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MARKETS AT HOME AND ABROAD A VIEW TO 1990

BUREAU OF AGRICULTURAL ECONOMICS · CANBERRA · A.C.T.

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'To prophesy is extremely difficult - especially with respect to the future.'

Chinese proverb

In 1942 Colin Clark made a projection of what he thought might be the situation in world agriculture in the 1960s.(1) He projected a substantial improvement - some 90% - in the terms of trade for agricultural commodities in the 1960s compared with the 1920s to 1930s. During the postwar world shortages of the early 1950s this projection may have had some validity; it became increasingly inaccurate during the 1960s. Agriculture's terms of trade are now about the same level as in Clark's base period. This well known attempt to look ahead has been regarded - perhaps somewhat unjustly - as a warning to anyone courageous enough to enter the field of long term prediction.

Economics has developed a lot since 1942. If, as suggested, some 90% of all the scientists who ever lived are alive today,(2) the percentage for economists is probably higher. As an economist, one might hope that the greater knowledge that these economists are developing would enable us to project ahead some 20 or so years with more confidence; to believe this, however, would be to put loyalty ahead of realism.

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* The assistance of Alan Hayman in the preparation of this paper is gratefully acknowledged. Other Bureau colleagues have helped in a number of ways, not excluding attempts to keep my feet on the ground.

(1) Colin Clark, *The Economics of 1960*, MacMillan, London, 1942, Chapter V.

(2) Alvin Toffler, *Future Shock*, Bodley Head, London, 1970, p. 27.

On the other hand, it is not possible to 'opt out' of looking ahead - to ignore the future is to take a conscious decision implying judgements about it. There are advantages in making one's assumptions explicit. For many investment and planning decisions now being taken, twenty years is not a long time.

The following discussion of the domestic and export market situation as it might be in the 1990s is concerned primarily to identify the key variables likely to influence the future rather than to provide absolute indicators of the future position. It is nevertheless subject to many qualifications and cautions.

A. Domestic Demand

The major factors determining changes in domestic demand are population growth rates, real income changes, changes in relative prices and changes in tastes.

While population and income growth rates are amenable to systematic projection methods, changes in relative prices and tastes are not. Changes in demand, due to the two latter factors may, at times, more than offset the effects of population and income growth.

(i) *Population*

The following table shows past and projected population figures for Australia:

Table No. 1
POPULATION PROJECTIONS: AUSTRALIA
(Millions)

1950	1960	1970	1980	1990
8.1	10.2	12.5	15.0 to 15.3	17.8 to 18.5

Source: Commonwealth Bureau of Census and Statistics, *Projections of the Population of Australia, States and Territories*, 1972 to 2001 (1970 Base Year).

These figures assume a net immigration figure of between 75,000 and 100,000 per year compared with the 88,000 achieved in the five years ended 1970. Official immigration programmes seem likely to be scaled down, but voluntary immigration may not tail off - indeed if the arguments about pressures of population growth on resources have any significance one would expect voluntary immigration to be maintained or to grow. In broad terms, therefore, it may not be unreasonable to expect an increase in the Australian population of some 5 million (which assumes a net immigration of 60,000) and possibly more in the next 20 years.

This represents a population increase of some 40% over the period. In the last 20 years, the domestic market for agricultural commodities has grown at about 2% per year, or about the rate of growth of population. If we take as a working hypothesis a population increase of 5 million, and if consumption per head remained unchanged, domestic demand would also grow by 40% or so, slightly less than 2% per year. To assess how reasonable this might be, it is necessary to consider possible income, price and taste changes.

(ii) *Incomes*

Income growth in real terms in Australia has been at a rate of some 4.5% per annum overall, or some 2.4% per head over the past 20 years (5.2% and 3.2% respectively over the past 10 years). Personal consumption expenditure has been growing in real terms at 2.4% per year in the last decade, or 1.6% per annum in the past 20 years. While the relationship between consumption expenditure and income may change over the next 20 years, a rate of some 2½% to 3% per annum in the growth of real income per head - or some 2% per annum in real consumption expenditure per head (a doubling in 35 years) would not seem an unreasonable expectation.

The difficulties of estimating the effect of income growth on demand are illustrated in Table No. 2. These show various estimates of income elasticities; not all the estimates are strictly comparable - some are based on cross section data and some on time series data. These

figures also reflect the difficulty of effectively isolating the income effect from relative price effects; the OECD in its projections has not attempted to separate them and their elasticities are composite estimates.

While it is possible to relate these elasticities to the per caput consumption expenditure growth figures discussed above, this would need to assume no significant changes in relative prices, (for the OECD relationships a continuation of the past patterns of change in relative prices), or in tastes in the next 20 years. Moreover, the elasticity is itself likely to change over time, particularly with growth in income or with changes in the distribution of income.

Table No. 2

INCOME ELASTICITY ESTIMATES: AUSTRALIA

Commodity	OECD	FAO	Other
Wheat	-0.6	-0.10	+0.2 (d)
Rice	+1.5	0.0	+0.36(a)
Sugar	-0.1	-0.10	
Beef and veal	-0.2	+0.20	+0.14(b)
Mutton and lamb	-1.2	-0.30	
Mutton			-1.7 (c)
Lamb			+0.1 (e)
Pigmeat	+2.0	+0.30	+0.12(b)
Poultry		+0.70	+0.14(b)
Total meat, poultry, fish and game			+0.15(b)
Eggs	+0.2	0.0	+0.2 (d)
Fresh milk	0.0	0.0	+0.05 to +0.075(d)
Cheese	+0.75	+0.4	+0.75(d)
Butter	-0.7	-0.1	-1.4 (d)
Citrus		+0.59	
Bananas		+0.50	
Other fruit		+0.82	
Vine fruit			+0.88(d)
Canned fruit			+1.3(d)

(a) J.J. Quilkey, 'The Demand for Rice' (unpublished Ph.D. dissertation) New England. (b) Bureau of Agricultural Economics, Beef Research Reports No. 3 and No. 8, *Household Meat Consumption in Melbourne and Sydney*, 1967 and 1970. (c) G.C. McLaren, reported in D.B. Williams (Ed.), *Agriculture in the Australian Economy*, University of Sydney Press, 1967, p. 270. (d) F.H. Gruen et al, *Long Term Projections of Agricultural Supply and Demand, Australia, 1965 to 1980*, Department of Economics, Monash University, 1967. (e) I.W. Marceau, reported in D.B. Williams (Ed), loc. cit. p. 270.

(iii) *Tastes*

This basket term covers the effects of new products, new knowledge or beliefs about existing products (e.g. health factors), technological changes such as spreadability in butter, as well as of tradition and changes due to the greater urbanisation of the population or any swing 'back to nature'. Past changes in taste patterns have been influenced by the high levels of immigration; even with a sustained inflow of migrants the impact of such changes is likely to be less in the next 20 years than in the past.

Possible taste changes are likely to increase per head consumption of commodities such as wine and perhaps cheese and to show up in some decline in per head consumption of commodities such as butter and tobacco.

There has been a significant increase in the proportionate consumption of processed food in Australia and this trend is likely to be maintained. For example, the proportion of fruit in the U.S. consumed in the processed form (42%) is over twice that in Australia (17%).[3] Moreover, continued development of techniques of food treatment, handling and presentation in convenience forms is likely to continue. Generally for high income, high food consuming countries such as Australia, while increased income does not lead to much additional expenditure on foods, it does lead to added expenditures on services associated with food.[4]

(iv) *Trends in Domestic Demand*

Over the past two decades per caput consumption of such items as poultry meat, cheese, fruit and vegetables has increased substantially (see Table No. 3); that of flour, butter and beef and veal has declined while per head consumption of wholemilk and sugar has stayed more or less unchanged.

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(3) See E.W. Bunkers and Willard W. Cochrane, 'On the Income Elasticity of Food Services', *Review of Economics and Statistics*, Vol. 39, 1957, p. 271 et seq; Marguerite C. Burk, 'Ramifications of the Relation Between Income and Food', *Journal of Farm Economics*, No. 1, 1962, p. 115 et seq.

(4) S.F. Harris, 'Australian Food Processing Industries and Their Raw Materials', *Food Technology in Australia*, August 1970, pp. 391-393.

Table No. 3

PER HEAD CONSUMPTION OF AGRICULTURAL COMMODITIES

1950 to 1970

Commodity	Units	1950	1960	1970
Total meat (a) *of which* -	lb (c)	236.3	233.9	253.8
Beef and veal	" (c)	131.6	85.4	87.2
Mutton	" (c)	38.4	63.2	43.3
Lamb	" (c)	24.6	38.2	50.7
Total red meat (excl. pork)	"	194.6	186.8	181.2
Total dairy products *of which* -	gals (d)	106.6	94.1	86.3
Fresh milk(b)	" (d)	30.8	30.5	30.3
Butter	" (d)	63.8	51.8	41.9
Cheese	" (d)	6.3	6.2	8.7
Other milk products	" (d)	5.7	5.6	5.4
Eggs	no.	229	210	220
Wool	kg	3.4	2.4	2.7
Cotton	"	5.2	6.8	8.1
Wheat	lb	256.6	250.9	233
Rice, milled	"	4.0	3.7	5.7
Refined sugar (excl. syrups, honey, glucose etc.)	"	121.2	107.4	110.4
Total fruits *of which* -	lb	170.0	173.0	217.4
Citrus	"	37.4	35.5	66.5
Bananas	"	21.2	26.0	22.8
Apples and pears	"	-	39.1	42.4
Dried fruit	"	9.5	6.2	5.3
Canned fruit	"	12.1	16.5	19.9
Total vegetables (incl. potatoes)	"	205.0	224.3	278.4

(a) Includes poultry. (b) Includes cream for human consumption.
(c) Carcass weight equivalent. (d) Wholemilk equivalent.

Source: Commonwealth Bureau of Census and Statistics, *Report on Food Production and the Consumption of Foodstuffs and Nutrients in Australia;* BAE estimates.

Looking ahead with no changes in consumption per head, the growth in demand would reflect simply population growth which was indicated earlier as about 40% to 1990. It is possible to classify the major commodities in terms of the likelihood of the local market increasing faster, more slowly, or more or less in line, with population growth. While this permits some subjective evaluation of income and possible taste changes, major changes in relative prices and in tastes could alter the position for any commodity very substantially.

In general terms the expectation is that the demand for wheat, sugar, butter and products such as wholemilk powder, as well as perhaps mutton and dried vine fruit will grow less rapidly than population growth; that for lamb, fresh milk, wool, possibly eggs, and canned deciduous fruit, demand will just about keep pace with population growth; while for a number of other commodities (beef and veal, poultry, pigmeat, cheese, cotton, coarse grains, rice, vegetable oils, and fresh fruit) the growth in demand will be greater than population growth, reflecting a positive income (Table No. 2) or taste effect on consumption per head. In common with the patterns observed overseas for example, wheat (or flour) consumption per head is expected to decline with the increase in incomes. The market for coarse grains is tied pretty much to the livestock industries and is likely to grow at least as rapidly as the poultry and pig industries - possibly more so to the extent that grain is used as a supplement to, or as a replacement for, grass in the beef industry.

Expenditure on products such as beef and veal tends to increase as incomes grow. In the past two decades, however, the price of beef and veal has increased relative to other commodities and per head consumption has declined. In part this was offset by increased consumption of other meats, particularly poultry and pigmeats. Although relative prices of beef are likely to remain high, some income effect could be experienced; at the same time existing high levels of consumption per head will limit the extent to which significant additional quantities of meats as a whole will be consumed. Total beef and veal consumption, however, could increase by as much as 50%. Mutton

consumption has tended to fall as income rises but the local market could well absorb an additional 75,000 tons by 1990, the extent of any per caput consumption decline possibly being offset in part by an increased use in processing. The possible domestic demand for lamb, even if demand per head does not change much, could take it to somewhat above the present industry production levels, while consumption of both pork and poultry are likely to continue to increase as prices fall further relative to other meats.

The pattern of the dairy industry demand seems likely to change, with a decline in consumption of butter per head (declining bread consumption and competition from margarine) but an increase in the demand, per head, of cheese; in the absence of major technological or taste changes, fresh milk consumption per head should remain relatively stable. By 1990, with the growth in population projected, the domestic market's requirements for milk in all forms could require a production level for domestic consumption alone approaching the current production levels.

The situation for fruits is complex; the costs of producing, handling and selling fresh fruit - involving a high labour cost for quality fruit in particular - will adversely affect the rate of growth of consumption per head. Tastes could well reinforce the demand for fresh fruit, however, but be less favourable for some processed fruits. Canned deciduous fruits, for example, have suffered a slowing in the rate of consumption in Australia because of the decline in the relative price of competitive products, such as ice cream and prepared desserts, and a reversal of this trend may be difficult to achieve. Some increase in the demand for other processed forms might be expected.

Generally, the Australian domestic market takes about 40% to 50% of our agricultural production. In the absence of major changes in tastes or technology, the growth in the domestic market overall could match pretty closely the growth in population. On the basis of a 40% population growth, the agricultural production needed to meet the requirements of the domestic market in 1990 would amount to between 60% to 70% of current agricultural and pastoral production.

B. Export Demand

The projection of export demand is more difficult than domestic demand. Again, the factors relevant to world demand are world population and income levels, which together with any taste and relative price changes, determine the total market in countries overseas for agricultural foods and raw materials. Additionally the extent to which this is likely to be met from domestic production in these countries rather than from imports then needs to be considered. This involves assessing the supply position in importing and competing countries as well as the impact of governmental trade and currency measures; these latter, in particular, are virtually nonpredictable.

The following population estimates seem unlikely to change much even if significant changes were made now in birth control practices.

Table No. 4
ESTIMATES OF TOTAL WORLD POPULATION
1950 to 2000
(Millions)

Area	1950	1960	1970	1980	1990	2000
World	2,576	2,986	3,632	4,457	5,438	6,494
Developed	858	976	1,090	1,210	1,336	1,454
Underdeveloped	1,658	2,010	2,542	3,247	4,102	5,040

Source: United Nations, *World Population Prospects, As Assessed in 1963,* (UN publication, Sales No. 66: XIII.2) 1966; United Nations, *The World Population Situation in 1970,* Population Studies No. 49, N.Y., 1971 pp. 45-46.

According to these projections the world must feed an additional 1.8 billion people in the next 20 years, an increase of almost 50%. While this seems large, the world has managed to feed an additional 1.0 to 1.1 billion people over the last 20 years. From the world food shortages of the late 1940s and early 1950s, the current situation is one of periodic surpluses with land going out of production in traditional producing areas such as the U.S., and increased emphasis in a number of countries on physical controls on production.

There are still large number of under-fed and under-nourished people in the world but FAO recently said that although there are some 300 to 500 million people suffering from malnutrition, this is about the same number as 15 years ago.(5) Colin Clark and others, however, charge that the FAO greatly exaggerates the extent of hunger in the world.(6) Even accepting the FAO estimates we need to recognise that they exist concurrently with an excess of labour resources in agricultures throughout the world and, in some countries, an excess of land.

(i) *Some Futurology*

Claims are being made that, with the population explosion, a critical food shortage is either upon us already, as writers such as Erlich have argued(7) or is imminent.(8) If these claims were valid a significant impact could be expected on the world market for agricultural commodities in the period under review, including those exported by Australia. It seems unlikely that this will be so.

The proponents of these views tend, as did Colin Clark in 1942, to underestimate the potential for increased production that exists in agricultures throughout the world even with known technology, quite apart from the likelihood of new technologies; moreover, they put too much emphasis on the role that land as such plays in the process of agricultural production rather than the capital and technology that is applied to it.

In the past two decades, the growth of agricultural production has exceeded that of population.(9) There are reasons to think that this will also be so in the next twenty years. It is not necessary to accept

(5) FAO, *State of Food and Agriculture*, 1972.
(6) Colin Clark, *Starvation or Plenty*, Taplinger, N.Y., 1970, Chapter I.
(7) See, for example, Paul R. Erlich, *The Population Bomb*, Chaucer Press, 1968.
(8) The thesis propounded in D.H. Meadows et al, *The Limits to Growth*, Universe Books, N.Y., 1972. See also J.W. Forrester, *World Dynamics*, Wright-Allen, Cambridge, Mass., 1971.
(9) USDA, *The World Food Budget 1970*, Foreign Agriculture Economic Report No. 19, October 1964, p 19; FAO, *Agricultural Commodity Projections*, 1970-1980, Rome, 1971, p. 13.

in full the conclusion of Colin Clark, that at present U.S. standards of food consumption and with present technology the world could provide food for 35 billion people,[10] or the implications he draws from it, to accept that possibilities exist for substantial increases in food production without looking to synthetic proteins or non-agricultural foods to fill the gap.[11]

If we limit our horizon to 1990, there seems little reason to expect any basic structural change in the nature of world production, consumption and international trade. In the absence of any major political or social change the expectation is that the tendency will be towards periodic overproduction, in relation to effective demand, in the major crop products and possibly also in the case of some livestock products.

Looking further beyond - with the expected addition of an additional 1 billion people in the 10 years from 1990 to 2000, and accelerating growth possible beyond that, significant changes in the relative prices of agricultural commodities may take place or pressures show up on food supplies. But even then Malthus is unlikely to come into his own.

This is not to underestimate the magnitude of the enormous problems to be faced in the years ahead.[12] Nor is it to deny that there exists a food problem of major intensity, which could well persist.

But the social and political, as well perhaps as the technological problems and pressures that rapidly expanding populations with growing - but widely varying - levels of real income are likely to generate, could prove more important constraints than the capacity of the world to feed these populations. For example while, as Norman Macrae has pointed out,[13] 60% of the world's population still lives on farms,

(10) Colin Clark, *Starvation or Plenty*, pp. 157-160.
(11) See, for example, Willard W. Cochrane, *The World Food Problem*, Cromwell, N.Y., 1969.
(12) See Toffler, op cit; Meadows, op cit.
(13) *The Economist*, 22-28 January, Supplement on The Future of International Business, p. xiv.

this proportion will have to decline for the necessary agricultural efficiency to be achieved. The drift to the cities that this implies, added to the further pressures of the immense growth in populations could provide a critical social and political disorientation to add to the existing and growing problems of urbanisation.

(ii) *Export Market Trends*

The major part of Australia's agricultural exports are directed today - and are likely to continue to go - to the higher income countries of Western Europe, the United States and Japan. But increasing trade barriers in the developed countries and income growth in the developing countries is likely to result in a larger proportion of our agricultural exports going to less traditional markets in the developing countries.

Demand for agricultural commodities in the developed countries will grow relatively slowly. Generally their populations are well fed with limits to the additional food - in quantity terms - they can eat. Growth in demand in these countries is consequently related closely to population growth which, over the next 20 years will be about 20% to 25%. Population growth in the developing countries in the same period is likely to exceed 60%.

Demand in the developing countries will consequently grow more rapidly simply to maintain present diet levels. Increases in real incomes are also likely to result in a significant additional demand for agricultural foods. The potential additional demand in the developing areas is consequently very substantial, but there will be tight limits on the extent to which this demand will be made effective in international trade. There seem to be no strong grounds for expecting these countries as a whole to achieve, or to permit, a markedly different balance of payments position such that they will be able to import major parts of their agricultural commodity requirements.

(iii) *Developed Countries: Demand Trends*

Trends in consumption in these countries will be broadly comparable to those expected in Australia. Consumption of high calorie foods such as bread grains, rice and potatoes will decline and, reflecting changing dietary habits as well as availability of substitutes, so will butter; there will be some increase in per head consumption of high protein foods such as red meats and cheese as well as in textile fibres. In Japan and parts of Southern Europe consumption per head of livestock products generally could increase significantly as, to a lesser extent, could that of sugar; bread grains in Japan are likely to increase further at the expense of rice.

(iv) *Developing Countries: Demand Trends*

Trends in consumption of foodstuffs in these countries are likely to show some increase in protein rich foods. Income growth will in part determine changes in food demand as will the success of attempts to develop livestock industries and high protein vegetable products such as pulses, etc. Trade can be expected to follow existing patterns with cereals significant, including grain imports to sustain growth in indigenous livestock industries.

These countries will attempt to meet the major part of their livestock industry demands from local production with some trade possible where associated imports are necessary, e.g. skim milk powder imports for combining with local vegetable oils as reconstituted milk or grain imports for livestock feeding. As in developed countries per caput consumption of textile fibres is expected to increase.

(v) *Centrally Planned Economies: Demand Trends*

The total consumption of foods in these countries is expected to increase with their expanding populations and improving incomes. Increasing urbanisation will also have an impact on the demand for commercial supplies. Because of their relatively lower and generally more even distribution of incomes, a substantially large proportion of the increase in incomes is spent on food and textile purchases. As in

other countries the pattern of demand tends to change with income increases but the effect of this change is only beginning to become apparent. The diet in many areas is still primarily based on cereals, potatoes and vegetables with fish as an important traditional source of protein.

As economic development has proceeded, national priorities in the allocation of resources have been adjusted to take more account of industrial consumer goods. If this trend continues it would provide a promising growth in the demand for agricultural raw materials such as wool, cotton, hides and skins.

These countries are pursuing an objective of raising self-sufficiency in their requirements of agricultural products and of increasing trade within the bloc. Imports are regarded as a residual, arising largely from seasonal fluctuations in domestic output. These fluctuations however can give rise to large variations in their requirements of particular commodities from other countries and/or in their supplies to the world market.

(vi) *Production Trends*

Apart from wool Australia is, as a trader, almost inevitably a marginal supplier. Most countries in the world - whether developed, developing or centrally planned - attempt to supply the bulk of their agricultural requirements from their own production.

To support this aim, governments in importing countries use a variety of methods to limit imports: tariffs, variable levies, quantitative import restrictions and licensing as well as straight out import embargoes. These measures partly protect and encourage local industries and partly, in the developing countries, save foreign exchange. Through various industry price support and other production incentive schemes, they also encourage production of commodities for which an actual or potential import demand exists.

In the developed countries, scope for increased production remains great. In Europe, for example, excessive fragmentation of holdings remains a major problem. With restructuring and consolidation of small holdings substantial increases in production are possible. In North America further increases in yields appear possible with existing technology; substantial acreages have already been taken out of production under existing support policies.

Generally even though some impact is being felt on the availability of land with the growth of population and the urban spread in Europe, the capacity exists for a rapid growth in agricultural production if economic pressures and government action make this worthwhile.

This view is supported by the projections of the FAO (to 1980) and the OECD (to 1985).(14)

Compared with an early 1960s production of grains in Europe of 115m metric tons, the OECD projects a production in 1985 of 174m metric tons. The comparable figures for North America are 192m metric tons and 362m metric tons respectively.

With the projected expansion in production in the exporting countries including Australia and a projected reduction in the European import requirement, a potential for surplus production is inherent in the projections.

European production of beef and veal is projected to increase from 6.1m metric tons to 8.2m metric tons, that of North America from 8.3 to 13.9m metric tons. A significant deficit is projected.

In general, the projections point to a surplus of wheat, rice, coarse grains, sugar and oilseed products in the 1980s but to a deficit in meats.

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(14) OECD, *Agricultural Projections for 1975 and 1985*, Paris, 1968.

On this basis, trade will remain important for Australia in grains and in meats, though the overall growth in Australian agriculture is projected to slow somewhat. Increased consumption of textile fibres is also predicted.

It is important to remind ourselves that projections are not forecasts, though with present and prospective beef prices few would differ from the long term expectations to which these projections may give rise. They could well be right but although hard to visualise beforehand, projections themselves are usually self correcting, often with an over-reaction. The forecasts in 1947 of shortages of temperate foodstuffs gave way to surpluses; the seemingly permanent U.S. dollar surplus gave way to an enormous dollar deficit; more recently wool prices have experienced an unimagined price turnaround.

Importing countries, such as Japan, expecting a shortage of beef at the end of the present decade could be expected to attempt to secure their supply position. The Japanese are concerned at the prospective meat and feedgrain position and are looking at ways of improving the availability of supplies.

The limitations of projections and the need for frequent revisions can be seen from FAO's projections for Australia. By 1980 the FAO has projected that Australia will be exporting some 450,000 tons of beef and veal: in 1971-72 we exported almost 600,000 tons. The likely level of exports of beef and veal by the 1980s is substantially greater than that; 1.0m tons by the mid-1970s is not improbable.(15)

The assumptions of the FAO projections, and to a lesser extent those of the OECD, understate the likely or possible rate of growth of Australian beef production. They seem also to have understated the rate of growth of demand,(16) however, and this may offset to some extent the production underestimate.

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(15) BAE, 'Prospects for Australia's Beef and Veal', Attachment C in *Report on the Australian Wool Industry 1971-72* (Randall Report), Commonwealth of Australia, Canberra 1972.

(16) I.M. Roberts, and G.L. Miller, 'The EEC Market for Beef and Veal', *Quarterly Review of Agricultural Economics*, Vol. XXIV, No. 3, July 1971.

In part, any excess of demand would result in increased prices which would itself constrain demand. In part it would show up in increased demand for feed grains, though in the view of the OECD not sufficiently to meet the increased potential grain availability from the growth in the grain producing capacity available to OECD countries including Australia.

The projections for dairy products similarly suggest trends towards surplus at least in the early years of the projection period, moving towards a balance with declining production and a switch to beef production.

The FAO and OECD projections are for the period to 1985; in general there are no particular reasons to expect that had the projections been made for 1990 instead, there would have been significant differences in the results.

(vii) *Substitutes and Technological Change*

The demand and supply trends discussed assume little change in the relative position of substitutes and no major technological changes with a significant effect on the pattern of agricultural production and demand. While the total market for textile fibres is expected to grow at a faster rate than population, largely due to the effect of income rises, each fibre will have to compete for its share of this total market, taking account of the availability of supplies and its adaptability to processing and fashion changes.

Any technological developments in synthetic fibres could be expected to affect the wool market. Technological changes need not work only against wool; development of easy care and washability characteristics for wool has improved its competitive position and further research is being undertaken to improve the textile qualities of wool.

Although we have witnessed a long period of downward prices for synthetic fibres, there appears to be some belief that the economies of scale production, given existing technology, have been largely exhausted. If so, general inflationary pressures, particularly those applicable to labour costs, should start to exert themselves on synthetic fibre prices.

The doomsday men foresee early pressures on the available supplies of petroleum resources. This may not affect the supply position of synthetic fibres as the usage of such products in synthetic fibres is relatively small. Of total world plastic production of 27m metric tons in 1971, some 21%, or about 5.8m metric tons was synthetic fibres. Total plastic production currently absorbs some 2% of annual petroleum usage;(17) i.e. synthetic fibres require less than ½% of annual petrol usage. Moreover, coal is an alternative production base and more ample world stocks of coal are known to exist. Any significant rise in prices of petroleum products, however, could influence synthetic fibre prices in the period under review since these are an important component of the cost of such fibres, as could a switch to coal as a base since this is presumably more costly.

Synthetic substitutes are also potentially important competitors for meats. The basic technology for producing synthetic meat is well established. Soya bean protein extenders (wheaten and other proteins can also be used) are being used, and are economic to use. In the U.S., for example, it has been found technically possible to extend the hamburger mix by 25% to 30% using synthetic meat, while maintaining the palatability of the end product and reducing unit costs by 20%. Their use at present in the U.S. is no greater than 1% of total meat production because of a number of factors, including labelling laws. But by 1980 the USDA expects them to replace between 4% to 8% of the meat market, although they still expect an increase in U.S. meat requirements of some 20% by 1980. The growing use of meat extenders could affect the U.S. cow beef market and our own export market supplying the manufacturing beef market which is vulnerable to the inroads of synthetic meats.

(17) S.R. Bradley, Chairman, British Plastics Federation.

A survey of major food suppliers in the U.K. indicated an expectation that although presently only constituting a very small part of the market, by 1990 some 25% of the market would be met by the new meat substitutes.

Their use generally remains small, but interest has been greatest in the U.S., Japan and Britain, all markets for our meat. If projected shortfalls of beef give rise to sustained high prices, the inroads could be significant. While prices remain high this may not matter; the unknown factor is whether meat or the synthetic substitutes would take the brunt of any reduced demand and subsequent price falls.

As for wool, technological changes taking place in the presentation and marketing of meat should assist in holding meat's competitive position.

Technological changes are also possible for dairy products - whether in terms of ultra high temperature treatment of milk which could change milk from a perishable to a stable product or of development of reconstituted milks.

C. Summary

In summary, the domestic markets for Australian agricultural products are likely to grow substantially in the next 20 years. This growth will be broadly in line with population growth; that is, if as seems possible, the Australian population increases by some 40% by 1990, the domestic market will increase by a similar proportion though differently for different products.

The world population is growing at a rapid rate such that a further 1.8 billion people will have to be fed in the next 20 years.

In the past 20 years the world has shown itself capable of feeding an additional 1.0 to 1.1 billion people, with food production expanding faster than population.

With population increasing and with growth in real income, the demand for food will rise and, in the developing countries available food supplies may be inadequate to meet this demand without prices increasing. This could be a problem if the countries concerned cannot afford to import. This world, however, should be able to feed the growing population with some improvement in per head consumption for some time to come, although this may not meet the food problem of the developing countries which stems from their overall problems of low incomes.

Problems of a social, political or technological nature are likely to provide constraints on the rate of growth of the world's population more rapidly than the physical capacity of the world to produce food. For present purposes, however, this means that at least into the 1990s the world population problem is unlikely to affect significantly the export markets for Australian agricultural products.

Australia's export markets have been primarily in the developed countries which have the resources to make their demand effective. With high existing levels of consumption and low rates of population growth, the growth in demand in these countries is relatively slow. For a number of commodities, and particularly for grains, the capacity for production in the developed countries seems likely to expand faster than demand; whether or not this capacity is utilised will be influenced by relative grains and meat prices. Because of the growth in protective measures the reduction in their net deficit is carried by traditional agricultural exporters such as Australia. Because of the increased barriers to trade and with the growth in real incomes in the developing countries, Australia has been increasing its trade with the developing countries and with the centrally planned economies.

Production capacity is expanding outside the developed countries and there is a limit to the extent to which these countries can or are prepared to replace the diminishing import markets in the developed countries for a number of commodities.

Thus, the possibilities of periodic surpluses as well as periodic shortages in crops, such as wheat, coarse grains, sugar and oilseed products are likely to remain through to the 1990s. The expectation is that for meat products in particular, the market will remain firm in the longer term though a number of countries seem likely to make strenuous efforts to remedy the shortage over the longer term; relatively slow growth in grains prices in the EEC, for example, could result in increased production of fed beef.(18) Japan is also taking steps to ensure supplies of meat products.

The difficulties of projection exercises of this kind are already reflected in the movements away from the projected results in practice. Technological, taste and price changes are likely to be major influences in ensuring that the projected results are not achieved; projections themselves, to the extent that notice is taken of them are to a degree self correcting, often with overshoot.(19)

Clearly, however, the agricultural sector will remain a major industry with a significantly larger home market to supply and a substantial export market role possible if it can retain the flexibility to absorb the ups and downs of export marketing in much the same way as it has in the past.

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(18) See footnote (16).

(19) G.L. Miller and S.F. Harris, 'Price Formation, Price Projections and Commodity Marketing Research', paper given to the 16th Annual Conference of The Australian Agricultural Economics Society, Sydney, February 1972.