

# Massey University



## NEW ZEALAND IN THE FUTURE WORLD FOOD ECONOMY

by

E.M. Ojala

IN COOPERATION WITH THE N.Z. COMMISSION FOR THE FUTURE

Agricultural Policy Paper No. 4  
DEPARTMENT OF AGRICULTURAL ECONOMICS  
AND FARM MANAGEMENT  
MASSEY UNIVERSITY, PALMERSTON NORTH

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*Prepared for and financed by  
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## PREFACE

This study was initiated in 1977 at the request of the New Zealand Commission for the Future. The purpose was to assemble information about the possible evolution of the world food economy in the period up to the end of this century, and against this background to assess the possible implications and alternatives for New Zealand as an exporter of agricultural products.

The intention from the beginning was to rely essentially on the Food and Agriculture Organization of the United Nations (FAO) for basic data and analyses about global developments in food and agriculture. Cooperation with FAO was formally established in August 1977, when Dr Nurul Islam, the Assistant Director General concerned, made arrangements for working collaboration with the University.

When the study was initiated, FAO was embarking on a major new perspective study of world agriculture up to the year 2000, with the cooperation of its member governments. The first comprehensive output from the FAO project was expected in the latter half of 1979. To permit full use to be made of this FAO work, the Commission agreed that the presentation of the report by Massey University could be delayed until the end of 1979.

However, the Commission subsequently decided to prepare in 1978 and publish in 1979 a series of studies on "New Zealand in the Future World". The University therefore accepted to produce an interim report to the Commission under this project, as a preliminary resource document for use by the Commission in drafting the agricultural sections of its publications. The preliminary report was completed and made available to the Commission for the Future in October 1978, under the title "New Zealand Agriculture in the Future World". Earlier work of FAO, including global commodity projections up to 1985, was utilized in preparing the preliminary report.



In August 1979 the FAO secretariat distributed to member governments the results of its longer range studies in a substantive document entitled "Agriculture: Toward 2000".<sup>1</sup> The information and analysis contained in this document has been drawn upon in the present report to the Commission by the University, supplemented by the underlying projections of FAO for livestock products.

The report has been prepared by Dr E.M. Ojala, Senior Research Fellow in the Department of Agricultural Economics and Farm Management. Other members of the University staff have also contributed in discussions of the project.<sup>2</sup> The collaboration of relevant staff units of the Ministry of Agriculture and Fisheries, DSIR, the Meat Producers' Board, the Dairy Board, Lincoln College and the NZ Institute of Agricultural Science is gratefully acknowledged. This collaboration took place mainly in a representative Working Party of experts set up for the purpose.<sup>3</sup>

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- 1 FAO document C79/24, dated July 1979.
  - 2 Including Mr A.B. Ward, Dr W.R. Schroder, Mr C.W. Maughan, Prof. R.J. Townsley, Prof. R.W. Cartwright, and Prof. A.M.M. McFarquhar.
  - 3 The following participated in the Working Party at different times, or submitted written comments:

Prime Minister's Department

Dr R.W.M. Johnson

MAF

Dr P. Bushnell  
Mr J. Jackman  
Mr P. Wauchop  
Mr W.A. Wilson

DSIR

Mr D.C. Isaacs  
Dr J.P. Kerr  
Dr Evan Wright  
Mr I. Warrington

NZ Dairy Board

Mr S. Blackmore  
Mr D.W. King  
Mr P.N. Aitken

NZ Meat Producers' Board

Mr M.W. Calder

NZ Wool Board

Mr L.K. Wiggins

NZ Meat & Wool Board's Economic Service

Mr N.W. Taylor  
Mr R.M. Davison

NZIAS

Mr D. Joblin  
Miss M. Mortlock  
Miss J. Smith

Lincoln College

Prof. B.J. Ross

NZ Commission for the Future

Ms Diane Hunt

The persons listed do not necessarily endorse all the views expressed in the report.

The Working Party held several meetings, and was particularly valuable in the analysis of issues affecting the response of New Zealand farming to the prospective global developments in food and agriculture.

The cooperation of the FAO Secretariat, extended principally through Dr J.P. O'Hagan, Chief of the Global Perspective Studies Unit at FAO Headquarters, Rome, has been indispensable, forthcoming and highly appreciated.

FAO is continuing its global studies of the world food economy. In 1980, for instance, it will review the document C79/24 and the underlying projections, in the light of further information and comments being received from member governments. In any case, future changes in the world situation will have implications for New Zealand. It will therefore be advisable to review periodically the assessment of the role of New Zealand agriculture in the future world.

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Dean, Faculty of Agricultural and  
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SUMMARY

1. The long range perspective studies of the Food and Agriculture Organisation of the United Nations (FAO) provide a global framework within which to assess the prospects for New Zealand as an exporter of pastoral products. This study is an attempt to do this, taking as a starting point the recent FAO report entitled Agriculture: Toward 2000.
  
2. The author and collaborators have endeavoured to combine local knowledge and viewpoints in New Zealand with the global expertise and analysis of FAO. There is more scope for cooperative studies of this kind on issues of strategic importance to New Zealand.
  
3. Cereals provide the basic food for mankind. Production of cereals in the developing world, where 22 per cent of the population are hungry, is projected to lag behind the growth of demand. Thus, the expansion of the cereals trade, which is well under way, is likely to be a feature of the remainder of the century. Even if demand at current rates of economic growth is fully met, the numbers of hungry people will be scarcely diminished by the year 2000.
  
4. The FAO analysis suggests that the 1980's and 1990's could be a period of significant growth of world trade in beef, sheepmeat and milk products, to the extent that export supplies are available.

5. The FAO method of projection expresses the balance between domestic demand and domestic production in each country around the year 2000 as a net deficit or a net export availability. In aggregating the country results in regional totals, the projected deficits and export availabilities are usually added arithmetically.
  
6. Considerable caution has to be exercised in interpreting the projected net deficits and export availabilities as actual trade prospects. FAO does not regard them as such. The reasons why the FAO projections are not to be taken as forecasts are outlined in this study. Basically, projections are only possible if simplifying assumptions are made. The FAO work is based on evidence and assumptions about
  - population growth;
  - income growth;
  - the relationship between income growth and consumer demand for different foods in individual countries;
  - prices; namely, that price ratios will remain the same as in the base period of the projections;
  - policies; namely, that policies will continue as known.
  
7. The results reflect FAO's authoritative understanding and interpretation of the factors affecting consumer demand for food products, and crop and livestock production trends, in all parts of the world. However, the working assumptions necessarily invest the results with considerable uncertainty. This study accepts the general indications of the FAO projections, rather than the precise statistical results.

8. The trade outcome of the projected demand and production developments will be influenced by
- price changes in the real world;
  - the intervention of governments, to facilitate, limit or ban imports or to subsidize or control exports, in the interests of conserving foreign exchange, protecting domestic producers or ensuring supplies to domestic consumers at reasonable prices, depending on the circumstances and political balance in individual countries.
9. The above factors affecting the trade outcomes of the FAO projections are discussed. The study, taking account of relevant producer board estimates, foresees the following general outlook, in different regions of the world, in the period up to the year 2000, as regards imports of livestock products of main export interest to New Zealand.

	Beef	Sheepmeat	Dairy products
Western and Eastern Europe and USSR	Decrease	Decrease	Decrease
North America	Fluctuating increase	Increase	Gradual increase of cheese
Japan	Increase	Increase	Gradual increase of cheese and casein
East and South East Asia	Gradual increase	Gradual increase	Gradual increase
Near East	Increase	Substantial increase	Gradual increase
Latin America	Little change	Little change	Gradual increase in Northern and Western zones
Africa, North and West	Possible increase	Gradual increase	Possible increase

10. For the most part, the above indications are already being reflected in the pattern of New Zealand's exports. They point to North America, Japan and the Near East as the main areas of expanding opportunities for the sale of New Zealand's meat and dairy exports over the next two decades, to replace the long-standing dependence on the United Kingdom. The indications also point to growing opportunities in the middle-income and petroleum-exporting countries of the Far East, Africa and Latin America.
  
11. It would be highly desirable to seek confirmation of the above indications, which are too global in character to be very reliable, through a continuing New Zealand centred programme to study the evolution of food and agricultural conditions and policies in important consumer and competitor countries. Such a project is a necessary component of an aggressive agricultural exporting stance. FAO could no doubt assist greatly in such a research project.
  
12. In addition Western Europe, North America and Japan will probably import more horticultural products, especially out of season. Also, middle-income countries in the Far East will be importing more feedgrains for their expanding livestock industries.
  
13. The agricultural trade outlook strongly reinforces other considerations which identify the Pacific Basin as a zone of special interest for New Zealand in the future.
  
14. The paper takes the view that the world market prospects for meat and milk facing New Zealand through the next two decades make it feasible to envisage a long phase of renewed expansion in the pastoral industries, particularly sheep and beef,

but not excluding dairying. It is assumed that the production and processing of specific products would be adapted to the preferences and requirements of the potential markets.

15. This very positive forward view constitutes a challenge. It contrasts with largely static production and exports of New Zealand's main pastoral industries through the 1970's. Dynamic increases occurred in some small lines of agricultural and horticultural output, and in beef up to 1975. The sheep industry has just resumed expansion. But the volume index of national farm output as a whole remained 1-6 per cent below the 1972 level until 1975/76 and 1976/77, when an expansion of 1-2 per cent was gained. National output in 1977/78 was again below 1971/72, but preliminary estimates for 1978/79 and 1979/80 point to levels some 2 per cent above 1971/72.
16. This fairly static situation has been a major handicap in the economic development of New Zealand. Pastoral farming is the type of production in which the country is reckoned to have the greatest comparative advantage. It could provide large increases in export earnings in the period up to 2000, if the conditions are favourable for expansion. Interpreting the studies currently available from FAO and other agencies, the author takes the view that growing external markets will exist. The New Zealand livestock industry has a strong positive advantage, in that the animal health situation and the processing facilities can meet the hygiene requirements of the most demanding importing countries.
17. The paper therefore goes on to examine briefly the factors that will affect the New Zealand response to the overseas market challenge of the future.



18. Basic physical factors are favourable. Some 52 per cent of the land area is in pasture, most of it already improved. One third of the pastoral land is hill country, too steep to be used for anything except sheep and cattle raising - or forestry. Farmed under sheep and cattle, it supplies stock for the downland holdings. The hill country is a resource of major significance for the New Zealand economy. Authorities believe its stock carrying capacity could be doubled. Why not, since the markets will be there?
  
19. Rising energy prices could improve the cost advantage internationally of the New Zealand system of pastoral farming, producing food from mainly renewable grassland resources. But the situation is not clear cut and continuing investigation is needed. The viability of energy farming in New Zealand with biomass is under study, but not yet proven.
  
20. The paper identifies several groups of factors that will determine the New Zealand response:
  - profitability to individual farmers;
  - motivation to increase output;
  - marketing skills;
  - national economic policies.
  
21. Three components of profitability are discussed: prices received, domestic costs, productivity. Through most of the 1970's profitability developments as measured by movements in the real value of the net incomes of sheep farmers and especially dairy farmers have been unfavourable.



22. The review of FAO projections to 2000 suggests that the trend of world prices for sheepmeat and beef will be favourable. New Zealand sheep and cattle farmers will be thereby encouraged if world price rises are not countered by exchange rate policy i.e. by persistent over-valuation of the New Zealand currency vis à vis other currencies. For the sheep industry, the domestic components of profitability will be crucial - internal costs and productivity developments at farm level.
23. The rapidly rising trend of farming costs and transport and processing costs, going up on a domestic ratchet, poses a real threat to profitability.
24. The export price outlook for dairy products is much more uncertain, because of the dumping of surpluses by northern hemisphere countries, especially the European community. If this is not better controlled in the future, the New Zealand dairy scene will be dominated by rising domestic costs and new investments for greater productivity and flexibility, especially in processing. The outcome could be a continuing decline in dairy cow numbers, and a static output.
25. This dairy outlook is probably too pessimistic. Many indications point to favourable evolution of export prices. In that event, the long-deferred expansion of the dairy industry could be resumed.
26. A strategic question for the future of New Zealand is whether and under what conditions this country can maintain its status as a low-cost exporter of pastoral products.

27. Profitability while the weak, the values and New approach (taxing) d productivity Similarly extension of farm p

28. The availability of small marketing Production instead of system ha

29. As in the could hob pastoral cost production contribution farming a New Zealand enough for - the who competition

30. Some recent priority industries

27. Profitability alone may not be sufficient. If profits rise while the motivation of farmers to increase production is weak, the outcome may take the form in part of higher land values and more investment for wealth than for output. New approaches to land policy and to taxation (e.g. factor taxing) designed to strengthen the incentive to raise productivity per unit of land may have to be envisaged. Similarly, new approaches to the complex of research, extension and more sophisticated management for higher levels of farm productivity will be called for.
  
28. The availability of markets with great expansion potential will be of small avail without a stronger component of professional marketing input in orienting the New Zealand response. Production must be increasingly well adapted to the markets, instead of markets being sought for what the New Zealand system happens to be producing.
  
29. As in the past, national economic policies in New Zealand could hobble expansionist responses on the part of the pastoral industries. In particular, the prevailing high cost protection of many manufacturing and service sectors contributes significantly to the rising input costs of farming and other export industries. For a country like New Zealand relying heavily on pastoral exports, it is not enough for the pastoral industry to be relatively low cost - the whole economy has to become more internationally competitive.
  
30. Some recent Government policy initiatives reflect a new priority being accorded to the expansion of the pastoral industries:

- the introduction of supplementary minimum price guarantees two years ahead for main pastoral products;
  - the improvement of concessionary public loans for land development;
  - the devaluation of the New Zealand currency in June 1979 and the subsequent controlled floating of the exchange rate;
  - the controlled opening of selected New Zealand manufacturing industries to foreign competition in lines where domestic production is too costly to warrant protection, combined with export incentives in potentially competitive lines: the policy has been applied first to the textile industry.
31. In the framework of such new domestic economic policies consistently implemented and reinforced by others in the field of motivation, a New Zealand role of rapidly expanding pastoral production and exports could be assured for the remainder of this century.
32. The paper identifies the following areas of research as being of strategic significance in relation to New Zealand's potential role in the future world food economy:
- factors affecting the low cost status and long range comparative advantage of New Zealand farming systems;
  - food and agricultural conditions, prospects, and policies in important actual and potential customer and competitor countries;

- means of reducing costs in the post-farm-gate stages of transport, processing and marketing;
- cost-reducing and efficiency-increasing technologies and practices in fertilizer production and application, with special reference to the post-Nauru phase;
- improving the production and overall efficiency of hill country farms;
- factors and policies affecting farmer's responses to opportunities to increase output;
- the introduction/adaptation/testing/breeding of new and improved plant and animal stocks.

## PART I: THE GLOBAL PERSPECTIVES

### 1. DEVELOPMENTS ON THE DEMAND SIDE

The future state of world agriculture - with major implications for the welfare of mankind - will be determined by the evolution of demand for farm products, and the capacity of national agricultural systems, modified by national and international policies, to respond to the growth of demand.

#### (a) Population Growth

The main determinant of demand for foods is size and growth of population. An important additional factor is the level and growth of income per head of population, to be discussed in the next section.

Estimates of population growth in major regions of the world from 1975 to 2000, based on the United Nations medium projections, are presented in table 1.

If medium rates of increase continue through the rest of this century, humanity will number some 6,000 million around the year 2000. This would be about half as many again as in 1975, calling for roughly a fifty per cent increase in overall food supplies. Population will grow three times as fast in the developing regions as in the developed ones. The increase in demand for food, as a first approximation, will be distributed similarly.

The changes in the geographical location of humanity between 1975 and 2000 that would ensue from the assumed regional rates of population increase are also shown in table 1. By 2000 no less than 78 per cent of the world's population will be living in countries now described as developing, compared with 72 per cent in 1975.

Table 1. World Population Projections 1975 to 2000

	1975		2000		2000 percent of 1975	Rate p.a. 1980-2000
	mill.	percent	mill.	percent		
Western Europe	365	9.2	396	6.5	108	0.3
E. Europe & USSR	364	9.2	441	7.3	121	0.8
North America	237	6.0	296	4.9	125	0.9
Australia/NZ	17	0.4	23	0.4	135	1.2
Other Developed	139	3.5	188	3.1	135	1.2
Total Developed	1,121	28.3	1,343	22.1	120	0.7
Latin America	319	8.1	602	9.9	189	2.5
Africa	325	8.2	671	11.0	206	3.0
Near East	189	4.8	366	6.0	194	2.6
Asia & Far East	1,138	28.7	1,903	31.3	167	2.0
China	839	21.2	1,148	18.9	137	1.2
Other Developing	29	0.7	49	0.8	169	2.1
Total Developing	2,839	71.7	4,736	77.9	167	2.1
World	3,960	100.0	6,079	100.0	154	1.7

Source: FAO: Agriculture: Toward 2000 (C79/24); Appendix table 3.

For a food exporting country like New Zealand, it is worth noting that in Western Europe - traditionally New Zealand's major customer - population is projected to grow at only 0.3 per cent a year. In North America, which has become an important market, the population increase is expected to be 0.9 per cent a year. The annual population growth rates of 2.0 per cent, 2.5 per cent, 2.6 per cent and 3.0 per cent, expected in Asia, Latin America, the Near East and Africa respectively, inevitably draw attention to these regions as areas of rapid potential increase in food demand in the longer term.

(b) Food Consumption Patterns and the Income Effect

The amount, composition and adequacy of food consumed by individuals varies greatly as between countries, within countries and even within households. Over the period 1974-76, the food supplies available in the developed countries, if evenly distributed, would have enabled their populations to consume food at an average rate equivalent to 3,362 calories per head per day, compared with a corresponding average in developing countries of 2,207 calories.<sup>1</sup>

These supply levels constituted 131 per cent and 96 per cent respectively of the estimated nutritional requirements of the populations in the two groups. Because of uneven distribution, national average supplies have to be well above 100 per cent of nutritional requirements - perhaps 115 per cent at least - if the whole population is to be reasonably well supplied without rationing. The 131 per cent ratio implies considerable overeating and wastage in developed countries, while the 96 per cent figure reflects the hunger experienced by millions in developing countries.

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1 FAO: Agriculture: Toward 2000; document C79/24, Rome, July, 1979; para 1.3.

The marked differences in food consumption levels in developed and developing countries are associated with even more marked differences in average income levels. Thus, in 1976 national average incomes per head were between 100 and 250 US dollars equivalent in Bangladesh, India, Pakistan, Indonesia, Zaire and Kenya, compared with around 1,000 dollars in Chile, Mexico and Brazil, 4,250 dollars in New Zealand, 6,000 - 7,000 dollars in Western European countries, 7,890 dollars in the United States and 8,880 dollars in Switzerland.<sup>1</sup>

Income differences are reflected in dietary patterns as well as in the overall level of food consumption. This is indicated in table 2, which shows the average dietary patterns existing in developed and developing countries in 1972-74.

The main feature is the much greater direct dependence on cereals for human nutrition in developing countries - 61 per cent of daily calorie intake, compared with 30.7 per cent in developed countries. There is also a greater reliance in developing countries on unprocessed basic foods such as roots, tubers, pulses and oilseeds.

A striking feature in the opposite direction is the much greater contribution of livestock products - meat, eggs, fish and milk, as well as animal fats - to food intake in the developed countries. Meat, for instance, contributes 13.4 per cent of dietary energy, compared with 3.9 per cent in the developing country group. Corresponding proportions for milk are 8.9 and 2.2 per cent.

While relative income levels are the main factor in such differences, ecological and social factors also play a part. Thus in Africa the dependence on roots and tubers for food is as high as 20 per cent. In Asia the contribution of meat is as low as 1 per

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1 The World Bank: World Development Report 1978, Annex table 1.



Table 2. Dietary Patterns in the Developed and Developing Countries, 1972-74

	Percentage share in per caput calorie supply	
	Developed	Developing
Cereals	30.7	61.0
Roots and tubers	4.7	8.1
Sugar	12.9	7.1
Pulses, nuts and oilseeds	2.4	6.4
Fruit and vegetables	4.3	3.6
Meat	13.4	3.9
Eggs and fish	3.1	1.3
Milk	8.9	2.2
Oils and fats	14.0	5.4
Other items	5.5	1.0
Average calorie supply per head per day	3,380	2,210

Source: FAO: Fourth World Food Survey, 1977;  
figure 4 and table 1.3.1

cent of calorie intake, while in China where meat provides 6 per cent of calorie intake, milk contributes only 0.4 per cent.

In general, as average incomes rise in developing countries, people gradually change their dietary pattern towards that characteristic of the more developed countries. Thus, in a study of 84 countries in 1970, FAO found a strong negative correlation between national income per head and the proportion of starchy foods and vegetable proteins in the national diet, and a strong positive correlation between national income per head and the proportion of animal proteins, sugar, and fats, both animal and vegetable.<sup>1</sup>

Of more direct interest to food trading countries is the relationship between personal income increases and the quantity of various foods consumed per head. This relationship is complex for mankind as a whole,<sup>2</sup> because it changes with the level of income and the rate of consumption already achieved, and the changes vary for different types of foods and socio-economic situations.

In general, as the rate of consumption per head rises with increasing income, the urgency for consuming more of the same food as a result of further increases in income diminishes. For some foods, such as cereals and starchy roots, the amount consumed per head actually falls when income rises above a certain level, other foods being available. For livestock products, especially meat and milk, consumption per head increases rapidly in most countries as income rises through the lower levels, at which consumption per head is low. Even at high income and consumption levels, demand is still responsive to income, especially for beef and veal, although much less so than at lower income levels. At very high incomes, as in North America and Western Europe, demand for milk may fall off with further income increases - high price, however, may be a factor in this effect, as well as saturation of demand.

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1 FAO: Provisional Indicative World Plan for Agricultural Development; Rome, 1970; Vol. 2, Chapter 13.

2 See FAO: Income Elasticities of Demand for Agricultural Products; Rome, 1972.

FAO studies point to income elasticities of demand for calories of animal origin of 0.95<sup>1</sup> in Africa, where the average annual consumption per head (in 1972-74) was about 9 kg of meat and 22 kg of milk. In the Far East, where consumption levels are much lower for meat and somewhat higher for milk, the equivalent income elasticity is estimated at 0.85. In Western Europe, where people consume about 65 kg of meat and 206 kg of milk a year per head, the income elasticity of demand for calories of animal origin was estimated at 0.29. In North America, at much higher levels of income and consumption (meat 112 kg and milk 230 kg) the elasticity index is still positive, though low at 0.04.

In the Near East and Latin America, where income and consumption levels are higher than in Africa and Asia, the corresponding income elasticity is around 0.5.

Japan has the income levels of a developed country, but the consumption and elasticity levels for livestock products are characteristic of middle-income developing countries, combining to produce a strong pressure for increased consumption.

These relationships between food consumption and income levels are of great significance for New Zealand and other food exporting countries. A small proportionate increase in demand in developed countries may be quantitatively much greater than a large proportionate increase in a developing country with low per caput consumption. On the other hand, a fast rate of income growth in a middle income country can result in a comparatively large absolute increase in demand, especially when multiplied by a rapid population increase.

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1 Percentage increase in demand per head associated with 1 per cent increase in income per head. The figures given are FAO estimates quoted by OECD in Study of Trends in World Supply and Demand of Major Agricultural Commodities, Paris, 1976; Chapter I.

In the light of the above discussion, it is important to take note of the expectation of the international agencies as to the likely growth of national and per caput incomes in different regions of the world. The assumptions used by FAO for the period 1980-2000 are summarized in table 3, in comparison with actual developments between 1961-65 and 1974-76.

The assumptions show developed countries as a group maintaining the same rate of gross domestic product (GDP) growth as in the base period 1961-65 to 1974-76, namely 4.5 per cent per year. However, because of slower population growth, GDP per head would rise somewhat faster than in the past, at 3.8 per cent per year.

For developing countries two alternative assumptions have been used - a "trend" rate reflecting past experience, weighted by more recent achievements, and a "normative" rate which could be attained only by much improved economic performance. The trend assumptions for national GDP growth in Africa, Asia and Latin America (5.9, 5.6 and 5.4 per cent per year respectively) are somewhat above those for developed countries. Those for the Near East, at 8.7 per cent per year, are much above the developed countries, reflecting the better economic prospects for oil exporting countries. The normative assumptions are all much higher than the rate assumed for developed countries.

For purposes of demand analysis, attention must focus on the expansion of GDP per head. Only for the Near East region do the trend assumptions give a rate of individual income growth as fast as or faster than in the developed zones. On the basis of normative assumptions income per head in all developing regions would grow as fast as or faster than in developed countries.

The fast rate at which average individual incomes are projected to increase in the Near East - around 6 per cent annually - emphasizes the importance of this region as a potential market. If the projected rates continue through the rest of this century, by 2000 the population of this zone will enjoy real incomes twice

Table 3. Annual Economic Growth Rates in Major Regions 1961-2000, actual and assumed

	GDP		GDP per caput		1975 level \$ US
	1961-65 to 1974-76 av	1980-2000 trend   normative	1961-65 to 1974-76 av	1980-2000 trend   normative	
Latin America	5.9	5.4 7.3	3.0	2.8 4.7	1,072
Africa	4.8	5.9 6.9	2.1	2.9 3.8	311
Near East	9.0	8.7 9.0	6.1	5.9 6.2	996
Asia & Far East	4.7	5.6 6.8	2.1	3.5 4.7	192
Developing regions	6.0	6.6 7.7	3.2	4.1 5.2	431
Developed regions	4.5	4.5 4.5	3.4	3.8 3.8	6,200 <sup>1</sup>
World	4.8	4.9 5.3	2.7	3.0 3.4	

1 1976

Source: FAO: Agriculture: Toward 2000 C79/24, Summary, para. 13.

Notes: (i) "Trend" represents the historical trend, modified to reflect more recent performance.  
(ii) "Normative" assumes improved economic performance. No normative assumption is made for developed countries.

as high as those projected for Latin America by the same time. Since milk and meat consumption levels in the Near East are already above those obtaining in other developing regions except Latin America, the absolute increase in Near Eastern demand for these products over the next two decades could be quite significant in relation to world trade.

(c) Demand Growth for Cereals, Meat and Dairy Products

Some of the above relationships and prospective changes are reflected in the estimates of FAO for regional and world demand for cereals and main livestock products around the year 2000, based on the population and income assumptions stated, and the continuation of present policies and price ratios.

In table 4 the projections of demand in 2000 for cereals, milk, beef and sheepmeat for main regions of the world are shown as percentages of actual consumption in the base period 1974-76, along with projected population increase for the respective regions. This presentation enables the population effect on demand to be compared with the effect of the other factors studied.

Thus, taking base period levels as 100, world population in 2000 is projected at 154, and world demand for milk, beef and sheepmeat in 2000 at 158, 168 and 212 respectively. At this global level, therefore, population increase would account for almost the whole of the projected increase in demand for milk. For beef and sheepmeat, the higher indexes for global demand in 2000 show that other factors, mainly income, exert a stronger effect than in the case of milk.

The pattern of projected regional changes is significant. For cereals, demand in the developed zones would be sustained mainly by a further increase in use for livestock feeding, particularly in Eastern Europe, the USSR and Japan, areas where this use is so far less intensive than in North America and Western Europe. The somewhat faster rate of increase in demand for cereals in developing



regions, where the predominant use is as human food, reflects the more rapid population growth, together with some increase in the feeding of livestock.

For milk and milk products, the indications in table 4 reflect the near saturation of per caput demand in Australia/New Zealand and in the big consuming areas namely Western Europe and North America. There appears to be more scope in the USSR and Eastern Europe - another major consuming area - for further increase in consumption per head. In Japan, even more. The larger expansions of demand shown for the developing regions are mainly population determined, except that the income effect in the Near East could be comparable to that in Japan.

As regards beef and sheepmeat, a significant increase in per caput demand in developed countries is projected only for Japan. The increases indicated for North America, especially for sheepmeat, and for Eastern and Western Europe, are much smaller but nevertheless significant.

The higher income responses to beef and sheepmeat than to milk in developing regions are fully brought out in table 4. An exception is Latin America where meat consumption per head is already high.

A notable feature is the strong rise in projected demand for sheepmeat, which is relatively much greater at global level than that shown for beef and veal. This result no doubt reflects the prevalence of sheepmeat consumption in many oil exporting countries.

A quantitative picture of world consumption and projected demand for milk, beef and sheepmeat is presented in table 5, which takes account of the base period consumption levels per head in the various regions. This table shows the distribution of world consumption among major regions in 1974-76, and of projected demand in 2000.

Table 4. Increases in Demand for Certain Foods in Comparison with Population Increase, 1975-2000

Estimates for 2000 as percentages of 1975 actual levels

Population	Demand for <sup>2</sup>			
	Cereals <sup>1</sup>	Milk	Beef & veal	Sheepmeat
EC (12) <sup>3</sup>	113	120	123	121
N. America	125	129	146	162
E. Europe & USSR	121	144	139	140
Australia/NZ	135	108	144	126
Japan	120	186	219	214
Total Developed	120	133	141	141
Latin America	189	246	245	207
Africa	206	260	268	296
Near East	194	220	291	329
Asia & Far East	167	199	219	297
World	154	158	169	212

1 Normative projection

2 Trend projection

3 Present 9 members plus Greece, Portugal, Spain

Source: FAO.



Table 5. Possible Changes in Geographical Distribution of World Demand for Livestock Products in 2000, in Comparison with world consumption patterns in 1974-76 - percentages

	Milk		Beef and veal		Sheepmeat	
	1974-76	2000	1974-76	2000	1974-76	2000
EC (12)	24	18	17	12	16	9
Other W. Europe	4	3	2	2	1	1
E. Europe & USSR	30	28	19	16	16	11
N. America	14	12	29	27	3	2
Japan	1	2	1	1	2	2
Australia/NZ	2	1	2	2	8	5
Total Developed	76	64	72	60	48	32
Latin America	8	12	15	18	5	5
Africa	2	3	3	6	10	15
Near East	3	6	2	4	17	26
Asia & Far East	9	13	3	6	10	13
World <sup>1</sup>	100	100	100	100	100	100

1 Including China and some non-listed developed countries.

Source: FAO.

In 1974-76 people in developed countries consumed about three-quarters of the world's supplies of milk and milk products, and of beef and veal. Even after the projected shift of demand increases to the developing world, the consumption in the developed zone would still be almost two thirds of total consumption.

The situation is different for sheepmeat. Already in 1974-76 more than half of world consumption occurred in developing countries,<sup>1</sup> with the Near East the major consuming zone. By 2000, on the assumptions used, two thirds of world demand would arise in developing countries.

The indications are that by 2000, Latin America and Asia would each be requiring as much milk as North America; Latin America would be demanding more beef than the European Community or the USSR plus Eastern Europe; and the demand for sheepmeat in each of the Near East, African and Asian regions would greatly exceed that projected for the EC or the USSR plus Eastern Europe.

The above projections of demand are valuable as reflecting the best estimates available of the likely effects of population and income growth and other relevant factors on the volume and location of consumers' preferences for the products mentioned, over the next two decades. They represent the summation of the effective demand likely to be developed internally within individual countries.

The extent to which such evolution of demand will influence trade will be assessed later in this paper. The implications for the nutritional status of mankind will first be examined.

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1 Including China.

(d) The Problem of Malnutrition

In section (b) above, reference was made to the FAO data indicating that in 1974-76, the total food supplies available in developing countries, if evenly distributed, would have met only 96 per cent of the estimated nutritional requirements of their populations. Since the distribution was and is uneven, while most people had sufficient food or more than sufficient, a big minority was left suffering from a greater or less degree of hunger.

Using a statistical method based on the limited amount of field studies linking food consumption with family income,<sup>1</sup> FAO has estimated the number of the hungry ones in the developing countries (excluding China and the Indo-China countries) at 414 million in 1974-76, or 22 per cent of their population. The definition is intended to cover those groups whose calorie intake is insufficient to support an active, healthy life, including for children normal growth and development - physical and mental - and learning capacity.

These malnourished are found mainly in the poorest countries, in the poorest urban and rural sectors where adverse ecological conditions, land tenure systems and economic factors lead to the emergence of large groups of landless and unemployed people. Within these groups, it is the pre-school children, younger women and school-age children who suffer most often and most severely.

Under trend projections of economic growth, without changes in income distribution patterns, the percentage of undernourished people in developing countries would be reduced to 15 percent by 1990 and to 11 percent in 2000. This significant improvement is much less impressive in terms of absolute numbers because of population increase. The 414 million figure of 1974-76 would remain about the same in 1990, and fall to around 387 million in 2000.

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1 FAO: Fourth World Food Survey, Rome, 1977; see Part II Dimensions of Malnutrition, for methodology.

Under the higher "normative" projections of economic growth, progress would be faster. The proportions of the undernourished would fall to 12 per cent in 1990 and 7 per cent in 2000, but there would still be around 242 million hungry in 2000, mainly in Asia and Africa.

These outcomes are contingent upon production targets being realized and imports being available when needed. Any shortfalls would be translated into larger numbers of undernourished than projected.

The international community may not accept such slow progress in freeing the world from hunger. The UN World Food Council may well place before governments the challenge to take additional measures - national and international - beyond reliance on general economic progress, to speed up the differential growth in purchasing power and in food consumption on the part of the poorer sections, with a view to reducing the proportion of the malnourished to, say, zero by 2000.

If such a challenge is taken up in effective programmes, the demand for cereals as food could rise faster than projected, and affect the use of cereals for livestock production in developed countries.

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## 2. AGRICULTURAL PRODUCTION TRENDS AND PROSPECTS

The above indications of future demand growth are conditioned by the assumptions made, and would obviously be changed by deviations from the population increases and economic growth rates assumed for the various regions, and from the income elasticity coefficients applied for different commodities and countries.

Even if the determinants of future demand evolve as projected, the outcome in terms of consumption could differ greatly from the projected demand if the supplies of food available turn out to be insufficient or, alternatively in surplus.

In most countries domestic production is the main determinant of supply. If domestic production exceeds demand, there is a pressure and a possibility to export - conversely, if it falls short of demand, there is a pressure to import. In either event, government policy may intervene to expand or to reduce demand, in order to achieve trade or development objectives.

The trade implications therefore follow from an analysis of production prospects, in relation to projected demand.

### (a) Food Production and Demand Trends in Developed Countries

It is evident from table 6 that the continuation of past rates of food production in the developed countries would be more than enough to meet their food requirements in the future. Demand for food in this group as a whole is projected to expand at only 1.0 per cent per year, whereas their food production has been rising during the 1970's at 2.1 per cent annually.

Table 6. Food Production and Demand Trends in Developed Countries  
Per cent per year compound

	Production		1980-2000	
	1961-70	1970-77	Population	Demand
Western Europe	2.2	1.5	0.3	0.6
E. Europe & USSR	3.1	2.2	0.8	1.0
North America	1.7	2.9	0.9	0.9
Japan		1.0	0.7	1.8
Total Developed	2.4	2.1	0.7	1.0

Source: FAO: State of Food and Agriculture 1978 and Document C79/24.

The present tendency in the industrialized countries of this group to produce unmarketable surpluses will be accentuated in the future, unless they slow down further their expansion of food output or find larger markets in developing countries. At the same time, however, the latter will be expecting the former to open up their markets to a larger flow of developing country agricultural exports.

Japan is a notable exception. Its demand for food is likely to increase faster than its food output has been expanding, pointing to a continuing and growing dependence on food and feed imports.

(b) Production and Demand Trends and Projections  
in Developing Countries

The confrontation of FAO's agricultural production projections for developing countries with the demand projections shows a very different picture, more akin to that of Japan. The results of individual country studies are summarized by the four main regions in table 7.

Agricultural production in the last two decades has been growing faster in the developing regions than in the developed world, except for Africa which has suffered a serious setback in the 1970's (table 7, columns 1 and 2). However, apart from African recovery, FAO's production projections associated with a trend rate of economic growth point to a slowing down of agricultural growth in the next two decades (column 3). Trend production increases would be much less than the associated trend rates of demand expansion (column 5). Thus the prospects for developing regions would be either slower improvement over present inadequate levels of food consumption, or larger food import burdens.

Table 7. Developing Regions - Agricultural Production and Demand Increase, Trends and Projections  
Per cent per year compound

	Production				Demand	
	Historical		Projections 1980-2000		1980-2000	
	1961-70	1970-76	Trend	Normative	Trend	Normative
	1.	2.	3.	4.	5.	6.
Latin America	2.9	3.0	2.7	3.8	3.1	3.8
Africa	2.7	1.3	2.8	4.1	3.7	4.1
Near East	3.3	3.2	3.0	4.0	3.6	4.0
Asia & Far East	2.7	2.8	2.6	3.5	3.0	3.5
China	3.0	3.0				

Source: FAO: State of Food and Agriculture 1978, and Document C79/24.



Such an outlook is clearly unacceptable in human and political terms. FAO has therefore developed an alternative set of projections associated with "normative" rates of economic growth, much faster than those achieved in the past (see table 3). The higher demand projections derived from this normative scenario are presented in table 7 (column 6). FAO then concentrated its attention on the development measures necessary to accelerate agricultural production in the different countries and regions, to match the normative demand projections. The resulting production increase rates (table 7, column 4) are considered by FAO to be feasible, given a series of developments which have been fully described.

These developments include the expansion of cultivated area where feasible, greater intensity of cropping especially by extension of irrigation, higher yields, improved seed, more cash inputs in the form of fertilizers and pest control chemicals and mechanical power, the improvement of livestock farming, more agricultural research, and the institution of appropriate incentives to farmers in the form of price, marketing and credit policies. The total investment and aid requirements to support the agricultural development efforts of the developing countries have been assessed and presented.

The FAO study Agriculture: Toward 2000 strongly emphasises the acceleration of agricultural production in the developing countries, as the key requirement for more balanced world development, for raising food consumption levels of the world's most needy people, and for the achievement of faster economic growth in the developing, non-oil-exporting world.

The FAO study is probably the most complete and concise analysis currently available of the technical, technological, institutional and economic issues involved in such acceleration. All aspects of the question are not equally important for New Zealand. This paper will take up some issues which seem of significance in relation to the evolution of New Zealand's role in the future world food economy.

(c) Location of Available Land

The main regions of the developing world differ markedly in their land resources. These differences are brought out most starkly when related to size and growth of population, as shown in table 8. This table compares estimates of the area of arable land used per head of total population in the four developing regions, with the area potentially available per head, in both 1980 and 2000.

In 1980 the current usage of arable land per head is already very low (i.e. very intense) in Asia and the Far East (0.21 hectare), and very close to the potential amount available per head of 0.28 hectare. By 2000, usage per head will be forced down to 0.16 hectare, compared with total potential availability of 0.19 hectare per head.

The Near East region is only slightly better provided with land. In Latin America and Africa the land/man ratios - current and in prospect - are very much easier. FAO maintains that the differences persist even when the ratios are corrected for land quality differentials.

It is clear that Asia and the Near East are rapidly running out of land suitable for agriculture. The presentation is made more dramatic by estimates showing that 76 per cent of the population of the Near East and 63 per cent in Asia and the Far East live in countries with only 10 per cent or less of arable land in reserve (in 1975). Corresponding proportions for the populations in Latin America and Africa were 5-6 per cent.

There is much scope remaining in Asia and the Far East and in the Near East for intensifying agricultural productivity per hectare. But in the end, even advanced technology and rapid economic growth cannot overcome the limitations of land shortage. Witness the experience of Japan.

Table 8. Total Potential Arable Land Area per Head of Population in Developing Regions; hectares per head

	Arable land used		Potential arable land	
	1980	2000	1980	2000
Latin America	0.52	0.48	1.79	1.09
Africa	0.55	0.38	1.71	0.95
Near East	0.39	0.25	0.60	0.36
Asia & Far East	0.21	0.16	0.28	0.19

Source: FAO: Document C79/24, table 4.5.

While current trading opportunities with individual countries may wax and wane according to changing circumstances and policies, the most stable relationship for the food exporter will eventually develop with countries that are inevitably faced with diminishing capacity for food self sufficiency because of resource constraints.

(d) Energy Considerations

Although agriculture uses only a small share of the world's total energy consumption - about 3.5 per cent in 1974 - the dependence of high yields on high energy inputs means that the conserving of energy in farming will become an increasingly important consideration between now and the end of the century. If the real price of commercial energy rises, there will be a tendency for farmers to substitute other inputs for it.

This is likely to affect particularly the industrialized countries. In 1972-73 the use of commercial energy in agriculture in Western Europe amounted to  $27.9 \times 10^9$  joules per hectare, compared with 20.2 in North America, 9.3 in Eastern Europe and the USSR, and only 2.2 in developing countries.<sup>1</sup> Measured per agricultural worker, the differences are much wider - from  $556 \times 10^9$  joules in North America to 82.4 in Western Europe and 2.0 in developing regions as a whole.

On the other hand, the commercial energy used in agriculture per ton of cereal output is six times as much in the developed countries as in the developing world. This suggests that the return per unit of commercial energy in terms of cereals produced, is considerably less in industrialized agriculture, although the input and output mixes are hardly comparable.

<sup>1</sup> FAO: Energy Use in Agricultural Production; in State of Food and Agriculture, Rome, 1976, pp.79-111.

Table 9 compares the energy inputs in the agricultural systems of several developed countries with the nutritional energy output. This information confirms that output per hectare rises with increasing energy input per hectare, but at a diminishing rate of return. It is evident that developed nations with limited amounts of land to provide food have evolved agricultural production systems which use very large amounts of energy, taking advantage of relatively low fuel energy costs. In some cases the commercial energy input greatly exceeds the food energy output, as in the United Kingdom, the Netherlands and Israel.

It has to be noted that the table assesses energy output in the form of products available for human consumption i.e. agricultural output in the form of raw materials such as feedgrains and fibres is not included. Inputs that contribute to non-food output are, however, hard to separate out in some cases. While the table is subject to such limitations, the general picture it presents is considered to be valid.

Some specialized subsectors of industrialized agriculture are particularly energy-intensive. Thus, energy accounted for 42 per cent of the total costs of horticultural production under glass in the EC in 1972. In the Netherlands the heating of glasshouses alone takes 79 per cent of all the energy directly consumed by agricultural production. In Australia and New Zealand on the other hand, while the food energy outputs per hectare are relatively low (table 9), the energy inputs are much lower, reflecting the greater economy of energy use in the farming systems of these countries. The energy-intensive systems were developed on the basis of unlimited supplies of low cost fossil fuels. If energy prices continue to rise significantly, agricultural activities which are heavy users of energy will have to face more severe adjustments than those which use comparatively less energy. So far most industrialized countries have cushioned their agriculture against rising energy costs by means of subsidies. The European Economic

Table 9. International Comparisons of Energy Inputs and Outputs

	USA	Australia	UK	Netherlands	Israel	New Zealand
Area of cultivated and pastoral land (10 <sup>6</sup> ha)	530	490	19	2.3	1.2	13
Nutritional energy output (PJ)						
Crop	1260	230	70	60	8.4	7.9
Animal	490	40	65	30	1.5	32.6
Total	1750	270	135	90	9.9	40.5
Energy inputs (PJ)	2391	97	299	140	19.5	25.0
Output (GJ/ha)	3.30	0.55	7.11	39.1	8.3	3.1
Input (GJ/ha)	4.51	0.20	15.7	60.4	16.3	1.9

Note: Energy input refers to commercial energy - it excludes labour but includes energy used in the manufacture of inputs such as machinery, fertilizers and chemicals.

Sources: (a) Gifford, R.M., 1976. An Overview of Fuel Used for Crops and National Agricultural Systems. Search 7: 412-417.

(b) Spriggs, T.W., 1978. Irrigation and Energy. Proc. N.Z. Irrigation Association Conference, Ashburton.



Commission, however, has recommended that agriculture should be required to adjust to higher energy costs.<sup>1</sup>

The nature of the adjustments can not be precisely forecast. But a specific example may be illustrative. Beef, for instance, can be produced either by grazing cattle on pasture or by fattening them in a feed-lot situation. It would appear that the commercial energy input per kilogram of meat produced is much less in the grass fed situation than in the feed-lot, where the grain to be fed has been produced by a process of land cultivation, seeding, application of weedicides, harvesting, drying, transportation, storage and feeding-out, all activities which use a lot of fuel energy. Any major increase in the real price of commercial energy is likely to favour a reduction in the proportion of beef produced in feed-lots compared with that produced on pasture.

Overall it would appear that if there is a major increase in real energy prices, then the comparative advantage of the type of meat production practised by Australia and New Zealand will increase relative to the type practised in many other developed countries.

In relation to meeting the demand for beef in Europe and North America, the production advantage of New Zealand will be offset to some extent by the increase in transport charges which will also result from higher energy prices. The net effect on New Zealand's comparative advantage as a meat supplier to Northern Hemisphere countries remains to be assessed, but the transport disadvantage could be offset to some extent by concentrating on markets in the Pacific Basin.

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1 Reported in FAO: The State of Food and Agriculture, 1976; page 109.

It is evident, too, that glasshouse horticulture in industrialized countries will become much more costly relative to production in more temperate countries and in sub-tropical zones. This should improve, for instance, the comparative advantage of Mediterranean producers competing for the European markets.

The impact of energy availability and cost on the type of technological advances adopted in developing countries in the future is not yet clear-cut. In most of the agriculture of such countries the fuel energy input per acre is extremely low, so that a period of increasing energy input is probably feasible as well as necessary. But in some developing countries not favourably placed for energy supplies, the pressure is already being felt to economize in energy use in agriculture.

This will call for a truly innovative approach in agricultural research in the developing world, rather than seeking mainly - as at present - to adapt the agricultural techniques used in developed countries, which are energy-intensive. There seems no alternative to a growing reliance on fertilizers and on commercial energy for power in developing country agriculture, but this reliance can be accompanied by more efficient use of organic sources of plant nutrients, greater use of animal power, improved fuelwood supplies and the greater use of local building materials.

Agriculture, particularly in developing countries, already contributes energy to other parts of the economy in the form of fuel from wood, dung and crop residues, as well as food, and will have to continue doing so. In addition, wood can be used in large scale processing systems to produce liquid fuel for transport and machinery, in the form of methanol. This possibility is being examined in some countries, including New Zealand.

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Crop agriculture is also being increasingly considered as a source of liquid fuel, in the form of fuel alcohol produced from cassava, sugar cane and other crops. Brazil, for instance, has an operational programme of ethanol production from sugarcane, which is expected to yield 4 billion litres by 1980. Full replacement of petrol and diesel oil would require 33 billion litres of ethanol. USA is also developing a large programme based on maize.

If commercial energy prices continue to rise, the provision of alcohol or other forms of energy could become an important component of crop agriculture in some countries. The fundamental issue is the potential impact of such diversion or withdrawal of land from food production on the food economy of individual countries and of the world at large.<sup>1</sup>

(e) Environmental Questions

The concern felt in both developed and developing countries with the protection of the environment will increasingly affect agricultural developments in the next twenty years.

Sources of concern include the danger of pollution of waters by the run-off or draining-off from fields treated repeatedly with heavy dressings of chemical fertilizers. More directly serious is the concern - often ill-founded - about the possible contamination of foods with residues of pesticides used to safeguard and improve the production process on farms. In some developed countries social controls have already been introduced in the form of a ban or restrictions on the use of some of the most effective chemicals, including DDT and other persistent organo-chlorine products. Some sectors of the public have also stressed the dangers to wildlife of the widespread use of such chemicals in agriculture.

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1 The possible use of crops for liquid fuel production in New Zealand is discussed later.

The dense concentrations of livestock, especially cattle in feedlots, which are a feature of modern animal husbandry in industrialized countries, are coming under critical observation as sources of pollution by effluents.

These and similar problems are serious enough to influence agricultural research and practice, and will become increasingly subject to public policy. Policy measures which restrict the use of the most efficient production methods are bound to reduce productivity and raise costs. This effect will be most noticeable in the areas where the methods which cause concern are most widely practised, namely the industrialized countries.

In the developing countries environmental problems associated with agriculture, although requiring less immediate attention, nevertheless are likely to present a heightening challenge. To a considerable extent, such problems can be avoided or reduced in the developing world, by the evolution and promotion of alternative systems at an early stage.

(f) Trade Limitations on Accelerated Growth  
of Developing Regions

The FAO study postulated a "normative" alternative to "trend" economic growth assumptions in the search for a basis for envisaging a stable degree of self sufficiency in cereals in the developing world, in place of the alarming current trend for ever rising imports.

However, rates of economic and agricultural growth in developing countries which would stabilize their degree of cereal self sufficiency by 2000, would also produce large supplies of their export commodities, namely sugar, oilseeds and vegetable oils, meat, tropical beverages (coffee, cocoa, tea), tobacco and raw materials (fibres and rubber). Most of these commodities are sold to developed countries, and the trend rate of expansion of their import demand is very low.

The overall export supplies of the developing regions grew at 1.7 per cent annually in the past. Under the more optimistic growth scenario they could expand at 4.7 per cent a year, considerably faster than the import requirements of the developed countries are likely to increase. This imbalance raises a serious doubt about the validity of the normative assumption for the developing countries.

The most important problem commodities would be sugar, oil-seeds and oils, and tobacco. These are crops in which there is competition between the agricultural systems of developed and developing countries, and it is the domestic support and protectionist policies in many developed countries which have most acutely frustrated the growth of export supplies from developing countries. The substantial additional market opportunities needed by the developing exporting countries would arise only if the developed countries moderated very considerably their expansion of production of the competing products. The agricultural protectionism of the industrialized countries is so deep-seated that the necessary reduction in their self sufficiency ratio for competing commodities is hard to envisage by 2000.

In the case of the beverage crops and raw materials, the import demand of developed countries increases only slowly for other reasons - the already saturated demand for the former in the developed zones (apart from the USSR and Eastern Europe where access is restricted), and the competition from synthetics and substitutes in the case of raw materials.

Attempts to substitute exports in processed form for the primary product are being made by many developing countries. This development is seriously handicapped, however, by tariff barriers in developed countries which discriminate against the processed form.

The obstacles to trade expansion and the major increase required in external aid, combine with domestic technical and institutional constraints to suggest that the agricultural development course in the developing world up to 2000, is likely to be closer to the trend than the normative projections of FAO.

### 3. POSSIBLE TRADE PERSPECTIVES IN THE WORLD FOOD ECONOMY

In preparing the study Agriculture: Toward 2000, the FAO secretariat complemented its projections of demand at national level by projecting production of agricultural commodities also, for individual countries. In terms of arithmetic, the difference between the two projections for a given country can be regarded as an import requirement or an export availability at the end of the projection period.

By aggregating the calculated import requirements and export availabilities to regional levels, it is possible to assess how the course of supply and demand, projected in conformity with the assumptions made, would affect the net export or import status of particular regions for each commodity studied.

Similarly, aggregation to the global level indicates whether the forces of production and demand, if they developed as projected, would lead to surpluses or shortages in the world commodity markets.

It is evident that the actual outcome in terms of national, regional and world trade will usually turn out to be different from the projected situation. If the projections point to future world surpluses or deficits, for instance, national and international policies will change, and in the event world exports and world imports will balance, with perhaps some change in prices or in stock-holding. The value of the projections is that they highlight the long term factors at work in the commodity markets, and thus provide governments and others with a *basis for anticipating and orienting* needed policy changes regarding individual commodities or development generally.

The basic assumptions underlying the projections may not, of course, be borne out in practice, with consequent effects on the trade outcome. In fact, the trade projections are the most uncertain part of the whole exercise. The results should be treated

with great caution, preferably as the starting point for more detailed specific studies on the preliminary findings that are of major interest to a particular country.

For example, if the developing countries experience the assumed rates of population increase but slower growth in income, the need for additional food in many areas will not be translated into effective demand. On the other hand, if incomes grow more rapidly than assumed, it is possible - particularly in more advanced developing countries where rural and urban sectors are more closely linked - that the agricultural sector will also grow more rapidly. If this happens, the level of self sufficiency may remain constant or rise, even as total demand for food grows rapidly. This type of situation could arise in some South American countries, if their economic growth accelerated, and is reflected in the FAO normative scenario.

But there are many developing countries where the cities are better linked with foreign countries than with the domestic hinterland for obtaining fast increases in food supplies when industrial development is speeded up. This is the type of situation in many parts of Africa and South East Asia. In some cases the local agricultural resources may be poor, as in the Near East. If income growth exceeds the assumed rates in such areas, the faster increase in demand for food could easily outstrip the projected rate of growth in domestic food production, especially of livestock products, giving rise to greater import demand. If foreign exchange was a constraint, as in most non-oil-exporting developing countries, the import demand would have to be cut back, leading to higher domestic prices which would limit demand growth.

Over short periods, weather is still a major factor affecting agricultural supply and prices and hence demand. In the medium and long term, policy intervention by governments is the main influence on supply and demand, and hence in determining whether import requirements become real imports, and whether projected export availabilities arise and become actual exports.

Despite the limitations of projections, there is value in analyzing their implications for commodity markets, provided the trade outcomes are viewed as the reflection of specific assumptions (presumably acceptable ones) and are not treated as forecasts.

In the light of this introduction, the possible trade perspectives for some major agricultural commodities in the period up to 2000 will be outlined, on the basis of the FAO analyses.

(a) Cereals

The present tendency for the cereal import requirements of developed countries to grow slowly is likely to continue in the longer term. The increase may consist almost entirely of additional supplies of feed grains needed for the further expansion of livestock industries in Japan and the USSR. These import requirements will become commercial trade.

All the indications point to a major expansion of cereal imports into developing countries, the amount depending on the rate of economic growth which they can achieve. If present trends continue, their net cereal deficit (excluding China) could reach 91 million tons by 1990, and 153 million tons by 2000, compared with 33 million tons in 1974-76.

This dismal outlook would be improved upon, if the development of these countries accelerated in line with FAO's normative economic growth scenario. In this event, the overall dependence of the group on cereal imports from developed countries would still increase substantially, from the present 33 million tons to 52 million in 1990 and 88 million around 2000.

The prospects in the main developing regions under this scenario are summarized in table 10. Asia and the Far East is shown as improving its self sufficiency ratio from 93 to 97 per cent, Latin America would stay at 97 per cent while Africa and

Table 10

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Africa

Near Ea

Asia &

Total

1 FAO

Source



Table 10. Possible Cereal Deficits of Developing Regions, 1975 and 2000 under high growth assumptions<sup>1</sup>  
- million metric tons

	Demand		Production		Net deficit		Percent self sufficiency	
	1975	2000	1975	2000	1975	2000	1975	2000
Latin America	78	192	76	186	2	6	97	97
Africa	50	130	43	102	7	28	86	78
Near East	59	130	49	90	9	40	84	69
Asia & Far East	206	410	191	396	14	14	93	97
Total	393	863	360	775	33	88	92	90

1 FAO "normative" or optimistic scenario.

Source: FAO: Document C79/24; table 3.16.

especially the Near East would experience declines in their net self sufficiency in cereals. Overall, even under these normative growth assumptions, the self sufficiency of the developing world, excluding China, would go down from 92 to 90 per cent.

Most of the deficit, including increasing supplies for animal feeding, will be met as commercial imports on the part of the richer developing countries and those with the capacity to expand export earnings. Some import requirements will be met as food aid or as a result of financial aid.

Taking account of the differing capacity of various groups of countries to import commercially, FAO has assessed annual cereal food aid requirements in 1990 at 32 million tons if current trends continue, compared with the present flow of about 9.5 million tons. The financial, logistical and development policy implications of food aid of such magnitude are staggering, and it is hard to imagine so much becoming available or being absorbed. Under the "normative" scenario entailing faster agricultural growth in food deficit countries, the food aid requirement could be as low as 13 million tons, but the under-nourished would still number over 300 million.

Unless unforeseen favourable developments occur, some food import requirements of developing countries will not be met by trade or food aid. If starvation results, or threatens, international public opinion, focussed in the UN World Food Council, could be sufficiently aroused to insist on the creation of international means to finance essential imports to meet basic human needs, until the deficit countries could accelerate their domestic food production sufficiently.

It is to be expected that the developed country cereal exporters would manage their capacity to produce surplus supplies, to match the commercial import and food aid requirements. The flow of subsidized cereal exports from the EC could well be enlarged. These possibilities imply that world cereal prices, though fluctuating periodically, would not show a rising trend in



real terms, an outcome that could change if international financing of food transfers were initiated, or if US biomass farming for liquid fuel production became significant enough to affect the export of grains.

The present portents are that world cereal trade on commercial and concessional terms between now and the end of the century will be a major growth industry, and a crucial element in the world food economy.

The implications for New Zealand are not clear. Given the potentiality for relatively low cost cereals production in North America, it would seem unlikely that real prices of cereals would rise far enough for grain exports to become an important and profitable feature of New Zealand agriculture. However, if market or energy or policy developments led to any diversion of farming efforts in industrialized countries away from grain fed livestock raising, there could well be an expansion of market opportunities for pastoral food product exports from New Zealand.

(b) Beef and Veal

The FAO projections of demand and production to 2000, based on the continuation of recent trends at constant real prices, are presented for major regions of the world in table 11, along with the derived estimates of net trade and self sufficiency ratios in 2000.

The projections for the European Community (enlarged to twelve members by the inclusion of Greece, Portugal and Spain) show aggregate demand rising faster than production, leading to an increase in import requirements (above actual imports in 1975) of some 170,000 tons by 2000. This relates to supplies from outside the Community. Parallel developments are seen in the other Western European countries outside the enlarged Community, suggesting an additional import requirement for the whole of Western Europe from outside that region totalling some 410,000 tons.

Table 11. Beef and Veal; Trend Projections to 2000 of Demand, Production and Net Trade, by regions, in comparison with 1975 actual data

	thousand metric tons						Self sufficiency Percent	
	Demand		Production		Net trade <sup>1</sup>		1975	2000
	1975	2000	1975	2000	1975	2000		
EC (12)	7,476	9,225	7,217	8,795	-259	-430	97	95
Other W. Europe	987	1,507	1,019	1,296	+32	-211	103	86
N. America	13,299	19,468	12,411	17,957	-888	-1,511	93	92
E. Europe & USSR	8,720	12,115	8,571	13,744	-149	+1,629	98	113
Australia/NZ	1,103	1,592	2,083	3,114	+980	+1,522	189	196
Japan	392	859	323	518	-69	-342	82	60
Total Developed <sup>1</sup>	32,452	45,797	31,967	45,959	-485	+162	99	100
Latin America	6,631	13,731	7,341	12,409	+710	-1,322	111	90
Africa	1,578	4,663	1,568	2,644	-10	-2,019	99	57
Near East	980	3,226	876	1,769	-105	-1,457	89	55
Asia & Far East	1,534	4,563	1,523	2,782	-11	-1,781	99	61
World <sup>1</sup> —Trend	45,205	75,779	45,331	68,730	+126	-7,049	100	91
- Normative		77,398		77,795		+397	100	100

<sup>1</sup> Totals include several countries not covered by regional subtotals shown.

Source: FAO.

The projections point to a continuing dependence (7-8 per cent of consumption) on imports in North America, and a rising dependence in Japan. These developments, if they eventuated, would add a further 900,000 tons to the import requirements of developed countries by the year 2000.

These figures overshadow the increase of 540,000 tons in the combined exports of Australia and New Zealand - about fifty per cent more than in 1975 - indicated for 2000. However, the zone of USSR and Eastern Europe is seen to emerge as a major source of exports, comparable with Australia/New Zealand.

On trend assumptions all the developing regions would show a much faster growth of demand than of production, pointing to sharp falls from their current degree of self sufficiency in beef and veal, and an overall deficit of 7 million tons by 2000. Since the developed country projections are in balance, the developing country deficit becomes a world deficit.

Obviously such a deficit could not arise. It simply reflects where present trends are thought to be heading. Presumably, indications of excess demand would push prices up, reducing demand and stimulating production until world supply and demand came into balance. Most likely, in fact, only those developing countries with least foreign exchange constraint would permit their projected beef deficits to result in actual imports. The import demand of these countries, however, should contribute to a strong world beef market in the coming decades.

FAO considers that a marked acceleration of economic growth in the developing countries, based on agricultural as well as industrial development, would speed up their beef production considerably. The result could be reduced deficits in Africa, Asia and the Near East, and a substantial export surplus in Latin America, bringing the projected world situation into balance (see "normative" world total in table 11).

One method of relating these data more closely to New Zealand is presented in table 12. It selects five zones which took 87 per cent of New Zealand's exports of beef and veal in the period 1974-76, which is the base period for the FAO projections. The zones are the European Communities (enlarged to the Twelve), Eastern Europe and the USSR, North America, Japan and the oil-exporting developing countries. These include nearly all the countries which seem most likely to have the foreign exchange availability to meet their projected import requirements of beef and veal. Their average annual net imports in 1974-76 amounted to 1,486 thousand tons, of which New Zealand supplied 178 thousand tons, or around 12 per cent.

The aggregated net import requirements of this group around the year 2000, as projected by FAO on a trend basis, would amount to 2,880 thousand tons. If this trade eventuated and New Zealand maintained its 1974-76 share, her exports to the group would have to increase by 167,000 tons, or 94 per cent. If the projected large beef exports from the USSR/Eastern Europe bloc did not eventuate, the import opportunities facing other exporters including New Zealand would be very much greater.

This approach omits consideration of all developing countries other than oil exporters. Many of those omitted are relatively fast growing countries where New Zealand beef exports are being accepted in increasing amounts, as in the Caribbean and Pacific areas, and places such as Hong Kong and Singapore, for which FAO projections are not available.

(c) Sheepmeat

The FAO production projections for sheepmeat around 2000 are summarized in table 13 along with the demand projections, and the consequential net trade projections, by main regions.

Table 12. Beef and Veal: Projected Net Import Requirements in 2000 of Selected Zones, showing New Zealand's exports in 1974-76

thousand metric tons

	1974-76		2000
	Imports from NZ <sup>1</sup>	Total net imports	Projected deficit Trend basis
EC (12)	12	259	430
E.Europe & USSR	8	149	-1,629 <sup>2</sup>
N. America	151	888	1,511
Japan	2	69	342
Oil exporting countries	5	121	2,229
Above countries	178	1,486	2,883
World	203		

<sup>1</sup> Shipments from New Zealand.

<sup>2</sup> Projected export availability.

Source: FAO.

Table 13. Sheepmeats; Trend Projections to 2000 of Demand, Production and Net Trade, by regions, in comparison with 1975 actual data

	thousand metric tons						Self sufficiency Percent	
	Demand		Production		Net trade <sup>1</sup>			
	1975	2000	1975	2000	1975	2000		
EC (12)	1,086	1,316	794	955	-292	-361	73	73
Other W. Europe	100	152	97	143	-3	-9	97	94
N. America	223	361	202	3	-21	-358	91	1
E. Europe & USSR	1,143	1,597	1,182	1,491	+39	-106	103	93
Australia/NZ	531	668	1,055	1,557	+525	+889	199	233
Japan	119	255	-	-	-119	-255	-	-
Total Developed <sup>1</sup>	3,349	4,724	3,474	4,453	+124	-271	104	94
Latin America	383	799	402	475	+19	-325	105	59
Africa	693	2,215	712	939	+18	-1,276	103	42
Near East	1,170	3,820	1,069	1,689	-101	-2,130	91	44
Asia & Far East	695	1,942	681	830	-14	-1,112	98	43
World <sup>1</sup> - Trend	6,968	14,759	7,016	9,320	+47	-5,439	101	63
- Normative		13,382		11,601		-1,782	101	87

<sup>1</sup> Totals include several countries not covered by regional subtotals shown.

Source: FAO.

The figures point to a much faster growth of demand than of production in all main regions of the world, except Australia/New Zealand, which emerges as the only important exporting zone. At the global level, if current trends continue until 2000, production at 9 million tons would be some 5 million tons short of projected demand. Such an imbalance could not in fact arise. Adjustment would take place through higher prices and policy changes, resulting in balance at a lower level of consumption than projected and a higher level of production. The value of the unadjusted projections lies in their indication of a strong growth in world demand for sheepmeat.

Among developed countries, the Eastern European bloc is shown to change from a small net export status in 1974-76 to a small net import status in 2000. Western Europe, North America and Japan are projected to have considerably larger import requirements than at present - larger than the projected increase in exports from Australia and New Zealand.

All the developing regions are shown with large net deficits by the year 2000, the biggest gaps being indicated for the Near East and Africa. As for beef, foreign exchange limitations could prevent much of these projected deficits being expressed in actual imports, except in the case of the oil-exporting countries and some middle income developing countries.

Table 14 has been prepared to relate the FAO sheepmeat projections more closely to New Zealand. This table is restricted to the main importing zones of current interest to New Zealand, whose projected deficits are most likely to be funded as actual imports. The only developing countries included are the oil-exporters plus Jamaica, Peru, Jordan and South Korea. In 1974-76 95 per cent of New Zealand shipments of lamb and mutton went to this group of countries, where they provided 368,000 tons of their total net imports of 515,000 tons of sheepmeat. In 2000, FAO projects that those countries will have a total net import requirement of no less than 3¼ million tons, if present trends continue and current price ratios are maintained.

Table 14. Sheepmeat: Projected Net Import Requirements in 2000 of Selected Zones, showing New Zealand's exports in 1974-76  
thousand metric tons

	1974-76		2000
	Imports from <sup>1</sup> NZ	Total net imports	Projected deficit Trend basis
EC (12)	236	292	361
E. Europe & USSR	27	-39 <sup>2</sup>	106
N. America	15	21	358
Japan	46	119	255
Oil exporting countries	24	101	2,008
Jamaica, Peru, Jordan, South Korea	20	21	162
Above countries	368	515	3,250
World	386		

1 Shipments from NZ

2 Net exports

Source: FAO.



Most of the countries would have foreign exchange available, so that their import deficits could be expected to give rise to trade expansion, if regular supplies were available from exporters.

Some of the developing countries could become protectionist of their domestic sheep raising industries. But even if two thirds of the projected import requirements of this group were to be cut off by policy interventions, the remainder would offer double the present opportunity for New Zealand exports on the basis of current shares in the respective markets.

(d) Milk and Milk Products

The main features of the FAO trend projections for milk and milk products are summarized by regions in table 15, in terms of milk equivalent.

Since the FAO methodology assumes the continuation of current policies and price relatives, the results for developed countries inevitably depict the enlargement of the milk surplus of the expanded European Community and the rest of Western Europe. The USSR and Eastern Europe is seen as moving into a surplus position almost as great as that of the EC.

North America would develop a large deficit, because of a much slower increase in domestic production than in demand. Japan is shown with rapidly expanding demand and production - self sufficiency would remain fairly stable in the low 80's per cent, resulting in a doubling of the import deficit in comparison with 1974-76. Australia could have a large deficit, while New Zealand's exports are projected to rise by around 20 per cent.

The developed countries as a whole are shown with a much smaller surplus than in the mid-seventies, because of large deficits in North America and Japan and the possible turn-around in Australia.

Table 15. Milk and Milk Products; Trend Projections to 2000 of Demand, Production and Net Trade, by regions, in comparison with 1975 actual data  
thousand metric tons of milk equivalent

	Demand		Production		Net Trade		SSR	
	1975	2000	1975	2000	1975	2000	1975	2000
EC (12)	101,608	122,398	108,301	133,610	+6,693	+11,212	107	109
Other W.Europe	17,136	21,019	18,778	22,774	+1,671	+1,755	110	108
N. America	60,362	78,020	60,791	63,798	+429	-14,221	101	82
E.Europe & USSR	129,640	186,396	129,781	196,663	+141	+10,266	100	106
Australia/NZ	8,613	9,330	12,779	10,662	+4,166	+1,333	148	114
Japan	6,155	11,448	5,032	9,250	-1,123	-2,199	82	81
Total Developed <sup>1</sup>	326,903	435,700	338,631	441,419	+11,728	+5,719	104	101
Latin America	32,684	80,186	29,956	65,726	-2,728	-14,460	92	82
Africa	8,325	22,211	6,423	11,118	-1,902	-11,094	77	50
Near East	13,807	40,143	12,632	24,569	-1,174	-15,574	91	61
Asia & Far East	39,941	87,445	37,437	61,627	-2,504	-25,818	94	70
World <sup>1</sup> -Trend	427,738	676,404	431,169	613,066	+3,431	-63,337	101	91
- Normative		690,881		661,881		-29,000	101	96

<sup>1</sup> Totals include several countries not covered by regional subtotals shown.

Source: FAO.

FAO projects dynamic dairy development in the developing countries up to 2000, but with production growth lagging behind demand. The import deficits of all developing regions would therefore become much greater, particularly in Asia and the Far East, quite over-shadowing the projected surplus of developed countries.

At the world level the relatively small overall surplus of today would be replaced by a major shortage, if the developing countries had the foreign exchange to cover their deficits by importing. There would certainly be need for a considerable increase in food aid in milk products directed towards the poorest countries. FAO foresees a possible requirement of 300,000 - 330,000 tons of milk powder by 1990, compared with an estimated transfer in 1978 of 235,000 tons of skimmilk powder and 52,000 tons of butter oil.

Because of the uncertain purchasing power in foreign exchange of many developing countries with projected deficits, the data are hard to assess as regards trade prospects. To clarify some of the more realistic implications, the data are shown separately in table 16 for the oil-exporting developing countries group, which will have the capacity to buy, and some of New Zealand's good customers, namely the Asean Group, Jamaica, Peru and Chile, which are likely to purchase most of their requirements.

For all these countries together, the projected net deficits of dairy products around the year 2000 are some 4-5 times their mid-1970 imports, and some ten times the total annual dairy exports of New Zealand in 1974-76.

The large projected deficits of North America, Japan and possibly Australia are almost certain to call for more dairy imports than in the mid 1970's, though perhaps not to the extent projected. If only one sixth of the projected increase materialized as actual imports, that proportion would be equivalent to New Zealand's total annual exports in the mid-1970's. The prospects

Table 16. Milk and Milk Products: Projected Increases in Net Deficits of Selected Developing Countries by 2000, compared with 1974-76 net imports  
thousand metric tons of milk equivalent

	1974-76 Net imports	2000 Projected deficit	
		milk equiv.	Per cent of 1974-76 net imports
Oil exporting developing countries <sup>1</sup>	2,859	14,534	508
Asean group <sup>2</sup>	1,750	7,301	417
Jamaica, Peru & Chile	699	2,516	360
Above countries	5,308	24,351	459

1 Excluding Indonesia

2 Excluding Singapore

Source: FAO.

seem good for New Zealand to find buyers outside Europe, long before 2000, able to purchase considerably more dairy products than New Zealand currently sells to the EC.

A key determinant of prosperity for the New Zealand dairy industry in the next two decades will be the dairy production and trade policies of the industrialized countries. If they do not change, the growing market opportunities in the developing world will be increasingly taken over by subsidized exports from the high cost producers of Western Europe and perhaps Eastern Europe. If artificially low prices continue to rule in international markets as a result, the New Zealand industry in its present form would become increasingly unprofitable and unable to rise to the opportunities in the developed importing zones of North America, Japan and Australia, unless the latter offered special arrangements.

The most favourable development for traditional and potential exporters would be the collapse of the current EC dairy policy under its irrational weight and cost, and its replacement by a regime under which the interests of European consumers and external producers were maintained in a better balance with those of the European producers. A year ago, such a development was hardly foreseeable, but the internal pressures for change are intensifying and in the perspective of the year 2000, the possibility should not be overlooked.

Another development favourable for New Zealand that could be envisaged would be the negotiation of long term international dairy agreements under which the industrial importing countries of the future - Canada, United States, Japan and Australia - undertook to share the growth of their dairy markets with New Zealand as the only important non-subsidizing exporter; and the EC and New Zealand agreed on minimum export prices closer to the EC internal support levels, for a wider range of products. The outcome in the dairy sector of the recently concluded multilateral trade negotiations under the GATT may be seen as a pointer in these directions, but more changes are needed before New Zealand could have a reasonable assurance of a bright dairy future.

(e) Summary of Market Implications for New Zealand

The above results reflect FAO's understanding and interpretation of the factors affecting consumer demand for food and agricultural products and crop and livestock production trends in all parts of the world. FAO's knowledge in these respects is authoritative, and is basically accepted by governments in all regions. The broad findings of earlier projections of FAO to 1985 were subsequently confirmed by studies undertaken by other agencies, such as the US Department of Agriculture, the OECD and the International Food Policy Research Institute.

Nevertheless, the FAO projections are only a starting point - a globally consistent one - for further analysis by national authorities, who can bring to bear their own knowledge and judgement in interpreting the results. Projections have a misleading precision. In fact, the figures are sensitive to variations in the underlying assumptions.

It is the open-ended nature of the FAO commodity projections that precludes their use as forecasts. The authors have not forced divergent trends of demand and supply into balance, by selecting and applying specific changes in prices and policies. This challenge is left to particular users of the study, who may be concerned to assess more clearly the particular options that may face them in the future.

The main source of uncertainty about trade prospects lies in the policies of governments. The protection of domestic agriculture against foreign competition is a dominant objective of government policy in nearly all importing countries. Protective trade policies are therefore the rule rather than the exception.

The intensity of the protection in particular cases depends on a number of factors. A major consideration is cost relative to the national budget. The larger the relative size of the agricultural sector and the higher the degree of protection sought,

the greater the cost. Thus it is the industrialized countries, where agriculture employs only 3-15 per cent of the population, that can afford the highest levels of protection. Their agricultural import barriers therefore tend to be the highest and the most intractable. Even industrialized countries may find the cost of a high degree of self-sufficiency too great in the case of commodities for which their production resources are relatively too unfavourable. Thus Japan admits wheat and feedingstuffs freely, while maintaining costly protection of beef and milk. It is a common policy to admit more freely commodities like feeding stuffs which are an input into a domestic industry.

Imports of commodities of which competing domestic production is absent or minimal are also admitted without significant restrictions e.g. sheepmeat into Japan and Canada, and tropical products or out-of-season fruits and vegetables into most temperate zone countries.

In developing countries, the prevailing low levels of incomes force governments to pay more attention to food prices than is the case in developed countries. Thus high levels of protection for domestic farmers are ruled out, especially as the budgetary cost of supporting incomes in the largest sector of the economy - agriculture - would be relatively very large. Also the institutional structure for implementing farm support policies is often inadequate. However, developing countries, other than oil-exporters, often face foreign exchange shortages which may force them to restrict allocations for the importation of non-essential food items i.e. non-cereals.

Over a period of two decades up to 2000, government policies affecting production and trade in foodstuffs will continue to evolve in response to changing objectives and pressures. If history repeats itself, the protection of self-sufficiency in importing zones is likely to be the dominant force in such changes, up to relatively high levels of budgetary and consumer cost in the case of the industrialized countries. Thus, it is hard to foresee



changes in the common agricultural policy of the EC - even when enlarged to 12 members - which would permit rising imports of beef and sheepmeat or imports of dairy products.

On the other hand, there are possibilities for changes in the balance of policy objectives in some countries which could lead to major expansions in certain commodity markets. Witness the pressures of domestic demand for livestock products in the USSR, which led to a significant increase in imports of grains. Simultaneously, the rising purchasing power of many developing countries plus the reopening of China helped to convert the static grains trade of the 1960's into the booming expansion of the 1970's.

The enlargement of the world grains trade seems almost certain to continue. But there are many indications that the 1980's and 1990's will also see a large, continuing expansion of world trade in livestock products, if exportable supplies are forthcoming at reasonable prices.

Positive signs in developed countries are the steadily declining degree of self sufficiency in beef and cheese in Japan, the stable dependence of the United States on overseas suppliers for some 7 per cent of its growing beef consumption, the growing US deficit in cheese and the shift of Canada from export to net import status in beef. If domestic producers in these countries influence governments to maintain high price policies for beef, many consumers may turn to pork and poultry meat, and the market for beef could be undermined, as has happened in North America for milk products. Even so, import demand of these countries for beef, sheepmeat and some dairy products seems almost certain to grow significantly in the next two decades.

These developed countries will continue to protect their domestic livestock industries but - as the recent GATT negotiations demonstrated - it is possible for them to manage marginal increases in imports within the basic framework of their protective policies.



There is a danger however, that by unpredictable administrative management of imports through short term quotas, these countries may not induce sufficient confidence in overseas supplying countries to ensure the long run availability of the imports which they will need. Experience with rising import requirements may nevertheless bring them to recognize the essential complementarity of overseas supplies, and to replace short term import policies by longer term market sharing arrangements.

Even if protective policies are allowed to hobble the growth of imports by developed countries, there is every indication that the import demand of developing countries will expand fast enough to ensure dynamic world markets for meat and dairy products in the 1980's and 1990's. This remains true even if the projected large deficits of the poorer group of developing countries are omitted from trade considerations.

It is the oil-exporting and middle income developing countries which will induce the dramatic expansion of the meat and dairy trade in the remainder of this century. The high income elasticity of demand for these foods at the stage of development of these countries generates a rapid expansion of demand with increasing incomes, which is accentuated by fast population increase. But the production cycle for cattle has a long biological time lag, and the development of infrastructure and institutions for commercial processing and marketing takes even longer. The lags are shorter in sheep production but still significant. The inevitable result of slow domestic production growth is a surge in import demand which such countries can afford to finance.

The projected rapid growth of livestock product imports of the oil-exporting countries challenges traditional thought, despite the evidence of the last five years. However, estimates from different sources are mutually supporting. In 1977 the World Bank joined with FAO in a special study in depth of "The Outlook for

Meat Production and Trade in the Near East and East Africa".<sup>1</sup> For the Near East they projected a tenfold increase in the beef and veal deficit between 1980 and 1985 (from 33,000 to 331,000 metric tons), and a near trebling of the sheep and goat meat deficit in the same period (from 374,000 to 1,012,000 metric tons). At the same time they could only envisage a 60 per cent increase in the export surplus of beef and sheepmeat from East Africa.

It is noteworthy - and a good omen for New Zealand and Australian farmers - that the populations of most of the oil-exporting countries are predominantly sheepmeat eaters. They prefer sheep or goat meat to beef. How long this preference will last, no one can say. While it lasts, their rising demand for meat will be focussed primarily on lamb and mutton and goat meat.

The oil-exporting countries can be expected to develop their domestic livestock industries in response to demand. Few of them, however, have natural conditions favourable for livestock raising. Moreover, the transition from subsistence to commercial production could only be slow. In the Near East, for instance, the cost of protecting domestic livestock industries would be prohibitive. For 10-15 years at least, oil-exporting and middle income developing countries are more likely to adopt policy measures to facilitate the importation of livestock products, in response to the rising incomes and strong desire for better living standards on the part of important sections of their populations.

The flow of the import trade in livestock products to developing countries will be strongly influenced by the pattern as well as the rate of their economic development. FAO in elaborating its normative scenario of accelerated general economic growth, built in a more rapid development of agriculture. In countries where agricultural conditions were not too unfavourable, the faster rise in domestic output reduced or eliminated the

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1 World Bank and FAO: December 1977; table 1.11.

deficits of livestock products projected on the basis of continuation of present trends.

Because of the inherent rigidities in their agricultural sectors, however, many developing countries that possess non-agricultural resources may well choose a more industrial approach to development, as the oil and mineral exporters are already doing. Under this pattern of development, imports of livestock products will be at a maximum.

This kind of outcome is illustrated by an IFPRI staff study of the beef sector in Latin America.<sup>1</sup> Under high income growth assumptions, temperate South America (Argentina, Chile and Uruguay) would eat more of their production, and have less to export than if incomes were growing more slowly. Similarly, tropical South America with zero income growth would quadruple its beef export surplus, but with high income growth would generate a very large import requirement.

The present inequality of incomes in developing countries, which has many undesirable aspects, favours import demand for meat, and, to a less extent, for dairy products. A major redistribution of incomes in favour of the poorest people would stimulate demand for foodgrains and other basic foods at the expense of meat. A redistribution of such dimensions is most unlikely to occur during the next two decades.

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1 International Food Policy Research Institute: Growth Potential of the Beef Sector in Latin America - Survey of Issues and Policies: A. Valdes and G. Nores, Washington D.C., August 1978.

It seems a reasonable conclusion to draw, for the purpose of the further analysis in this paper, that in the 1980's and 1990's finding markets for beef and sheepmeat is unlikely to be a big problem for the traditional or relatively low cost exporters. The 7 - 8 year beef cycle will continue to occur, causing difficulties for exporters in the cyclical phases of relative oversupply, but the long term development will be expansion.

As regards dairy products there will be large surpluses in Europe, but import demand outside Europe will also be strong, and there are grounds for anticipating more effective international controls on export subsidies than have existed in the 1970's. However, the world trade outlook depends crucially on production and policy developments in the European Community and New Zealand. It seems reasonable to expect, on current indications, that the tendency to surplus production in the Community will be curbed by economic and policy changes well before the year 2000, to a much greater extent than at present.

If New Zealand maintains its non-subsidized dairy pricing system, the cost disparity between New Zealand and Europe may be expected to widen. It would thus become more costly for the EC to subsidize dairy exports of the current magnitude at current rates. If the European Parliament maintains its interest in the Community budget, higher subsidy rates for significantly larger dairy exports could well become outside the realm of the politically possible. On this analysis, a considerable proportion of the rising import demand of the developing world would be open to a low cost exporter such as New Zealand, at remunerative prices, if the export supplies were available.

If the dairy deficits of North America, Japan, Australia and the oil exporting countries caused a significant rise in real international prices, production would be encouraged everywhere, and the need for export subsidies would be reduced. This kind of evolution would not be an unfavourable one for a low cost exporter with supplies available.

Demand for certain horticultural products such as fruits, vegetables and cut flowers, including novelty items and out of season supplies, will continue to grow in the affluent industrial countries of the northern hemisphere.

Import demand for grains will rise constantly, both wheat for human consumption and all grains suitable for livestock feeding.

In the light of the above analysis, and taking a position midway, between "favourable" and "unfavourable" developments, one may foresee the following general outlook for quantitative changes in different regions of the world, in the period up to 2000, as regards imports of agricultural products of main export interest to New Zealand.

	Beef	Sheepmeat	Dairy products
Western and Eastern Europe and USSR	Decrease	Decrease	Decrease
North America	Fluctuating increase	Increase	Gradual increase of cheese
Japan	Increase	Increase	Gradual increase of cheese and casein
East and South East Asia	Gradual increase	Gradual increase	Gradual increase
Near East	Increase	Substantial increase	Gradual increase
Latin America	Little change	Little change	Gradual increase in Northern and Western zones
Africa, North and West	Possible increase	Gradual increase	Possible increase

In addition, Western Europe, North America and Japan will probably have to import more horticultural products, especially out of season. Middle income countries in the Far East will be importing more feedgrains for their expanding livestock industries.

For the most part, the above changes are already being reflected in the pattern of New Zealand's exports. They point to North America, Japan and the Near East as the main areas of expanding opportunities for the sale of New Zealand's meat and dairy exports over the next two decades, to replace the long standing dependence on the United Kingdom. In addition, the indications point to growing opportunities in the middle income and petroleum exporting countries of the Far East, Africa and Latin America.

This export trade outlook tends to reinforce other considerations which point to the Pacific Basin as a zone of special interest for New Zealand in the future.

The New Zealand response to the above world market perspectives will be influenced by many external and internal factors, which will now be examined.

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PART II: THE NEW ZEALAND RESPONSE TO WORLD MARKET  
PERSPECTIVES

4. THE CHALLENGE OF THE FUTURE

New Zealand's overall pastoral production has been static over most of the 1970's. Dynamic increases have occurred in some lines of agricultural and horticultural output, which constitute a small part of the farming scene. The picture is presented in table 17, in the form of a comparison of production in the three seasons centred on 1977 with the three seasons centred on 1966, for the main products of New Zealand farms.

The big sheep and dairy industries lost momentum. Beef and veal is the only line of pastoral production that has expanded over the period shown. Its growth was rapid for a cattle-based industry, but the momentum has been lost in this sector also since 1975, and in 1980 beef cattle numbers were the lowest for ten years.

The most dynamic growth occurred in the poultry industry and the associated production of feedgrains, maize and barley. Rapid increases have also occurred in fruit, vegetable and wine production. These growth areas are mostly protected subsectors of New Zealand agriculture and are so small relatively that their gains have not been able to offset the declines in the pastoral industries. The protection may be natural, as for fresh fruit and vegetables, or contrived, by measures such as fortuitous health and quarantine regulations, tariffs and import controls. Kiwifruit production, which has expanded rapidly, while not protected has had the benefit of a valuable export incentive.



Table 17. New Zealand Agricultural and Pastoral Production Trends:  
1975-78 compared with 1964-67

		1964-67 average	1975-78 average	1975-78 as per- cent of 1964-67
<u>Main pastoral products</u>				
Milk	000 tonnes fat	295	293	99
Wool	000 tonnes	307	309	101
Mutton and lamb	"	489	504	103
Beef and veal	"	323	583	180
<u>Other products</u>				
Wheat	"	297	357	120
Apples and pears	"	116	181	156
Barley	"	118	272	231
Citrus fruit	"	6	18	300
Subtropical fruit	"	3	10	323
Frozen vegetables	"	14	45	326
Wine	Mill. litres	9	35	383
Poultry meat	Mill. birds	5	24	480
Maize	000 tonnes	30	190	633

The volume index of the national agricultural output as a whole remained 1-6 per cent below the 1972 level until 1975/76 and 1976/77, when an expansion of 1-2 per cent was gained. National output in 1977/78 was again below 1971/72, but recovered in 1978/79 and 1979/80 to a level some 2 per cent above 1971/72.

The volume and pattern of the export flow have reflected the slow down of the pastoral industries including now beef, and the growth in horticultural and feedgrains output. Pastoral farmers in suitable locations have diverted acreage to cereals, fruits or vegetables to share in the higher profits made possible by changes in relative prices. This has resulted in somewhat more intensive land use in some areas, but the overall picture of New Zealand farming is still overshadowed by the static years of the 1970's.

Beef cattle numbers have been falling since the 1975 peak, in conformity with the world beef cycle, and will no doubt start to rise again with the cycle, to some extent at least, in a year or two. The number of dairy cows in milk has been falling for a long time, and has reached the level of fifteen years ago. However, after falling sharply in the early 1970's, sheep numbers have recovered rapidly, to attain new record levels in 1979 and 1980. It would appear that the sheep industry is indeed poised to use the great opportunities that seem to be emerging for livestock product exports in the 1980's and 1990's. But this pose could be fragile, if not consolidated by an encouraging environment, both external and domestic.

It seems reasonable to assume that profitable export opportunities will continue to expand in affluent countries for consumer-oriented lines of horticultural production that do not compete seriously with domestic supply industries in the importing countries. In the long run to 2000, such lines may make an increasing relative contribution to New Zealand's export earnings. Also, the more wealthy developing countries of Asia - the Republic of Korea and Taiwan - and Japan, may be ready to buy larger quantities of maize and barley from New Zealand for their growing livestock industries at satisfactory prices.

Nevertheless, pastoral production is the characteristic feature of New Zealand farming, and by far the largest component. This is the type of production in which the country enjoys the greatest comparative advantage, and from which the really large increases in export earnings can be looked for in the period up to the year 2000, if the conditions are favourable. It has been a major argument in New Zealand's strenuous diplomatic démarches against agricultural protectionism that this country should be permitted to earn its livelihood by doing what it is best fitted to do, namely to increase output and exports of comparatively low cost pastoral products.

The best indications are that the external market for such products will expand considerably during the remainder of this century. Will there be a New Zealand response? What will be its nature and how will it be determined?

The New Zealand livestock industry has a strong positive advantage, in that the animal health situation and the industry in general are geared to the hygiene requirements of the most demanding importing countries. The dairy industry at least also possesses a sophisticated and integrated production and processing system, capable of producing a wide variety of products to meet diverse demands.

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## 5. FACTORS AFFECTING THE NEW ZEALAND RESPONSE

### (a) Profitability

This is a key factor. The spectacular rise of the maize and kiwifruit industries in recent years testifies to the readiness of farmers to increase output of products where the profit margin is attractive. Most of the expansion of these industries has taken place on land previously used for dairying.

The three main components of profitability are prices received, domestic costs, and productivity.

The prices received by dairy farmers increased faster than their costs from 1968/69 to 1971/72, after which the situation was reversed. Between 1972/73 and 1978/79 costs increased by 123 per cent, while prices received rose only 72 per cent. Prices received reflected a trebling of costs of transport, manufacturing and charges from farm gate to shipboard for export produce during the 1970's. In the result, the net incomes of dairy farmers on average rose in money terms by about 66 per cent between 1972/73 and 1978/79. But after allowing for domestic inflation, their real incomes fell by about 30 per cent over the same period. And this in an industry that has to work seven days a week.

Such facts go far to account for the static evolution of the dairy industry since the mid-1970's.

The changes on sheep farms were somewhat less unsatisfactory overall, although many features on the production side were disturbing. Over the ten years 1968/69 to 1978/79 prices received by farmers for lambs, other sheep, beef and wool fluctuated considerably, more or less trebling through the period. Most of the increase for lambs, mutton sheep and wool came in the last half of the 70's, after a low point in 1974/75. Depressing these gains and reflected in them was a five-fold increase in costs from farm

gate to f.o.b. Sheep farmers costs rose rapidly in the latter half of the 1970's, more than offsetting the price gains in this period. Through the 1970's the productivity of the national sheep flock fell slightly, as indicated by lambing percentages and wool shorn per sheep. Some recovery is now under way.

During the decade of the 1970's sheepfarmers net incomes trebled in money terms. After correcting the value of money by application of the consumers' price index, net incomes are shown to be about the same as they were ten years ago, and only half of the level attained in the good price year of 1972/73.

If profitability rises in the future, New Zealand pastoral production will be encouraged to respond with increased output. A review of the FAO projections to 2000 suggests that the trend of export prices for sheepmeat and beef will be favourable. The impact on New Zealand sheep and cattle farmers could be favourable if not countered by exchange rate policy i.e. by persistent overvaluation of the New Zealand currency vis à vis other currencies. For these industries the internal contributors to profitability will be crucial - domestic costs and productivity developments.

The recent rapid rise in farming costs on a domestic ratchet which functions independently of external costs and prices poses a real threat. If rising prices to farmers continue to be completely offset by rising farm costs the only hope for better profitability in the future would lie with cost reduction through productivity developments, which has been the key to New Zealand's success as an agricultural exporter in the past. It is the function of agricultural research to discover such developments, and of agricultural education to promote their wider adoption by farmers.

A recent survey of the Akitio County, an essentially pastoral area in Southern Hawkes Bay, indicated a "readily attainable" potential production increase of 50 per cent.<sup>1</sup> Farmers who are

<sup>1</sup> Ministry of Agriculture and Fisheries: Economic Review of New Zealand Agriculture 1979; Wellington, January 1980; page 3.

undertaking investment for farm improvement - according to the Akitio Survey - believe it to be profitable. But many farmers are apparently not yet committed to development. The uncertainty of reward, generated by the rising trend of costs, both on-farm and farm-gate to f.o.b., is often quoted as a deterrent.<sup>1</sup>

The export price outlook for dairy products is much more uncertain, because of the dumping of surpluses by northern hemisphere countries, especially the EC. If this does not cease or come under control to the extent that real international prices for dairy products rise, the dairy scene will be dominated by rising domestic costs and major investment efforts to increase productivity and flexibility, especially in processing. If high profitability continues in horticultural or arable lines of production, farmers will continue to divert dairying land at the margin to such uses. The outcome to 2000 could be a further decline in dairy cow numbers, but static output around or slightly above present levels.

The above is probably a pessimistic assessment for dairying. Many indications, as mentioned earlier, point to developments that could lead to a favourable evolution of the external price component of profitability. In that event, the resumption of long-deferred expansion of the dairy industry would depend on competition with horticulture and the control of domestic cost increases, or offsetting them by further cost-reducing technological advance.

A strategic question for the future of New Zealand is whether and under what conditions this country can maintain its low-cost status as an agricultural exporter. This question warrants research in depth at an early date.

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1 Maughan, C.W. and Ward, A.B.: Farm Production in New Zealand: an Analysis of Incentives and Disincentives; Massey University, Agricultural Policy Paper No. 2; July 1978.



Other questions of strategic importance for New Zealand relative to the evaluation of overseas markets for pastoral products include the evolution of the food and agriculture economy and of agricultural production and trade policies in the potential importing zones of the future and in competing exporting countries. All the concerned New Zealand interests need to have basic and updated understanding of such determinants of the New Zealand role if this country is seriously committed to maintaining and improving its position as a major, reliable, low cost exporter of pastoral products in the future world food economy. The work of international agencies such as FAO can provide a valuable starting point for such studies. But a New Zealand focus for this type of research is a necessary component of an agricultural exporting stance.

(b) Motivation to increase output

From the national point of view, the opportunity and requirement in the future is to increase the output from the farm lands of New Zealand. The individual farmer's point of view is usually to increase output per person. This may be done by increasing production on one viable farm by a well-designed development programme. Another way is to purchase additional land and maintain a more extensive farming system on a bigger holding.

The latter approach is inconsistent with the goal of a rapid increase in national output. Farmers with investible resources are disposed to adopt it, when faced with uncertain output prices, constantly rising costs, and interruptions to marketing channels. Under such conditions many farmers with available funds may be motivated more strongly to increase their wealth than their income.

This suggests that profitability alone may not be sufficient to spur the increase in output which export markets could absorb. Increased profitability could be expressed in higher land values and larger holdings, rather than in more investment and more adventurous management to raise production and productivity.



This argument would point to the need for new approaches to such delicate questions as land policy and taxation, with a view to strengthening motivation to take advantage of opportunities to increase output per unit of land as well as per farmer.

A related question is the approach to research and farm advisory work on farm productivity. It seems certain that the old ways will not sufficiently impact all farmers with the resources and potentiality to raise output. In many cases, farmers may lack self confidence with respect to the techniques needed to intensify production. Extension activities may have to give more attention to interesting and training farmers in the much more sophisticated types of management needed at very intensive levels of production, especially in a large scale of operation.

The supply of pastoral products for export will be a major problem for New Zealand during the next two decades.

### (c) Availability of land

Of New Zealand's 26.8 million hectares, 32 per cent is in improved pastures. Another 20 per cent is unimproved grazing land. Some 2.2 per cent is covered by forest plantations and only about 1.5 per cent is in crops, gardens and orchards.

This pattern of use reflects the response of New Zealand to the availability over the past century of relatively unlimited overseas markets for dairy products, meat and wool, and the suitability of soils and climate for scientific, pasture based livestock production.

A basic fact is that one third of New Zealand's pastoral land is hill country. Because of steepness, most of it has no alternative agricultural use apart from sheep and cattle raising. Forestry is its only other possible role, and a marginal diversion from sheep to forestry is under way in some areas. It is estimated that

in the North Island, hill country sheep and beef farms carry almost two thirds of the sheep and three quarters of the cattle in that island. The hill country also supplies sheep and cattle to the downland farms. It is a resource of major significance to the New Zealand economy.

The potential production capacity is unknown. The Akitio Survey<sup>1</sup> concluded that a 50 per cent increase was "readily attainable" in that county. One authority has assessed the potential stock carrying capacity of the North Island hill country as at least double the present level.<sup>2</sup> The National Research Advisory Council has accepted the same order of increase as technically feasible for the New Zealand hill country as a whole.<sup>3</sup>

About one third of the land in improved pasture - or about 10 per cent of New Zealand's surface - has been assessed to be physically suitable, currently or potentially, for intensive cropping or horticulture.<sup>4</sup> Since only about one sixth of this area is presently used for such purposes, the physical potentiality for a major expansion of these types of production exists, should export markets and producer returns develop favourably relative to livestock production possibilities.

(d) Energy prices

A major factor affecting the New Zealand response will be the impact of energy prices on the comparative advantage internationally of the New Zealand system of pastoral farming.

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1 MAF: op. cit.

2 Hight, G.K.: Problems and Potential of Farming on North Island Hill Country; NZ Agricultural Science, November 1976.

3 NRAC: Hill Country Research; Wellington, January 1978.

4 Leamy, M.L.: Resources of Highly Productive Land in New Zealand; New Zealand Agricultural Science, 8 (4), 1974.

On the face of things, it could reasonably be expected that New Zealand's capacity to produce food energy in the form of live-stock products from mainly renewable natural resources will be more of an asset in 2000 than it is today.

But the situation is not clear cut and calls for continuing investigation. Much will depend on the rate and extent of increase in the real price of petroleum and alternative fossil fuels. Other factors will include: the nature and cost of the adjustment of energy intensive farming systems of Europe and North America to high energy costs; the price elasticity of demand for meat and milk in the rich countries; the degree of agricultural protection that will be acceptable to consumers in those countries; the impact of rising energy prices on processing and shipping costs; changes in the real cost of energy in New Zealand; the relative emphasis to be placed in New Zealand agriculture on net food energy output per man and per acre; the degree of openness of the New Zealand economy that citizens will opt for.

The time is ripe for New Zealand to study very seriously these and other relevant factors that will influence this country's comparative advantage in agricultural production in the future, and the patterns of farming that could evolve. Some beginnings have been made.<sup>1</sup>

Energy considerations may have another and more direct impact on New Zealand agriculture. The cost of petroleum imports is currently about equal to the foreign exchange earned by the entire meat industry. If oil is not found soon in New Zealand, and oil prices continue to rise as expected, the option of producing energy from biomass grown as farm crops may have to be explored with greater priority.

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1 Pearson, R.G. and Corbett, P.S.: Energy in New Zealand Agriculture; Search 7, 1976, pages 418-423; and Spriggs, T.W.: Irrigation and Energy; DSIR, Palmerston North, April 1978.

Preliminary studies have already started to examine the potential of energy farming.<sup>1</sup> Research so far undertaken indicates that the amount of land suitable for potential biomass crops is substantial, ranging from 2.4 million hectares for maize, 3.1 million for sugar beet, 4.4 for lucerne and 7.6 million hectares for radiata pine trees. It is considered theoretically possible to obtain all transport fuel requirements of New Zealand in the year 2000 from 1.3 - 2.2 million hectares of land devoted to forest (2 - 3 times the present area of plantation forests), or 0.7 - 1.3 million hectares of annual crops (2 - 3 times the total area presently under crops, gardens and orchards).

If agricultural crops were to be used for energy production, it is evident that 5 - 10 per cent of the best pasture land would have to be diverted to energy farming. The impact on pastoral production and exports would be considerable. However, the authorities estimate that energy farming could save two dollars of foreign exchange for every one dollar of foreign exchange earnings lost through reduced agricultural exports.

In any case, the viability of energy farming in New Zealand is not yet proven. Present proposals call for the initiation of a comprehensive research and development programme, including one or more commercial type ethanol plants, with a view to assembling information that would permit a decision on energy farming as a major energy resource to be made by 1990.

In the longer run mankind will no doubt prefer to develop solar or nuclear energy and to use land for food and fibre production rather than for energy wherever possible. In the shorter term up to 2000, biomass could well make a contribution to transport fuel supply in New Zealand. The trade-off in terms of agricultural exports forgone would have to be assessed, although strategic considerations of security would no doubt be given due emphasis in decision-making.

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<sup>1</sup> NZ Energy Research and Development Committee: The Potential of Energy Farming for Transport Fuels in New Zealand; Report No. 46, University of Auckland, August 1979.

(e) Supply and cost of fertilizers

Most New Zealand soils need phosphorus - it is a critical input so long as New Zealand farming is based on pasture growth boosted by atmospheric nitrogen fixed by clovers. In the land development phase the requirements are high, but subsequently fertility can be maintained with somewhat reduced application rates.

Any diversification from pasture to cropping or horticulture, would entail increasing requirements of artificial nitrogen and of potash.

The present sources of New Zealand's supply of phosphates - on Nauru and Christmas Islands - will be effectively exhausted in about 15 and 8 years respectively. Substantial alternative supplies are available at higher cost, from Queensland, North Africa and USA, and large deposits occur in Peru and in New Zealand waters on the Chatham Rise. Experimental direct applications of the Peruvian and Chatham Rise phosphates to New Zealand soils are already under way. Domestic manufacture of urea in New Zealand from natural gas is about to be developed.

The relative cost of obtaining effective phosphate responses on New Zealand soils in the future will be a key factor in determining the intensity of farming operations in the longer run. This is an area of high research priority.<sup>1</sup>

(f) Market orientation and marketing

The systematic and continuous identification of existing and potential marketing opportunities abroad will be an essential element in orienting the New Zealand response. This will be a necessary function and expense in the structure of private companies and statutory marketing bodies, as well as in the operation of the relevant government departments.

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<sup>1</sup> National Research Advisory Council: Phosphate Fertilizer Use: Report of a Working Party; Wellington, October 1978.

In particular, the requirements and preferences in the most potential future markets will call first for specific study, and secondly for adaptation of the New Zealand products as necessary and where possible. There is an institutional question here, in that some of the major export marketing bodies in New Zealand are heavily weighted by producer interests. If pastoral export performance in the future is to measure up to the potential opportunities orientation towards the customer will have to be integrated more effectively into the whole production marketing system.

The negotiation of market access and of more equitable international rules for agricultural trade as affecting small as well as large trading countries will have to be a continuing or increasing pre-occupation of the government.

Overseas marketing policy may well have to give more weight to longer term aspects and advantages. This seems to be the case in the dairy sector particularly. At present the New Zealand industry has access for a diminishing quota of butter in the EC at strictly administered prices, running at about one half of the United Kingdom wholesale price. In developing country markets, including those with dynamic growth prospects, New Zealand suffers severe competition from dumped EC surpluses. Present policy focuses sharply on trying to maintain the EC quota. Another option, possibly better tuned to the revival of expansion in the New Zealand industry, might be to use the EC quota to negotiate a higher administered price for NZ butter in the EC closer to the internal EC levels, and a reduction of EC dumping on other markets.



(g) Livestock resources

Breeds of sheep and cattle have been adapted by New Zealand farmers over the decades to succeed under New Zealand farming conditions and produce the types of product in demand in the United Kingdom market. The most popular types of livestock may not be so well adapted to serve the different preferences of the markets of the future, in North America, Japan, the Near East and other developing regions.

New Zealand cattle and sheep breeders have imported a wider range of livestock in the last decade. These have enlarged the variations available for the selection of breeds and strains to meet most effectively the needs of the future that can be assessed. The use of the high fertility Booroola breed to raise lambing percentages in New Zealand sheep flocks is being investigated.

In recent years deer have been transformed from a national pest into a national livestock resource under commercial farming, with promising export opportunities. A similar transformation of the rabbit, under controlled systems of production, has now been officially authorized.

(h) Horticultural resources

As indicated earlier, up to 10 per cent of the New Zealand soil area is suitable for horticulture, whereas only 0.2 per cent is currently used. The industry has been developed for the local market, but exports are now worth some 80-100 million dollars annually.

The main established fruit crops are pip fruits, citrus and kiwifruit.<sup>1</sup> They are expanding rapidly, especially kiwifruit which has the benefit of export incentives. Further growth is

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1 Statement from Plant Diseases Division, DSIR; May, 1978.



entirely feasible in these and other lines, such as stonefruit, berryfruit, and grapes. Profitability, and competition from domestic supplies in importing countries may limit the expansion of apple exports in the future. A number of newer crops are available and are being planted more widely, e.g. avocados, melons and blueberries. Revived interest is also being shown in the export potential of other crops such as passionfruit, feijoas and tamarillos. Possibilities for the future include many lines not yet grown in New Zealand commercially, such as Asian pears, prunes, sour cherries, persimmons, macadamia nuts, pecan nuts, guava, pawpaw and others. Cultivars of these species are being imported, selected and assessed.

Grass and clover seeds are already a significant export. For many other crops, seed production for export is feasible. Given the advantage of out-of-season supplies from New Zealand and the possibility of halving the time needed to produce commercial quantities of seed of a new variety, there is great potentiality for expansion of the seed export industry.

Thus the capacity to respond to a variety of overseas market opportunities is being enlarged, on the side of planting material and production methods. Some products, such as kiwifruit with high value for bulk, can be exported fresh, but most would require processing. A great expansion of exports would therefore require an enlargement of processing facilities. Production techniques on the farm would have to become more capital intensive and efficient for many processing crops.

The key to continuing expansion of export horticulture will be up to date overseas market information, and the integration of production and processing with marketing through efficient and flexible management systems.

Horticultural diversification would also have the desirable side-effect of reversing the trend of rural depopulation.

(j) Agricultural and horticultural research

The role of research, which has always been critical in New Zealand agricultural development, will continue to be of basic importance. The perspectives for the future, in New Zealand and abroad, as they are progressively clarified, will have to be increasingly reflected in the orientation of agricultural and horticultural research. The results of such research will strongly influence the response of New Zealand agriculture and horticulture to the challenges of maintaining and enlarging its role in the future world food economy.

All the research currently under way will no doubt have a contribution to make. The areas which seem at present to have strategic significance include the following:

- factors affecting the low cost status and long range comparative advantage of New Zealand farming systems;
- food and agricultural conditions, prospects and policies in important actual and potential customer and competitor countries;
- means for reducing costs in the post-farm gate stages of transport, processing, and marketing;
- cost reducing and efficiency increasing technologies and practices in fertilizer production and application, with special reference to the post-Nauru phase;
- improving the production and overall efficiency of hill country farms;
- factors and policies affecting farmers responses to opportunities to increase output;
- the introduction/adaptation/testing/breeding of new and improved plant and animal stocks.

(k) National economic development policy

The information and analysis so far available from the competent international agencies and various New Zealand authorities point to the possibility of larger markets becoming available for New Zealand's traditional pastoral exports in the next two decades than could be supplied without a faster expansion of New Zealand's pastoral industries than is currently taking place.

If import demand facing New Zealand should prove to be as strong as the available analysis indicates, world prices for New Zealand's traditional pastoral exports should rise in the long term,<sup>1</sup> thus tending to encourage increased production and exports. However, under past economic policies in New Zealand, the incentive effects of external farm product prices have been and are being reduced by the rapid rise of domestic prices and costs, which are kept more or less insulated from overseas competition. Thus, it is quite possible that the pastoral industries could remain without adequate incentives to increase production to match the expansion of export outlets at satisfactory prices.

This situation and broad outlook pose several strategic options for New Zealand. Three main ones can be identified.

One strategy would be to give a high national development priority to the rapid expansion of the pastoral industries. In view of New Zealand's pattern of resources, including a large component of hilly pasture lands, and comparative advantage in livestock production, this option deserves very serious consideration. It would not exclude the further processing of pastoral exports, especially for developed country markets, and the continuing expansion of exports of peripheral crops and horticultural products.

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1 Subject to cyclical fluctuations, affecting particularly beef and wool.

This strategy has gained support from recent Government policies. Relevant developments in this sense have included:

- the introduction of supplementary minimum price guarantees two years ahead for main pastoral products;
- the continuation and improvement of concessionary public loans for land development;
- the 5 per cent devaluation of the New Zealand currency in June 1979, and the subsequent controlled floating of the exchange rate;
- the controlled opening of the textile industry to foreign competition in lines where New Zealand production is relatively too costly to warrant protection, combined with export incentives in potentially competitive lines.

This last development is perhaps the most significant break with previous economic policies in New Zealand. It is a momentous if small beginning. If the same policy can be successfully applied to a wide range of other industries, the rapidly rising trend of domestic costs could be mitigated. This would have an important positive impact on the future course of profitability in major export industries, including pastoral farming. With the continuation of such a policy approach to manufacturing industry, one could envisage with more confidence the evolution of mutually supporting primary and secondary industry in New Zealand, with the whole economy becoming more internationally competitive. It is futile to expect agriculture or any other major industry to be internationally competitive in harness with highly protected service industries.

In the framework of such new domestic economic policies, a New Zealand role of rapidly expanding pastoral production and exports could be assured for the remainder of this century. This could provide the base for sound rural development and rural amenity programmes.

Another strategy would be for New Zealand to accept relatively slow growth in the pastoral industries and to rely increasingly on industrial exports based on large scale exploitation of abundant low cost energy resources, and on raw materials derived from farming. Under this option, the above industries would have priority in claims on the limited investment resources of the country. The primary industries would contribute to export earnings through more processing before export, more exports of high priced horticultural products and of forest products. However, as export lines move away from grass-based livestock products, New Zealand's international advantage would be harder to sustain.

This condition of retarded agricultural development is not uncommon as an accompaniment of accelerated industrial development. It has occurred in Uruguay and also in Argentina, which now imports dairy products from this country. There would not seem to be any fundamental reason why a strong emphasis on export-oriented industrial development could not be combined with the expansion of pastoral industries for export. But recognition of the basic needs of the pastoral sector and the national economy would have to be reflected in the national policy measures. The retention of large sectors of economic life quite insulated from external competition would be inimical to the success of large export industries, both primary and secondary.

Another strategy for New Zealand would be to reduce dependence on imports, and thus on export earnings. This option could be based primarily on the use of domestic renewable and non-renewable sources of energy and raw materials. It would certainly result in many export opportunities for livestock product exports being passed by. If carried very far, it would entail some limits on the expectations of New Zealanders as regards material standards of life.

Under past and present national economic policies, if not further modified, it is likely that the great pastoral industries will continue to react more to the overall disincentives in the domestic environment than to the growth of external markets.

## AGRICULTURAL POLICY PUBLICATIONS

Department of Agricultural Economics & Farm Management, Massey University

### 1. PROCEEDINGS, SUMMARIES OF DISCUSSIONS, ETC.

	Cost
1. Proceedings of Agricultural Policy Seminar 1976 - (C.W. Maughan Ed.)	Out of Print
2. Proceedings of Agricultural Policy Seminar No. 3 1977 - Two Volumes (C.W. Maughan Ed.)	\$3.00 per volume
3. International Seminar on the Role of Australia and New Zealand in World Agricultural Trade - Summary of Discussion 1978 -(C.W. Maughan Ed.)	Out of Print
4. Proceedings of Workshop on New Directions in the New Zealand Freezing Industry 1979 - (C.W. Maughan Ed.)	\$3.00

### 2. DISCUSSION PAPERS, RESEARCH REPORTS, ETC.

#### Agricultural Policy Papers

No. 1	New Zealand Development: The Problem of Imports and Exports 1978 (C.W. Maughan Ed.)	\$3.00
No. 2	The Future of N.Z. Agriculture - Economic Strategies for the 1980's (I. McLean)	— *
No. 3	Farm Production in New Zealand - An Analysis of Incentives and Disincentives 1978 - (C.W. Maughan & A.B. Ward)	Out of Print**

\* Published by N.Z. Planning Council. Not available at Massey University.

\*\* This report was incorrectly assigned the number 2 in the first edition. It is, in fact, No. 3 in the policy series.