Outlook

Food and water—enough for how many?

How many people can Australia support? There's no simple answer, of course; it depends on the country's ability to keep supplying the things people need and on how fast people consume these things: However, the question is clearly an important one. In Canberra, a group of biologists and physicists from CSIRO recently looked at possible limits to the amounts of food Australia could produce and water it could supply. Then they related these to population limits.

The scientists are Dr Roger Gifford and Dr Alan Aston, of the Division of Plant Industry, and Dr Jetse Kalma and Dr Richard Millington, of the Division of Land Use Research. They say that in the short term a continually growing population may be compatible with existing or improving standards of living, depending on resources and technological developments. But in the long term it certainly is not. They acknowledge that ultimate population limits can't be worked out now because nobody can predict future technologies and demands on resources.

The scientists suggest that a policy on population for Australia could be directed towards reaching, several decades hence, a stable target figure based on current technologies, consumption patterns, and assessments of resources. This long-term goal could then be adjusted as these variables change.

They stress the need for much more information if they are to arrive at firm figures on the population Australia could support with existing technologies and living standards. Rather than attempting to work out these limits, their aim was to examine some of the important grounds on which long-term population policy could be based. The study, one of the first of its kind in Australia, points to areas where more statistics are needed. The scientists suggest that similar projects should be undertaken every few years as new information becomes available.

Suitable land

They began their study by looking at estimates made since 1940 of the area of land in Australia where crops and improved pastures could grow, and were immediately confronted by major uncertainty. The estimates vary enormously—from 51 to 147 million hectares. As about 45 million ha are now used for agriculture, on these figures something between 6 and 102 million ha remain available for development by farmers.

The most recent thorough study of the situation was completed last year by Mr Henry Nix of the CSIRO Division of Land Use Research, and the team used his results in their work. Mr Nix calculates that, if climate was the only limiting factor, 237 million ha of Australia would be suitable for agriculture. But when one subtracts land where the terrain isn't suitable for farming—mainly because it is too steep or rocky—the figure falls to 132 million ha. Then when one also takes out areas where the soil won't support crops or pastures, only 77 million ha remain.

After subtracting the 7 million ha estimated by agricultural economist, Dr Bruce Davidson, as the area of potential farming land taken up for other purposes, we are left with a total of 70 million ha suitable for agriculture. Only 25 million of those hectares are not farmed now. The scientists emphasize, however, that these figures are estimates; adequate information on land attributes is not available for precise calculations to be made. Until it is, they say, a thorough consideration of the limits of agricultural production in Australia is not possible.

The team looked next at the prospects for increasing food output per hectare. For cereal crops, these don't appear bright. Up to about 1890, average wheat

Dr Gifford.

yields in Australia dropped steadily; the reasons were probably depletion of soil nutrients, the spread of wheat-growing to less-fertile areas, insufficient fallowing of land, and diseases. The introduction of superphosphate and new wheat varieties bred in Australia reversed the downward trend, but average yields remained below those achieved by the early wheat-growers until the 1940s. Since then the practice of improving the soil by planting legumes before and after wheat crops has increased yields by about half. The yield history of other cereals—oats, maize, and barley—is similar.

Future yields?

The scientists believe the data they have collected give no basis for concluding that cereal improvement through breeding has done any more than protect yields from decline due to disease and to the progressive cultivation of poorer land. And they don't see any technological breakthrough around the corner that may boost yields the way the introduction of superphosphate and legume-planting did. They conclude that it seems unwise to plan for the future with the expectation of any appreciable increase in per-hectare yields of wheat, oats, maize, and barley.

For vegetables, fruit, sugar cane, and other crops grown in high-rainfall or irrigated areas, the prospects seem considerably brighter. Yields have increased markedly over the years, but they are still well below those achieved in some countries. For example, Peru's sugar cane production per hectare is about twice Australia's, and the average potato plot in the Netherlands produces nearly twice as many tonnes per hectare as the average Australian plot. The scientists say it seems safe to assume that Australia's present average yields of vegetables and fruit could be doubled with intensive management.

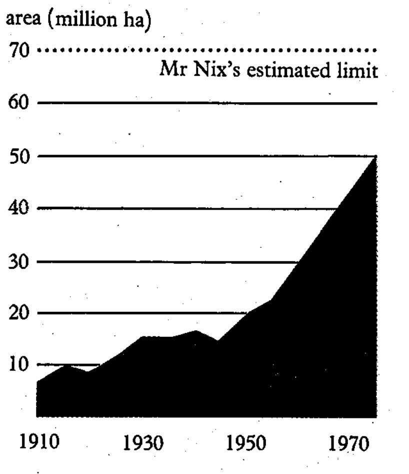
Dr Aston.

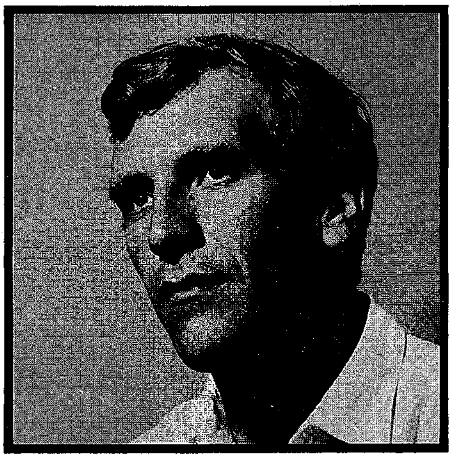
Dr Millington.

The scientists believe that enough food and water for 60 million people could be supplied.

They stress the need for much more information if firm figures are to be arrived at.

How the area under the plough has grown





Dr Kalma.

Meat production per hectare of improved grazing land could also increase, the scientists believe. It has grown progressively over the years, as pasture-sowing, fertilizers, the provision of more watering points, irrigation, rabbit control, and so on have enabled farmers to increase their stocking rates. The scientists calculate from the statistics available that each hectare of sown pasture has yielded an average of 50 kg (dry weight) of animal product, including wool, since World War II. They regard 75 kg per ha as a reasonable, although perhaps optimistic, goal to aim for.

Energy and protein

Relating these figures to population, they worked out from food production and export data that the food produced in Australia in an average year between 1965 and 1969 would have met the present food-energy demands of 37 million Australians and the protein demands of 34 million. Only about one-third of this food was consumed here; the rest was exported.

Next they worked out how the population that could be supported would change if:

- ▶ the whole area suited to agriculture (using Mr Nix's figure of 70 million ha) was brought under the plough
- ▶ this area was divided among different agricultural activities in the proportions applying in 1965–69
- ▶ average per-ha yields of cereal crops remained constant, but those of sugar cane, vegetables, and fruit doubled
- ▶ yields from sown pastures averaged 75 kg of animal dry matter per ha
- ▶ unimproved rangelands continued to produce their present meat yield

The answer was that enough food-energy would be produced to satisfy 82