land is scarce and population increase is out of hand, all that may be possible is to settle as many families as possible on the minimum area in the hope that they will somehow scratch a bare living. We then finish with a countryside that is a rural slum of poverty stricken people. This is a gospel of despair and we must try to avoid it. A better objective is higher output per man for this is the way to ensure a rising standard of living. And there should be scope in farming for the man with talent. It is of interest that in Kenya even where land is scarce, resettlement schemes make provision for a small proportion of larger units for men with capital and business ability.

We should however end on a note of optimism. In Sweden less than 100 years ago, there were farmers in the forest still practising shifting cultivation, cutting down trees, burning them, growing crops for a year or two, then moving on. They lived in rough wooden houses with a standard of living very little different from farms in the forest zone of West Africa now. Now they are amongst the most prosperous family farmers in the world with incomes of \$10,000 or more. Apart from some iron ore and timber, Sweden has very few natural resources not enjoyed by most developing countries. They did however limit their population to eight million.

There can be little doubt about the importance of the topic with which we are dealing today. The problems posed are difficult but if we ignore them, they will not go away. We still have some time in hand and these problems can be solved. The agricultural economist can play an important role if he can make his voice heard — not merely as a prophet of doom but by showing how practical solutions can be found.

## Notes

- [1] W. Allan, *The African Husbandman*, Oliver and Boyd, London, 1965.
- [2] Ester Boserup, *The Conditions of Agricultural Growth*, George Allan and Unwin Ltd., London, 1965.
- [3] Audrey I. Richards, Ford Sturrock and Jean M. Fortt, *Subsistence to commercial farming in present-day Buganda*, Cambridge University Press, 1973.