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O.T.W. PRICE

T.W. PRICE speech book

ECONOMIC DEVELOPMENT INSTITUTE

General Development Course, 1967-68

Seminar 5: Agriculture 5/2

Chairman: Mr. Gittinger
Associate: Mr. Schlesinger

Session 2:	Tuesday, January 2 (3:00 p.m.)
Topic:	Fertilizer Policies for Developing Countries
Readings:	"Investment and Trade in Fertilizer Nitrogen" (attached)
	"Economics of the Use of Fertilisers and Crop Protection Chemicals in Agriculture" (attached)
Speaker:	Mr. Owen T. W. Price (IBRD)
Outline:	None
Additional Readings:	None

INVESTMENT AND TRADE IN FERTILIZER NITROGEN*

O.T.W. Price**

Nitrogen is in many respects the most important single fertilizer nutrient affecting the rate of expansion in world agriculture today. Nevertheless to realise the full potential from raising the rate of nitrogen fertilizer usage a number of other conditions conducive to plant growth must also be satisfied. Amongst the most important of these are (i) an adequate supply of other nutrients essential for plant growth, (ii) sufficient moisture, (iii) the use of crop varieties capable of responding to heavy fertilizer treatment and (iv) good crop husbandry.

The development of fertilizer practice in many countries passes through at least three phases. In the early phase where little fertilizer is consumed and yields are traditionally low, nutrients are often used singly, particularly nitrogen and phosphate. As farming becomes more intensive, however, mixtures and compound fertilizers increase in popularity and 'complete' fertilizer treatment becomes widely practised. In the third phase, as crop production becomes even more intensive the rate of nitrogen use in particular, either as a topdressing or as part of high N compounds increases faster than P_2O_5 and K_2O. Perhaps the best examples of this pattern at each end of the scale are provided by Australasia, with a relatively low rate of fertilizer treatment per acre which has a nutrient ratio of $N:P_2O_5:K_2O$ of $1:1\frac{1}{2}:1\frac{1}{2}$ and Japan which uses fertilizers very intensively with a ratio of $1\frac{1}{2}:1:1$. Nitrogen used as a single nutrient is also very popular on peasant farms in the tropics and semi-tropics where heavy rainfall and high humidity lead to rapid leaching and decomposition of any nitrogen available in the soil. For this reason, although the rate of application per acre might not be high in these areas compared with parts of Western Europe or Japan, nevertheless the use of N relative to P_2O_5 and K_2O is also high, e.g. the Indian

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** Agricultural Economist, International Bank for Reconstruction and Development (World Bank), Washington, D.C. The views expressed in this paper are those of the author and do not represent either those of the IBRD or those of Imperial Chemical Industries to which the author was formerly attached.

sub-continent, south-east Asia and parts of China.

Land suitable for cultivation without major capital investment is limited in many of the developing countries of the world and their main opportunity for raising agricultural production must be in raising yields per acre. Nitrogen fertilizer will be required in increasing volume for this purpose.

FORECAST DEMAND FOR FERTILIZER N

Growth in the effective demand for fertilizer nitrogen over the next decade must underlie the pattern of investment and trade in nitrogen. Taking account of past rates of growth in consumption, increases in population and the need to raise levels of nutrition in the developing world in particular, Table 1 presents a forecast for 1975/76. This is not an attempt to state the need for fertilizer N in that year but to present a realistic target which is capable of achievement.

Table 1

Forecast of world fertilizer N consumption over the next decade

Regions	Actual million tons N 1965/66	Forecast million tons N		Growth rate 1965/66 to 1975/76
		1970/71	1975/76	
Industrial	15.6	30.0	42.0	10.4
Developing	4.4	9.0	18.0	15.2
World Total	20.0	39.0	60.0	11.6

This forecast suggests that world fertilizer nitrogen consumption will need to increase at some 4 million tons of nitrogen a year over the next decade. To achieve this expansion, regardless of where it is undertaken will entail investment in ammonia plants, in storage facilities, and in conversion plants, for the manufacture of urea, ammonium nitrate, ammonium phosphate and compound fertilizers.

All too frequently published estimates of the capital required to establish a fertilizer complex cover only a part of the total investment which becomes necessary in practice. On the assumption that

the total capital required to establish additional ammonia plants, conversion plants and storage facilities amount to a minimum of $200 per ton of nitrogen, it follows that new investment in fertilizer nitrogen facilities throughout the world will be required at the rate of $800 million per annum. Even if it is considered that the forecast rate of expansion in nitrogen consumption is too high, it will be apparent that the sums of capital involved must be formidable. Perhaps of even greater significance is the likelihood that the demand for fertilizer nitrogen will grow more rapidly in the developing regions of the world than elsewhere (see Table 1). These are areas which, in general, are extremely short of capital and particularly of foreign exchange with which to import capital equipment. If the fertilizer nitrogen requirements of the developing regions over the next decade were met entirely from an extension of indigenous production this could entail an annual investment of $400 million per annum in these regions alone.*

SOME INVESTMENT CRITERIA

Developing countries are frequently faced with the dilemma of whether to import products or make them locally. In the case of fertilizer nitrogen they are faced with three broad choices, namely:-

(a) to import finished nitrogen products;

(b) to import an intermediate product - ammonia - and convert this into finished products indigenously;

(c) produce ammonia and finished products indigenously and possibly import hydro-carbon feedstocks.

In deciding amongst these choices certain economic factors must be taken into account. The problem should first be examined as a commercial proposition. When this is done the first fundamental comparison which has to be made is to establish whether the cost of freight and handling the imported product outweighs the difference in operating costs between a developing country and an exporting country. It is being assumed that costs of manufacture in a developing country will be greater than in an industrial country because capital costs tend to be some 20 percent higher and because an industrial country is more frequently able to take advantage of the economies of scale associated with ammonia and conversion plants than a developing one. Costs of production per ton of ammonia for large plants almost

* Higher investment costs per ton of N have been assumed for the developing regions than for the world generally.

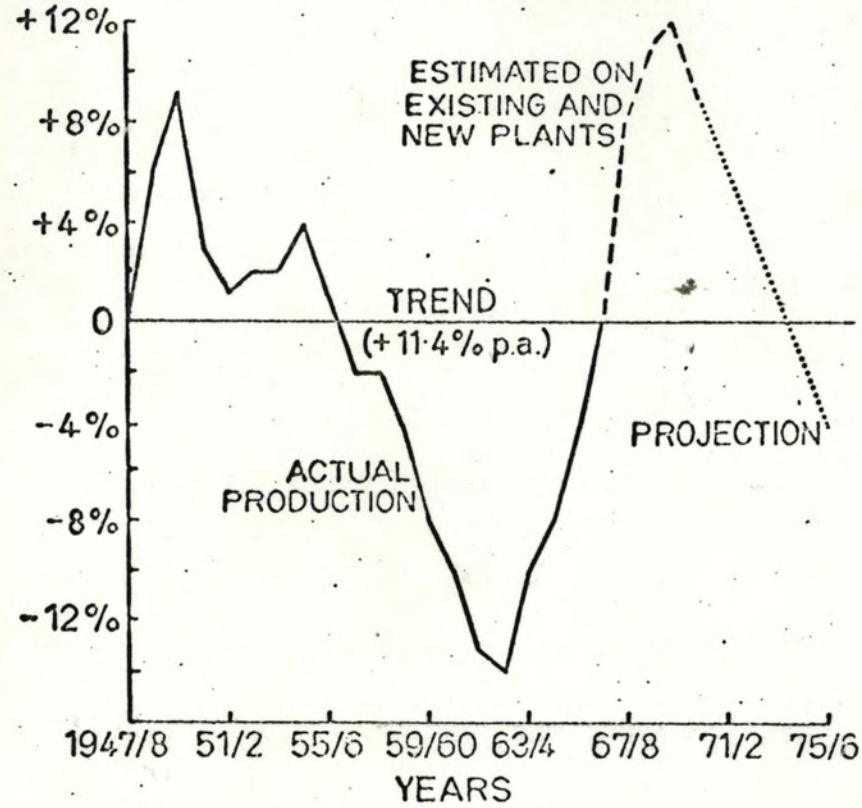
half those for small plants are sometimes quoted (see Appendix Table 1). Freight costs can also vary enormously depending on the location of the fertilizer market. For example, where a finished product has to be transported not only be sea but also up-country in some of the developing regions and allowance is made for handling and storage so that the imported product is being treated as if it were in the local factory warehouse or storage tank, freight costs can sometimes be very considerable thus giving a natural geographical protection to indigenous manufacture. A comparison of this type on the basis of straight-forward commercial criteria would frequently show that where the total market was only say 10,000 - 20,000 tons of nitrogen it would be more economical to import the finished products than to consider any form of local manufacture. As liquid ammonia becomes increasingly available in international trade in the future, I would suggest that for markets of between 50,000 - 100,000 tons of ammonia it will frequently become possible to demonstrate that such markets could best be served by importing ammonia for conversion into finished products in the local markets. Markets requiring in excess of 150,000 tons of ammonia should usually prove to be capable of supporting viable ammonia and conversion plants.

Most developing countries are seriously short of foreign exchange with which to purchase fertilizers or capital goods and a further criterion which they must frequently consider is the effectiveness of an investment in saving or earning foreign currency. Factors to note here are (i) some 40% or more of the capital costs of erecting a nitrogen fertilizer complex is local capital which would not have to be paid for in foreign currency whereas all the imported finished fertilizer products would have to be paid for in foreign currency; (ii) Is there a cheap supply of indigenous hydro-carbon feedstock available? For example, is naphtha available as a by-product from refining and has it no alternative use except for exports? In this case it should probably be costed into the plant at an export f.o.b. value rather than its full market price. (iii) Is there a large pool of labor and even technical staff available which is at present unemployed? In such an instance, the national interest might best be served by including their services at less than full cost.

In considering investment in a developing country some account should also be taken of the level of activity in the chemical construction industry. The world production of fertilizer N has shown a cyclical variation around a growth trend over most of this century (see Appendix Chart A). This has been associated with cyclical variations in the level of investment in ammonia plants. Chart 1 attempts to estimate the trend of production and variations around it up to the early 1970's.

CHART 1

WORLD FERTILIZER NITROGEN PRODUCTION
OVER THE NEXT DECADE -
FORECAST
CYCLICAL VARIATIONS AROUND TREND



The construction industry has recently passed through a marked peak of activity which has led to the industry being over-stretched, completion dates delayed and even, I suspect, tendering for new business not as competitive as it might have been. The large upsurge in capacity is expected to lead to temporary over-production and depressed fertilizer N prices over the next 3/4 years and already in anticipation of this, a reduction in investment activity is occuring. It takes several years, however, to plan, construct, and bring a new fertilizer complex into full production. I would suggest that the developing countries in particular should consider anti-cyclical investment in fertilizer N complexes. This would have the dual advantage of (1) enabling them to have their plants built in the time promised and at very competitive prices when there is a slack in the chemical construction industry; (2) it would increase their indigenous supply of fertilizer N in the mid-nineteen seventies when prices on world markets will probably be rising quite rapidly.

While there are some obvious criteria which must be taken into account in deciding whether to invest in fertilizer N plants in developing countries it will be apparent firstly, that the decisions of private industry and the state could be different and secondly, that when all the relevant factors are taken into account almost every investment decision relating to fertilizer N plants tends to be unique. Consequently it is a subject on which it is impossible to generalize. Equally there can be little doubt that it will continue to make sound economic sense to import finished or semi-finished nitrogen products into the expanding markets of many of the developing countries for years to come.

For a given market, imports and investments are really two sides of the same coin. Do you make the product locally or do you import it?

INTERNATIONAL TRADE IN FERTILIZER N

World trade in fertilizer nitrogen has grown from 1 million tons of N in 1950 to $4\frac{1}{2}$ million tons in 1965/6. This represents nearly a quarter of total world consumption in that year (see Table 2).

Table 2

World Fertilizer N Consumption and Trade in 1965/6

million metric tons of N

	Consumption	Imports
Industrial regions	15.6	2.1
Developing regions	4.4	2.5
Total	20.0	4.6

Part of this trade has been between industrial countries such as that which occurs within Western Europe and between Canada and the United States. In 1965/6, however, $2\frac{1}{2}$ million tons or more than half of the total world trade in fertilizer nitrogen was accounted for by the imports of the developing countries. Furthermore, imports accounted for over half their total supplies. Local trade between the industrial countries should not be expected to expand much and any major changes must be looked for in the pattern of trade with the developing countries.

Several factors influence the level of trade in fertilizer N and the following are particularly relevant in making an estimate of the future level of fertilizer N imports to developing countries:

(i) buoyancy of trade in primary products

(ii) economics of production

(iii) availability of capital

(iv) balance of payments

(v) trade aid schemes

(vi) political and strategic considerations

(i) Buoyancy of trade in primary products

Table 3 shows that as exports from the primary producing countries were rising rapidly so were their imports including fertilizer imports.

Table 3

Annual Rate of Change in Trade of Primary Producing Countries*

Period	Value of: Total Exports %	Total Imports %	Fertilizer N imports	Quantity of Fert. N imports	Ferts. as % of Total Imports
1947/8-1955/6	+ 5.1	4.8	+ 15.5	+ 12.7	0.9
1955/6-1962/3	+ 3.4	3.4	+ 0.7	+ 8.6	0.5
1962/3-1964/5	+ 7.6	7.0	+ 12.8	+ 4.0	0.6

* Primary producing countries include some highly developed countries. This table nevertheless serves in general terms to illustrate the problems of developing countries which are still primarily agricultural producers.

In the period 1955/6 to 1962/3 when the growth in export earnings slowed down so did the demand for fertilizer N on world markets weaken considerably. There is an additional factor that the export earnings of the developing countries arises in substantial part from the export of agricultural cash crops (sugar, tea, rubber, cocoa, coffee, etc.) and the terms of trade were moving against many of these products during the latter part of the fifties and early 1960's. As the export earnings of the primary producers revived from 1962/3 onwards, so also did their expenditure on fertilizers. Lack of supplies and high unit prices did not lead to a commensurate increase in the volume of imports. Table 3 emphasises very strongly that the expenditure on fertilizer imports to the developing countries will be substantially influenced by their supply of foreign currency which must either arise from export earnings or foreign aid.

(ii) Economics of production

I have already discussed the economies of scale (associated with new processes) which favor large plants. This would result in many instances in the developing countries or areas within a developing country being able to import fertilizers far more cheaply than they could be produced locally. The large new ammonia plants also have a high level of fixed costs and many of the apparent economies of scale disappear if these plants are not operated at near full output, (see Table 4).

Table 4

Effect of under-occupacity on NH_3 production costs of a large plant*

% of plant capacity employed		100%		70%		40%	
	Unit price	consumption/ton NH_3	cost/ ton NH_3 $	consumption/ton NH_3	cost/ ton NH_3 $	consumption/ton NH_3	cost/ ton NH_3 $
Naphtha:- for process	$/ton 20	0.535	10.70	0.535	10.70	0.535	10.70
for heating and additional steam generation	$/ton 20	0.291	5.82	0.386	7.72	0.710	14.20
Cooling water	$/m3 0.0075	230	1.73	247	1.86	402	3.02
Electric power	$kWh 0.0125	30	0.38	38	0.48	60	0.75
Boiler feed-water	$/m3 0.20	2.25	0.45	2.37	0.48	2.47	0.50
Chemicals & catalyst			0.75		0.75		0.75
TOTAL VARIABLE COSTS			19.83		21.99		29.92
Operators	$1.75/hr.6 men/shift		0.42		0.60		1.05
Maintenance	3%/annum		1.77		2.53		4.43
Capital cost	13.5%/annum		7.97		11.39		19.95
TOTAL COST PER METRIC TON NH_3			29.99		36.51		55.35

* 200,000 tons/year (600 metric tons/day) NH_3 plant. One centrifugal type steam driver compressor. Battery limits investment $118 m. see European Chemical News Vol.11. no. 270. March 31, 1967.

It follows that during the next few years with a market situation in which supply will tend to be in excess of demand that the developing countries will probably be able to import finished fertilizer nitrogen products relatively cheaply. They would be well advised to take advantage of this situation to seed and develop their home markets with cheap imports so that indigenous plants under construction could reach full production capacity more quickly when they come on stream.

(iii) Availability of capital

Since the developing countries frequently have to purchase their capital equipment from abroad, one measure of the capital available for investment is provided by their gold and foreign exchange reserves.

Table 5

Trends in Gold and Foreign Exchange Reserves

	Total $ '000 million*			Per head of population 1965
	1957	1960	3rd Quarter 1965	
Industrial countries	39.4	44.6	52.2	80
Primary producing countries	11.7	10.7	16.7	10

* International Financial Statistics - I.M.F. Feb. 1966.

Table 5 shows that the indigenous foreign currency available for expenditure on imports is considerably lower in the developing countries than the industrial countries. The oil producing developing countries are an important exception and have substantial capital reserves for the import of consumer goods and capital equipment if they so wish.

Owing to the shortage of available capital for importing equipment, developing countries are frequently dependent in part on foreign investment either by private enterprise, governments, or

international organizations such as the World Bank to finance their capital expansion programs. Many of the developing countries, either due to the danger of nationalization, rampant inflation, restriction of profit levels, or limitation of withdrawal of profit to the parent company, discourage private investment. In these circumstances there is a strong tendency on the part of private enterprise to invest in fertilizer plants in countries where the risk of losing one's capital is least and to export from these bases. Certain European producers are clearly operating on this premise and prefer to invest in ammonia plants at home, have an assured home market for part of their production and export the remainder.

It is essential, however, that the developing regions of the world try to mobilize foreign private investment to serve their markets in whatever form this is possible. Even off-shore investments in large ammonia plants near oil or natural gas fields which are undertaken by private industry should be encouraged if this is a means of tapping private capital which would not otherwise have been made available for nitrogen manufacture. In some instances this should enable a developing country to switch from importing finished products to importing ammonia and save foreign currency in doing so. I can see this sort of development over the next few years serving to stimulate international trade in nitrogen.

(iv) Balance of Payments

Terms of Trade moved heavily against the primary producing countries from the early 1950's until 1961/2 when there was a recovery. This recovery lasted only until 1964/5 when the Terms of Trade for primary products started slipping again. Fortunately this reversal has not yet touched the low reached in 1961/2. Looking to the future the outlook is relatively promising for food and feed crops, (e.g. rice, wheat, feed grains etc.).

Prospects for beverages (tea, coffee and cocoa) and sugar which are heavily dependent on the almost saturated markets of the developed countries and for raw materials (e.g. cotton, rubber, palm oil, etc.) are far less promising.

One might sum up by stating that the prospects for the primary products of the developing countries are somewhat patchy. Furthermore whichever way the Terms of Trade move, the developing countries owing to their import needs for development purposes are going to be faced with the balance of payments problems for many years to come.

When it is realised that 1 ton of nitrogen will frequently produce 10 tons or more of grain and that the former can be imported for less than half the price of the latter, the balance of payments of several developing countries would look healthier if they switched from food imports to fertilizer N imports. Realisation of this fact

is expected to stimulate the imports of fertilizer N to the developing regions over the next decade.

(v) Aid Schemes

This is a large subject on which only brief comment is possible in this paper. The United States is already making a magnificent contribution in this direction and in the future Western Europe in particular will also, in all probability, take a more active part than at present. Whereas this aid is well meaning it is seriously worth questioning the relative effectiveness of various aid schemes. Food aid schemes frequently achieve little in improving the basic position of developing countries whereas the supply of fertilizers, and agronomists to improve the indigenous agricultures of these countries, would achieve much more per dollar of expenditure in raising the real wealth and consequently the economic structure and ability to trade of these countries.

India provides an interesting case history. About 50 percent of U.S. wheat and flour shipments under Public Law 480 goes to India and since the mid-1950's most of the U.S. shipments to India have been under this scheme. Table 6 shows that Indian imports of wheat have increased substantially and that imports from other countries have declined.

Table 6

Average Annual Wheat Imports, India

Year	'000 metric tons		%
	Total imports	From U.S.A.	U.S. imports as % of total
1950-53	2,120	1,055	49.8
1954-56	578	141	24.4
1957-59	3,037	2,741	90.3
1960-62	3,714	3,016	81.2

Over the period 1950-55 wheat imports were equal to about 20 percent of local Indian wheat production whereas they amount to 27 percent of local production in the 1956-62 period. Indigenous

production of wheat in India over this period changed as follows:

	Rate of increase per annum	
	Production %	Yield /ha %
1950-1955	7.2	4.2
1955-1962	3.3	0.9

Assuming that a ton of N yields on average 10 tons of grain it can be shown that if India had maintained its imports at about 20 percent of home wheat production and used the money saved to purchase fertilizer N, rates of increase similar to those in the early 1950's would have been maintained and in 1960/61 the total amount of wheat available in India would have been about 1.8 million tons greater, representing some 180 million dollars worth were this imported. The dire food shortage in India more recently and even greater wheat and food imports occuring under aid schemes strongly suggests that the return from aid would have been far greater if it had been made available in the form of fertilizer aid rather than food. Without developing the argument further it will be apparent that stepping up fertilizer aid schemes would increase international trade in fertilizers. The reduction in food imports would also divert trade in food, as well as fertilizers to grow food, from one area of the globe to another. Looking to the future, it is suggested that fertilizer aid schemes would in many instances be more effective in the long term than food aid schemes in raising the living standards of developing countries. Furthermore, it seems probable that more of the giving and receiving countries will come to appreciate this fact provided it is associated with sound agricultural development and advisory assistance.

There is one fundamental issue here which the aid giving countries should consider carefully. Provided fertilizers are not extraordinarily expensive to the cultivator other factors are far more important in influencing the growth of fertilizer use than its price. Even in many of the developed countries of the world fertilizer nitrogen is being used at levels appreciably below the economic optimum rates. In many circumstances the existence of an effective agricultural extension service, reasonably attractive prices for agricultural products, efficient marketing channels and the provision of irrigation facilities in certain conditions have a far more profound effect in increasing the use of fertilizers and raising agricultural productivity than have changes in the price of fertilizers as such. All too frequently increased fertilizer aid may only achieve trade

diversion rather than trade expansion if the other factors conducive to an increase in the use of fertilizers are absent.

Since the willingness of the developed countries to help the developing countries is very limited a more effective use of the limited resources they are prepared to make available might well be achieved if this were supplied to a multi-lateral aid giving agency which purchased by competitive tender and also used part of the aid resources to stimulate fertilizer market growth by whatever means seem relevant in each of the developing countries receiving help.

(vi) Political factors

Greater emphasis than had been fashionable in the past, is likely to be given to agriculture in the over-all development plans of many of the emerging nations over the next decade or so. This is likely in turn to stimulate the level of fertilizer N imports as well as the level of investment in fertilizer N plants. However, certain emergent nations and particularly those which have recently gained independence are likely, for nationalistic reasons to establish indigenous fertilizer industries quite irrespective of economic considerations. The rate of such developments will be limited, however, by the availability of capital and particularly where conditions are discouraging to foreign private capital. The interplay of political forces on international trade is difficult to assess since in certain regions it could lead to an increase in local investment while in others it will discourage it.

Again some countries will establish a fertilizer nitrogen industry on the grounds of the 'infant industry argument' that uneconomic industries should be protected in a developing country until they have grown and gained sufficient strength to face the world competition. This political-cum-economic argument may well on occasions be justified with the elapse of time.

FORECAST OF GROWTH IN TRADE

After considering all the factors which have been discussed above and others it is estimated that world trade in various forms of fertilizer nitrogen may double over the next decade. This expansion is expected to occur primarily with the developing nations.

Table 7

Forecast of World Trade in Fertilizer N

million metric tons N

Regions	1965/6 Actual	1975/6 Forecast
Industrial	2.1	3.0
Developing	2.5	6.0
Total	4.6	9.0

The most rapid growth is likely to occur in ammonia and urea. This trade expansion will undoubtedly be stimulated in part by various aid schemes and to avoid trade distortion and serious cycles in supply, multilateral aid administered by international organizations could in the longer term become a significant factor in fertilizer trading.

SUMMARY AND SOME CONCLUSIONS

(a) The consumption of fertilizer N in various forms is likely to increase at an accelerated rate during the next decade compared with the past for a variety of reasons. One of these is the increased emphasis which agriculture is expected to receive in the plans of the developing countries.

(b) Fertilizer N consumption is expected to grow at the rate of 3-1/2-4 million metric tons N per annum representing new investment per annum of some $800 million in ammonia and associated facilities.

(c) Over the next decade world fertilizer nitrogen consumption is expected to treble and trade to double. Trade between the industrial countries is forecast to grow by only 50 percent but will need to nearly treble to meet the needs of the developing countries even after allowing for a very substantial expansion in indigenous production.

	1965/6		1975/6	
	Consumption	Imports	Consumption	Imports
	million metric tons N			
Industrial	15.6	2.1	42	3.0
Developing	4.4	2.5	18	6.0
World	20.0	4.6	60	9.0

(d) These developments along with other demands will place a strain on the resources of both the industrial and developing countries and in order that they are achieved as efficiently as possible great statesmanship will be required in the allocation of capital and aid to trade.

(e) Despite the value of aid, the export earnings of the developing countries probably still supply them with over 75 percent of their foreign currency. Industrial countries should always bear this in mind in any serious endeavor to help the developing parts of the world.

(f) Anti-cyclical investment in fertilizer N plants should be given serious consideration as a means of regulating variations in the import price of fertilizers to the developing countries and in order to supply them with fertilizer plants at competitive prices.

OWTPrice/ru
July 5, 1967

APPENDIX

Table 1

SAMUEL STRELZOFF - RATIONAL UTILIZATION OF ENERGY IN LARGE AMMONIA AND METHANOL PLANTS

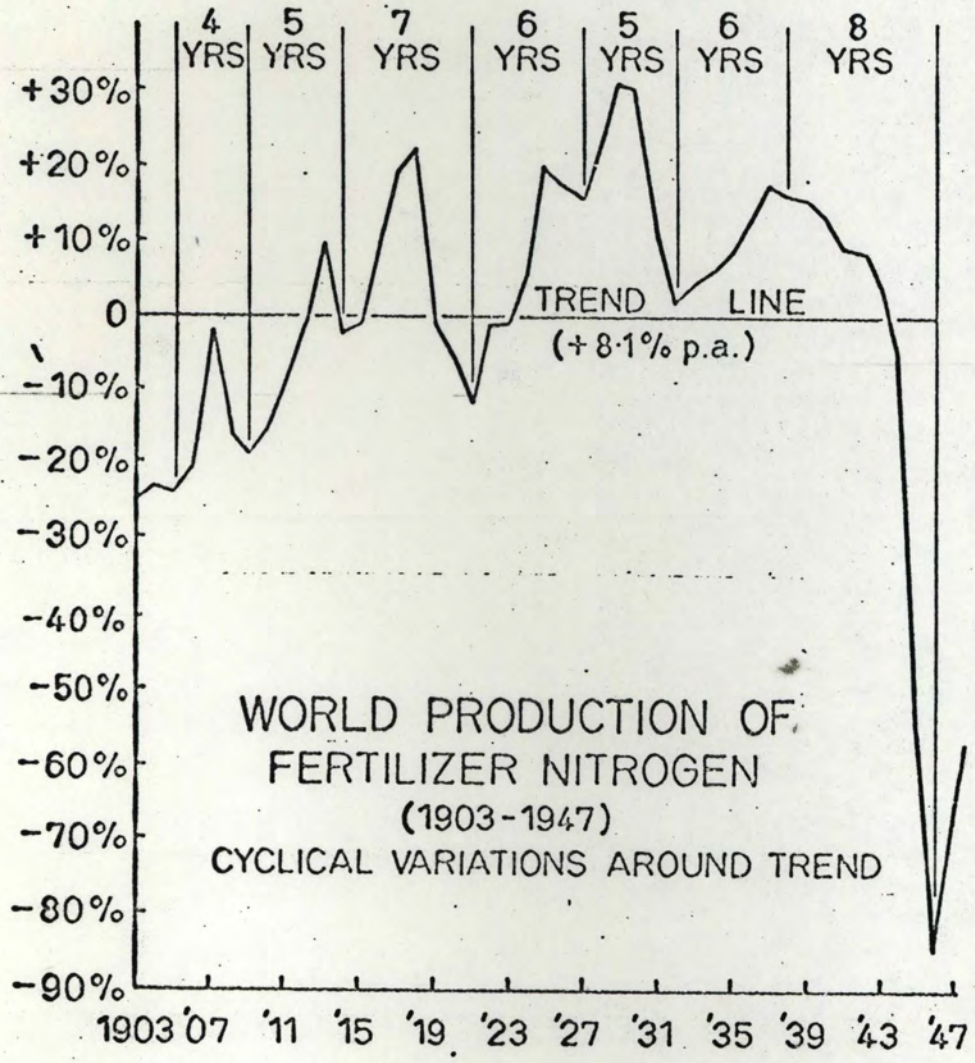
Presented at the American Petroleum Institutes Division of Refining Meeting
Houston, Texas, May 9th 1966

Ammonia Production Costs per Short Ton of Ammonia

Plant Capacity, s. tons/day	200	300	400	600	1,000	1,500
	Compressors and Drives					
	Reciprocating-Motor			Centrifugal-Steam Turbine		
Investment, million dollars	4.3	5.5	6.5	8.5	12.3	15.8
Raw Material and Utility Requirements, per Short ton of Ammonia						
Natural gas, million Btu	30.0	30.0	30.0	32.3	32.0	31.5
Power, kwh	625	625	625	30.0	30.0	30.0
Boiler feedwater makeup, gal	550	550	550	550	550	550
Circulating cooling water, gal	50,000	50,000	50,000	50,000	50,000	50,000
Production Costs, Dollars per Short ton of ammonia						
Raw material & utility costs:						
Natural gas, 20 cents per million Btu, 2 ¢ /therm	6.00	6.00	6.00	6.46	6.40	6.30
Power 0.7 cent per kwh	4.37	4.37	4.37	0.21	0.21	0.21
Boiler feedwater makeup, 25 cents per 1,000 gal.	0.14	0.14	0.14	0.14	0.14	0.14
Circulating cooling water, 2 cents per 1,000 gal.	1.00	1.00	1.00	1.00	1.00	1.00
TOTAL	11.51	11.51	11.51	7.81	7.75	7.65
Other costs:						
Catalysts and chemicals	0.40	0.40	0.40	0.40	0.40	0.40
Operating labor, 4 men and 1 supervisor at $3 per hr.	1.80	1.20	0.90	0.60	0.36	0.24
Plant overhead, 100 per cent of operating labor	1.80	1.20	0.90	0.60	0.36	0.24
Maintenance, 3 per cent of capital investment	1.84	1.57	1.37	1.22	1.05	0.90
Taxes and insurance, 2 percent of capital investment	1.23	1.05	0.91	0.81	0.70	0.60
Interest, 5 percent of capital investment	3.07	2.62	2.28	2.02	1.76	1.50
Amortization, 10 percent of capital investment	6.15	5.24	4.57	4.05	3.52	3.00
TOTAL	16.29	13.28	11.33	9.70	8.15	6.88
TOTAL PRODUCTION COST	27.80	24.79	22.84	17.51	15.90	14.53

APPENDIX

CHART A



Farmers Index, No. 1, Winter 1966/67, Published by Gavin, Norman & Co. Ltd.

Economics of the use of fertilisers and crop protection chemicals in agriculture

By O. T. W. Price, B.Sc., M.S. (Wisconsin), M.A., D.Phil. (Oxon)
and W. M. Strong, M.A. (Cantab)

Introduction

THE LARGE-SCALE CHANGES WHICH have taken place in United Kingdom agriculture during the last 25 years have led to a great increase in total production. An increase of 35% in the area of tillage since 1939, coupled with much higher yields, has led to the production of 182% more cereals, 136% more sugar beet, 43% more potatoes and large increases in other crops. Also, more livestock are carried on better grassland and more meat and milk is now produced (see Table 1). It will be seen that the largest increase has occurred in cereals where output has multiplied nearly threefold since 1938/9.

TABLE 1

U.K. output of agricultural products pre-war and in 1964/65

	Pre-war	*1946/47*	*1964/65*
Cereals ('000 tons)	4,442	7,222	12,488
Potatoes ('000 tons)	4,873	10,166	6,951
Sugar ('000 tons)	415	593	980
Milk (million gallons)	1,556	1,653	2,513
Eggs (million dozen)	545	451	1,246
Meat ('000 tons)	1,226	857	2,289

These changes are due to many factors, but fertilisers and crop protection chemicals have without doubt played a major part, expenditure on these items having risen from about 4½% of total farm expenses in 1939 to around 9% today.

TABLE 2

Trends in the use of fertilisers in the U.K.

	N	*P_2O_5*	*K_2O*
		'000 Tons	
1913	29	180	23
1929	48	198	53
1938/9	60	170	75
1948/9	185	419	196
1958/9	321	383	375
1964/5	565	479	425

Past and present fertiliser use

In the quarter century before 1939, fertiliser nitrogen consumption doubled and potash trebled, whilst there was little change in the phosphate used. In the last quarter century since 1939, however, nitrogen consumption has multiplied more than nine fold, whilst the use of potash is almost six times as high and that of phosphate nearly three times (see Table 2).

The level of fertiliser practice on individual crops in 1961/62 is shown in Table 3. The figures given in this table are based on the latest major survey of fertiliser practice conducted by Rothamsted Experimental Station and the National Agricultural Advisory Service with assistance from the Fertiliser Manufacturers Association. The data obtained in these surveys probably give a more precise picture of fertiliser practice than is available in any other country. A new survey is being conducted during 1966.

TABLE 3

Fertiliser practice on some individual crops in England and Wales, 1961/62

	Overall average rate cwt/acre	*Average actual rate cwt/acre*	*Area treated %*
	Nitrogen (N)		
Wheat	0·53	0·56	94
Barley	0·41	0·43	95
Oats	0·29	0·38	76
Potatoes	1·19	1·23	97
Sugar beet	1·17	1·18	99
Temporary grass	0·37	0·54	69
Permanent grass	0·17	0·44	39
	Phosphate (P_2O_5)		
Wheat	0·28	0·35	81
Barley	0·29	0·32	90
Oats	0·29	0·37	79
Potatoes	1·15	1·19	97
Sugar beet	0·99	1·01	98
Temporary grass	0·32	0·56	57
Permanent grass	0·21	0·60	35
	Potash (K_2O)		
Wheat	0·32	0·42	77
Barley	0·37	0·41	91
Oats	0·28	0·40	71
Potatoes	1·59	1·64	97
Sugar beet	1·62	1·64	99
Temporary grass	0·23	0·46	50
Permanent grass	0·11	0·39	28

Already a very large proportion of most tillage crops receives fertilisers. Application rates for potatoes and sugar beet are high and are, on average, at about the present recommended level or a little above. On cereals there is still scope for further increase, especially as higher yielding and more responsive varieties come into use. A high proportion of the area of grass is still untreated in any one year and even where fertilisers are applied the rate is usually well below the recommended level. Nevertheless, development is such that within the next ten years most temporary grass and at least 60 per cent of permanent grass will probably receive at least one dressing of fertiliser each year.

Optimum fertiliser use

In discussing the economic principles of fertiliser use it is a convenient starting point to define what is meant by the term 'optimum dressing of fertilisers'. The optimum dressing for any crop is that which will give the greatest return in terms of value over and above the outlay on fertilisers and their cost of application. It should be emphasised that this optimum level does not correspond to the maximum yield since at high levels of application the cost of additional fertiliser may exceed the value of the additional yield obtained. The calculation of the optimum level of use may best be explained by an illustration.

Table 4 gives typical figures of the average costs and returns which may be expected from applying nitrogen fertilisers to the higher yielding varieties of wheat on the assumption that phosphate and potash are available in adequate amounts.

TABLE 4

An example of the effects of nitrogen application on costs and returns per acre in wheat production in an arable district of England and Wales

Units of N per acre (1 unit=0·01 cwt)	0	20	40	60	80	100
	£	£	£	£	£	£
Fixed costs (£ per acre)	23·0	23·0	23·0	23·0	23·0	23·0
Additional costs: Fertilisers*	—	1·0	1·6	2·2	2·8	3·4
Harvesting†	—	0·4	0·7	0·9	1·0	1·0
Total costs (£ per acre)	23·0	24·4	25·3	26·1	26·8	27·4
Receipts (£ per acre)**	37·6	42·1	44·8	46·5	47·6	48·1
Profit (£ per acre)	14·6	17·7	19·5	20·4	20·8	20·7
Yield in cwt/acre	29·5	33·1	35·2	36·5	37·4	37·8
Cost (£ per ton)	15·6	14·7	14·4	14·3	14·3	14·4

*Based on maximum spring price for prilled ammonium nitrate 34·5% N ('NITRAM') in 1966/67 net of subsidy plus cost of application.

†Additional yields lead to increased cost of carrying and drying grain, baling straw etc. Where straw is burnt on the field, modern tackle used and weather ideal, additional harvesting costs could be less than shown.

**At 1966 Guaranteed Price (no allowance made for straw).

The application of nitrogen, since it raises the yield, raises the total value of the crop per acre. Table 4 also illustrates another very important aspect of the economics of fertiliser use, however, namely that its use *reduces unit costs of production*. In the example given costs were reduced from £15.6 to £14.3 per ton by applying 60 to 80 units of nitrogen per acre. This occurs because in the production of most crops a high proportion of the costs per acre are incurred independently of the yield obtained, e.g. the land has to be ploughed, cultivated, and the seeds sown. These costs may conveniently be described as fixed costs since they are of the nature of overhead costs and do not vary directly with output. As the yields per acre are raised these fixed costs decline per unit of output. The total margin by which the value of output exceeds the total costs per acre of wheat grown is determined by the margin per cwt. multiplied by the number of cwt. produced. Clearly, therefore, using nitrogen fertilisers up to the optimum level contributes to the total profit, both by increasing the margin per unit of output and by increasing the number of units produced. Using nitrogen fertilisers beyond the optimum level reduces the total profit because the value of any extra wheat produced (if any) is less than the cost of the resources used to produce it. In the example given, the optimum is between 80 and 90 units of N per acre (see Fig. 1).

Practical optimum dressings for tillage crops grown under average conditions in a normal season are shown in Table 5.

TABLE 5

Recommended fertiliser dressings for tillage crops in the U.K.

	N	P_2O_5	K_2O
	Units per acre		
Winter wheat	85	30-40	30-40
Spring barley	60-80	30-40	30-40
Oats	45	30-40	30-40
Potatoes	105-150	120	180
Sugar beet	80-120	70	70+salt

In the case of autumn sown cereals, the recommended level of dressing is applied by means of a 1:2:2 compound fertiliser in the seed bed, followed by a top-dressing of a straight nitrogen fertiliser in the spring. For spring cereals, a high-nitrogen compound is applied in the seed bed. The usual compound for root crops is one with a ratio of 1:1:1½, or a 2:1:1 or a 1½:1:1 together with salt for sugar beet and mangolds.

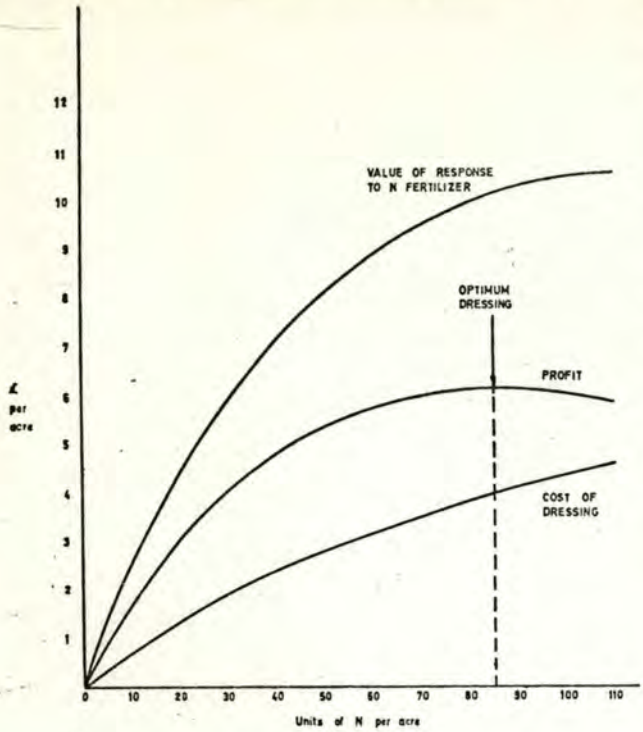
It can be seen that the optimum level of application varies considerably between crops, depending on the physical response to fertiliser application and the value of the crop produced. The estimated extra value of crop produced as a result of applying nitrogen at the recommended level is shown in Table 6. Actual responses will, of course, vary with climatic and soil conditions, position in the rotation, previous manurial treatment, etc., but the figures given in the Table are considered to be representative.

TABLE 6

Value of increase in crop production as a result of applying fertiliser N at the recommended level

		Increase in crop production		
Crop	*Fertiliser N units per acre*	*weight per acre*	*Value per acre*	*Value for 20 units N*
Potatoes	120	3½ tons	£50	£8·3
Sugar beet	100	3½ tons	£23	£4·6
Winter wheat	85	8 cwt	£10	£2·3
Spring barley	70	8 cwt	£8	£2·3

FIG. 1
The profitability of nitrogen for wheat production



Fertilisers for feed crops

The economics of fertiliser use on crops grown for feeding to livestock is a complex subject because the return from fertilisers is determined very much by the effectiveness of use by livestock of the extra feed which is produced. Yet it is of great importance.

Feed accounts for between 60 and 80 per cent of the costs of producing milk, beef and lamb. Grass and grass products are the cheapest sources of food available to United Kingdom farmers and consequently the extent to which these can technically be substituted in the diet for more costly feeds contributes to lower farm costs.

Good quality silage, either hand-fed or preferably self-fed, can replace appreciable amounts of costly concentrated feedingstuffs during the winter feeding period with a substantial reduction in costs on most farms, a fact already established by leading grassland farmers in the United Kingdom. Again, by the judicious use of nitrogen fertilisers to encourage early spring growth of grass, dairy cattle can be turned out to grass a few weeks earlier in the spring with a considerable saving in the indoor feeding concentrates.

The planned use of fertilisers throughout the grass growing season enables farmers to prepare for customary drought periods in their district and thus again reduces the need for supplementary feeding.

There is much confused thinking about the relative productivity of clover nitrogen and fertiliser nitrogen because comparisons are made on a physical basis. In the United Kingdom, clover swards are productive *later* in the spring than grass-dominated swards encouraged by fertiliser nitrogen. The value of grazing in early spring—say March to late April—when it enables dairy cows to be turned out of doors for their feed is considerably higher than during the main summer grass growing season.

Intensive use of nitrogen on grass

In examining the relative economics of different systems of feeding it is the profit per farm and therefore ultimately the *profit per acre* and *not per animal* which matters. In ruminant livestock farming the intensive use of nitrogen fertilisers frequently leads to intensive stocking per acre of grassland, and while the profit per animal may not always be as high as on farms depending more on purchased feedingstuffs, the profit per acre is greater. As was pointed out earlier in this paper, profits ultimately depend on the margin of profit per unit of output times the number of units produced. There can be little doubt in the United Kingdom that the cost per gallon of milk produced is lower on farms depending on grassland for as high a proportion of their feed as possible. It has already been found that dairy farms following a system of intensive grassland management made profits which were about twice those on a similar group of farms following a good standard of traditional management. Looking to the future, it is clear that farmers following systems of intensive grassland farming, owing to their lower costs of production per gallon, are better placed economically.

Current usage of crop protection chemicals

There is no published information based on surveys showing the extent of the use of crop protection chemicals, similar to that which is available for fertilisers. Estimates have been made, however, of some of the most important applications of chemicals in British agriculture[1] and these show that their use is widespread.

In England and Wales about 5 million acres of cereals (two-thirds of the total area) are drilled with seed which has been dressed; usually with an organomercury or a combined organomercury/BHC dressing. About 300,000 acres, equivalent to two-thirds of the total area of main crop potatoes, are given blight sprays in an average year, the number of applications depending on the season and the variety of potato grown. Whilst copper-based sprays are still used, other materials such as maneb, either alone or in combination with copper, and mancozeb and tin are being used to an increasing extent. All sugar beet seed is treated with a fungicide and insecticide dressing. The area of sugar beet sprayed for aphid control varies according to the season, the area sprayed in 1964 being about 180,000 acres (40%) with organophosphorus materials such as demeton methyl, dimethoate and menazon.

An estimate of the use of weedkillers on arable crops in the U.K. is given in Table 7.

TABLE 7

The extent of weedkiller use on arable crops in the U.K.

Crop	*Approximate area sprayed % of total area*
Wheat	75-80
Barley	70-75
Oats	60-65
Potatoes	5-10
Sugar beet	40
Mangolds, turnips, swedes, fodder beet	2
Carrots	65
Peas	85

The most important usage of weedkillers is on cereals where application of hormone weedkillers has increased from only a few hundred thousand acres in the early post-war years to something in the region of 6 million acres currently. In more recent years, however, one of the most striking increases has been the use of weedkillers on sugar beet, due to the introduction of chemicals such as endothal and pyrazon. Use on potatoes is also now beginning to increase rapidly from a position in 1963 where only 1-2% of the area was treated to 5-10% in 1965. The use of weedkillers on fodder crops is still at a very low level whilst grassland is the most neglected of all crops, which will need to be remedied in future years if the full benefit is to be derived from the increasing amount of fertilisers now being applied.

Profits from the use of chemicals

In assessing the profitability of using a crop protection chemical there is usually much less freedom in choosing the rate of application than is the case with fertilisers. The differing pattern of crop yields at various rates of application for a crop protection chemical and for a fertiliser can be illustrated by means of a diagram (see Fig. 2).

FIG. 2

Typical pattern of crop yield increase as a result of applying fertilisers and crop protection chemicals

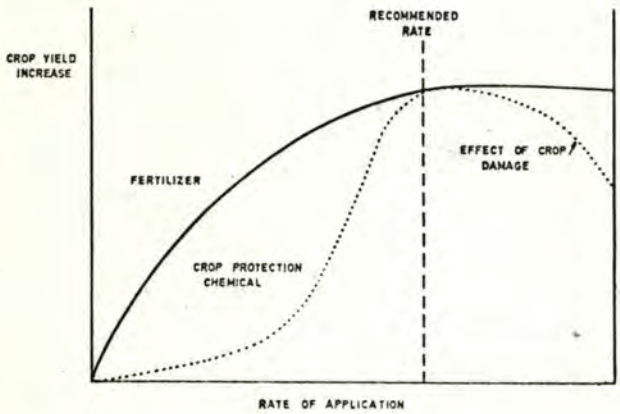


Fig. 2 illustrates how, for many crop protection chemicals, the main advantage is lost unless something near the recommended rate is applied, since the chemical will give a poor control of the pest or weed and little or no improvement in crop yield is achieved. Of course, the pattern will vary according to the individual type of chemical being used, and an example of this is shown in the diagram for rates of use above the recommended dose. Where the crop is highly tolerant to the chemical or where the chemical is applied under conditions where it cannot be absorbed by the crop*, application above the recommended rate will have little or no effect on crop yields. In these instances, the loss is confined to the wasteful use of the chemical. In the case of some other chemicals, however, when the crop is only tolerant up to a certain level, application above this may result in a drastic reduction in yield with a heavy loss in the value of the crop.

There is little point in considering the profitability of using a chemical except at the recommended rate Of course, this recommended rate will vary according to many circumstances such as soil type, the degree of weed or pest infestation, etc., but the gain from applying the rate recommended for the particular circumstance of the crop is likely to be much greater than for rates which are significantly different.

Increased yield is not the only benefit which may result from the use of crop protection chemicals. For example, the use of fungicides or insecticides may improve the quality of the crop whilst the use of weedkillers can help to reduce the amount of cultivations which may damage the crop and also involve expenditure on labour and machinery. These benefits can be very important, but they are not always easy to measure in financial terms.

It is not possible to quote the economic benefits from using a chemical, which can be related to such a wide range of the crop as can be done with fertilisers, since the extent of the benefit from control will depend on the extent of the pest or weed problem in a particular field. Examples can be quoted, however, of the increase in profitability which can be achieved through the use of crop protection chemicals.

Losses in sugar beet yields

Estimates of the loss in yield of sugar beet as a result of yellows virus during the period 1946-1962 range from an average of 0·1 ton per acre in 1962 to 2·6 tons per acre in 1957[2]. These averages relate to the whole acreage of sugar beet including areas not affected, and losses on crops which are subject to attack can be much greater. It has been calculated that yellows decrease a plant's yield of sugar by 4·5% for each week during which it shows yellows symptoms up to the middle of October. The British Sugar Corporation operates a spray warning scheme and treatments are applied only when there is a real risk of aphid attack.

**e.g., pre-crop emergence or directed inter-row spraying of paraquat. This chemical is inactivated on contact with the soil and is not taken up by the roots of the crop.*

In 10 field trials carried out at different sites a few years ago it was found that spraying carried out after receipt of the sugar factory's spray advice card increased the yield of washed beet by an average of 2 tons per acre and sugar content by 0·3%; sugar yield was increased by 15% and cash return by £14. 11s. per acre for an outlay of £1. 10s. per acre[3].

Value of blight sprays

In potatoes, trials carried out at Terrington over a period of years have shown that spraying following a blight warning and after subsequent periods of rain increased the yield of potatoes by almost 1 ton per acre on average[4], worth around £12 per acre. The cost of spraying varies according to the material used and the number of times the crop is sprayed. Assuming four applications of a combined copper-maneb product or of copper alone the cost would be in the region of £5-6 per acre including the cost of application.

Weedkillers in cereals

Turning to weedkillers, the widespread application of hormone weedkillers on cereals which has grown up over the past 30 years has made an important contribution to improved crop yields. The most commonly used material continues to be MCPA but there is increasing use of mixtures such as CMPP/2,4-D and 2,4-DB/2,4-D/MCPA to give control over a wider range of weeds. The cost of these materials together with the cost of application, ranges from about £1 per acre for MCPA up to about £2 per acre for some mixtures.

Recent work has shown that under some conditions the application of hormone weedkillers may not result in improved cereal yields or may even depress them[5], which suggests that their use without due regard to the extent of the weed problem is not justified on the basis of yield. Apart from the question of yields, farmers spray their cereals for a variety of other reasons, the most important probably being the greater ease of harvesting a weed-free crop, the production of cleaner grain sample and the reduction in weeds for following crops. These factors are extremely difficult to evaluate in financial terms. But one estimate has given a value in the region of 75/- per acre to these non-yield benefits[6].

Wild oat control

Considerable losses in cereal yields can be caused by wild oats. One means of control in spring barley is late sowing, but this in itself may reduce yields. For example, trials at Boxworth[7] have shown that, when there were relatively few wild oats present, late sowing reduced yields by just under 6 cwt. per acre which, valuing the grain at £1 per cwt., is worth about £6. Where there is a wild oat problem, however, late sowing may be worthwhile and the Boxworth trials showed that yields in 1963 from late sowing were 5 cwt. per acre more than from the infested early sown crop, and 10 cwt. more in 1964. If these figures are added to the normal gain from early sowing in clean land the losses due to wild oats can be seen to be considerable. The use of herbicides, such as barban or tri-allate, gives the opportunity to control wild oats without the need to delay sowing. To take the example of barban, the cost per acre including spraying would be in the region of £3-4 per acre[8] which would be repaid by an improvement in yields of about 4 cwt. per acre. The trials at Boxworth have shown that wild oats can cause yield losses considerably in excess of this.

Weed control in potatoes

There is an increasing interest in chemical weed control in potatoes. It has been known for many years that post-planting cultivations can reduce the yield of potatoes, by disturbing the roots and by loss of moisture from the soil, particularly if these cultivations are carried out late in the life of the crop. Trials carried out at various centres (particularly at Terrington[9] and Gleadthorpe Experimental Farms[10]) have shown that an increase in yields can be obtained by replacing traditional cultivations with chemical weed control. On the basis of an increase in yield of 30 cwt. per acre and valuing the crop at £12 per ton, the extra yield as a result of chemical weed control would be worth £18 per acre. Against this must be set the cost of the chemical, e.g. linuron, paraquat, etc., together with the cost of application. Taking paraquat as an example, applied at a rate of 1 lb (4 pints of product) per acre the expected extra margin would be as follows:

Extra yield of potatoes of 1½ tons at £12 per ton	£18 0 0
Less cost of paraquat and application ..	£ 3 10 0
Increased margin per acre	£14 10 0

Apart from the gain in yield the use of chemical weed control replaces the need for a considerable amount of post-planting cultivations. For example, a Potato Marketing Board survey[11] carried out in 1963 showed that, on average, growers carried out 5-6 separate post-planting cultivations. The elimination of the need to do these would free labour and machinery for other work on the farm and so make a further contribution to overall farm profit.

Paraquat in market gardening

The use of weedkillers in market garden crops has to some extent been hampered by the fact that crops are grown intensively and the use of a selective weedkiller which is suitable for one crop could cause damage to a succeeding crop. The discovery of paraquat has made possible a wide variety of uses in market garden crops since this chemical becomes inactive in the soil and so avoids the danger of damage to succeeding crops.

Weedkillers on grassland

Although considerable progress has been made in the use of fertilisers on grassland, it continues to be neglected as far as weedkillers are concerned. Yet the

application of weedkillers to improve grassland rendered under-productive by weeds, in conjunction with the use of fertilisers, has been found to improve productivity by much more than if either is used alone. This can be illustrated from the results of trials[12] carried out in various parts of the country over a period of four years from 1959-1962 to assess the effect of fertilisers and weedkillers in improving the productivity of permanent pasture. The average yield of weed-free herbage per acre was as follows:

	cwt/acre
Control (no fertiliser or weedkiller) ..	131
Weedkiller only	145
Fertiliser only	215
Fertiliser and weedkiller	270

The weedkiller treatment consisted of 1½ lb per acre of MCPA applied in the first year, which at current prices would cost about 11/- per acre for the chemical. Unfortunately, it is extremely difficult to measure the full economic benefit to the farmer, since this depends on the additional profits he obtains from the extra livestock output, made possible by increased grass production, and this is affected by many considerations in addition to the use of weedkillers. The results quoted above, however, show that in many cases increased profits from the more intensive use of grassland will be more easily achieved through a combined fertiliser-weedkiller programme than by the use of either alone.

Importance of paraquat

The introduction of paraquat has made possible the renewal of leys without the need for ploughing and cultivations. Renewal of leys by this means is particularly useful for short rotation leys based on Italian ryegrass where it is the practice to follow one crop of Italian ryegrass by another, and with this technique the ley can be renewed and back into production within six-eight weeks. The use of paraquat also makes possible the renewal of permanent and upland pasture under conditions where ploughing is difficult or impossible.

Future trends

Looking to the years ahead, an expanding population enjoying a rising standard of living, will require more food and of a higher quality. In view of Britain's balance of payments difficulties a greater proportion of the country's food supplies will need to come from British farms. Whilst this prospect offers a considerable opportunity for farmers, however, the future is likely to witness fundamental changes within the farming industry. The successful farmer will be the one who not only maintains his existing level of income, but also raises it at least as fast as the general rise in living standards in this country as a whole. To achieve this, he will need to overcome the effect of an increase in farm-workers' wages which will be a third higher in real terms by the mid-1970's.

The application of fertilisers and crop protection chemicals will contribute to efficiency and farm profits by improving crop yields and by raising their quality to meet market requirements. Insecticides, seed dressings and fungicides will be used in increasing quantities for the control of pests and diseases which will continue to offer a threat to successful farming. The main expansion, however, is likely to be in fertilisers, particularly on grassland and cereal crops, and in the use of weedkillers to replace mechanical methods of weed control, a trend which will be accentuated by the rising cost of labour and by the steadily declining number of farm workers.

An important development over the years ahead is likely to be the use of chemicals to kill off weed growth followed by the direct drilling of crops without the need for ploughing and other pre-sowing cultivations. With the use of paraquat, this technique is already being used on a commercial scale for the sowing of kale with excellent results, and trials carried out on a large scale with cereals have also proved very successful. The elimination of the need for ploughing and cultivations on at least a part of the cereal acreage will result in a very significant saving in time and labour during what is a peak period of work on many arable farms.

Farming of the future will be increasingly in the hands of commercially-minded farmers seeking to improve their profits by reducing costs and raising output. The increased use of existing fertilisers and crop protection chemicals, together with new products yet to be discovered and developed, will play an important part in contributing towards farming prosperity.

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Dr Owen Price was a lecturer in land economics at Oxford University. He works for I.C.I. as an industrial economist and fertiliser market forecaster. **W. M. Strong** was in the Agricultural Economics Department at Bristol University, is now an economist on the staff of Plant Protection Ltd.

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Development Digest

NITROGENOUS FERTILIZERS: SOME INVESTMENT CRITERIA

O. T. W. Price

[Some criteria relating to the advisability of building fertilizer plants are easy to overlook. For example, large ammonia plants show great economies of scale only if they are used at or near capacity. The cyclical nature of the chemical construction industry offers clues as to the best timing of increases in fertilizer capacity.]

Developing countries are frequently faced with the dilemma of whether to import fertilizer products or make them locally. In the case of fertilizer N (nitrogen), they are faced with three broad choices, namely: 1) to import finished nitrogen products; 2) to import an intermediate product—ammonia—and convert this into finished products indigenously; or 3) produce ammonia and finished products indigenously and possibly import hydrocarbon feedstocks.

In deciding among these choices certain economic factors must be taken into account. The problem should first be examined as a commercial proposition. When this is done, the first fundamental comparison which has to be made is to establish whether the cost of freight and handling the imported product outweighs the difference in operating costs between a developing country and an exporting country. Costs of manufacture in a developing country will be greater than in an industrial country, because capital costs tend to be some 20 percent higher in the former and because an industrial country is more frequently able to take advantage of the economies of scale associated with ammonia and conversion plants. Costs of production per

Mr. Price is an Agricultural Economist at the International Bank for Reconstruction and Development, Washington, D. C.

production cost of ammonia in a project. This naturally depends a great deal on the cost of the hydrocarbon to be used. In addition, a choice of very great significance is the size of an ammonia plant. Ammonia plants having a capacity of 600 tons ammonia/day and larger are capable of adapting the newly developed centrifugal compressors and other technological improvements which result in substantial savings in production and capital costs. It is generally true that a plant of smaller capacity than 100 tons/day is not economical; 200 tons of ammonia is about the minimum size of plant that is economically practical.

The capital investment required for a 600 tons/day unit is of the order of $15 million. If the natural gas costs 20¢ per 1,000 cubic feet (equivalent naphtha cost is about $8/ton), the production cost, including depreciation but excluding capital charges, is approximately $20/ton of ammonia. If the gas costs 5¢ per 1,000 cubic feet, the production cost is about $15/ton.

Because of the importance of ammonia as the principal intermediate in the manufacture of nitrogenous fertilizer, the tendency in recent years has been to consider very large ammonia production facilities close to the hydrocarbon source—e.g., natural gas field—where ammonia could be produced relatively very cheaply. Ammonia can then be shipped out to the fertilizer consuming regions where plants to convert the ammonia into conventional fertilizers can be installed.

[Based on material presented at various courses of the World Bank's Economic Development Institute by Dr. Chanmugam. All charts and tables are from The World Food Problem, Washington, D.C., The White House, 1967, Vol. II, pp. 382-386 and Vol. III, p. 104.]

ton of ammonia for large plants almost half those for small plants are sometimes quoted. Thus, in many instances, a developing country will be able to import fertilizers far more cheaply than they could be produced locally.

This is particularly true because the large new ammonia plants have a high level of fixed costs, and many of the apparent economies of scale disappear if these plants are not operated at near full output. The table on page 94 shows the considerable effect of underuse of capacity on ammonia (NH_3) production costs in a large plant.

On the other hand, freight costs can vary enormously depending on the location of the fertilizer market. For example, where a finished product has to be transported not only by sea but also up-country, and if allowance is made for handling and storage, freight costs can sometimes be very considerable, thus giving a natural geographical protection to indigenous manufacture.

On the basis of straightforward commercial criteria, it will frequently be more economical to import the finished products than to consider any form of local manufacture where the total market is only, say, 10,000-20,000 tons of nitrogen. As liquid ammonia becomes increasingly available in international trade in the future, I would suggest that even markets of between 50,000-100,000 tons of ammonia will frequently do best by importing ammonia for conversion into finished products in the local markets. Markets requiring in excess of 150,000 tons of ammonia should usually prove capable of supporting viable ammonia and conversion plants.

Most developing countries are seriously short of foreign exchange with which to purchase fertilizers or capital goods. Thus, a further criterion is the effectiveness of an investment in saving or earning foreign currency. Factors to note here are: 1) Some 40 percent or more of the capital costs of erecting a nitrogen fertilizer complex is local capital which would not have to be paid for in foreign currency, whereas all the imported finished fertilizer products would have to be paid for in foreign currency. 2) Is there a cheap supply of indigenous hydrocarbon feedstock available? For example, is naphtha available as a by-product from refining and has it no alternative use except for exports? In this case, it should probably be costed into the plant at an export f. o. b. value rather than its full market price. 3) Is there a large pool of labor, and even technical staff, available that is presently unemployed? In such an instance, the national interest might best be served by including their services at less than full cost.

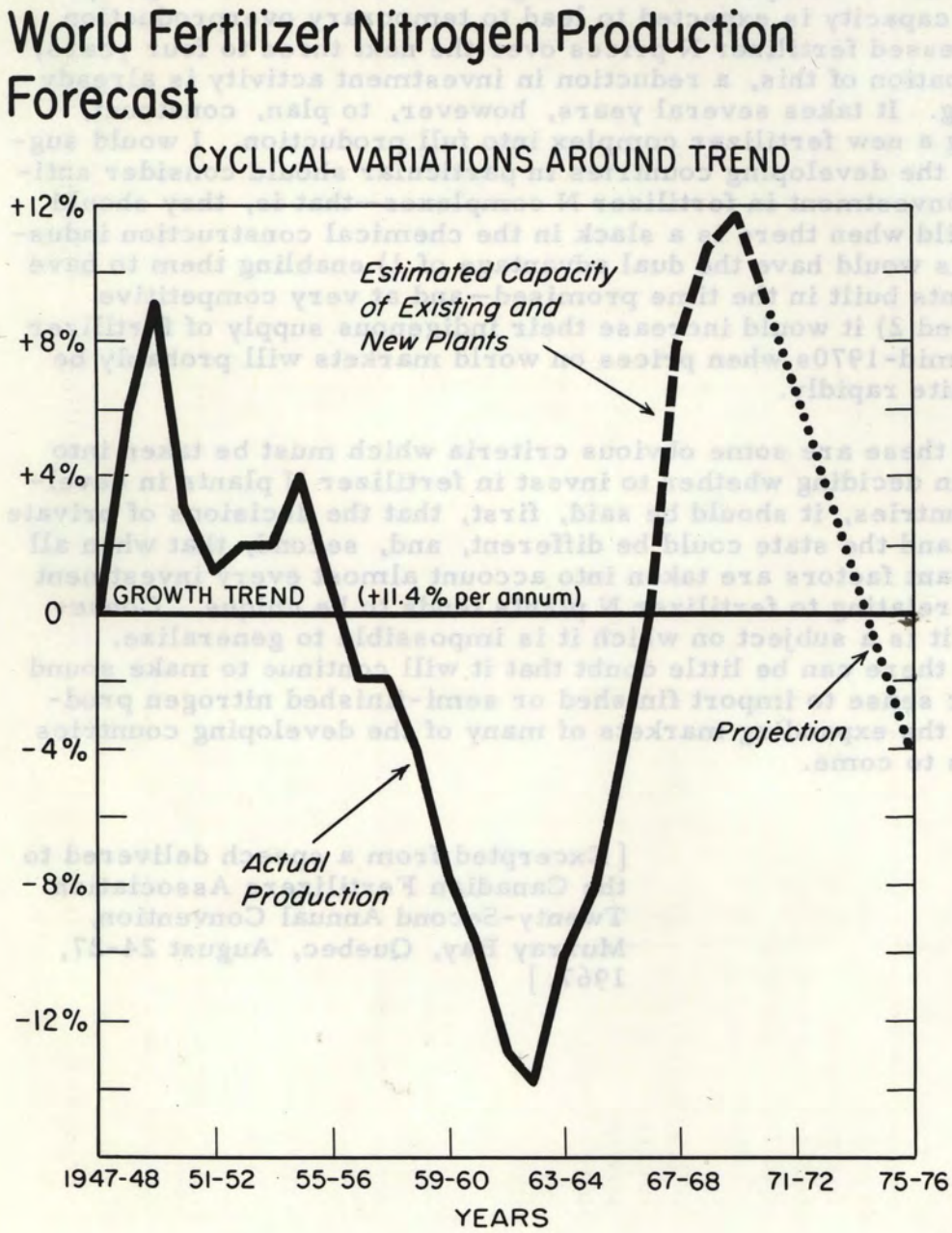
EFFECT OF UNDER-USE OF CAPACITY ON NH_3 PRODUCTION COSTS OF A LARGE PLANT*

% of plant capacity employed		100%		70%		40%	
	Unit Price	consumption/ton NH_3	cost/ton NH_3	consumption/ton NH_3	cost/ton NH_3	consumption/ton NH_3	cost/ton NH_3
Naphtha: for process;	$/ton 20	0.535	$10.70	0.535	$10.70	0.535	$10.70
for heating and additional steam generation	$/ton 20	0.291	5.82	0.386	7.72	0.710	14.20
Cooling water	$/m3 0.0075	230	1.73	247	1.86	402	3.02
Electric power	$kwh 0.0125	30	0.38	38	0.48	60	0.75
Boiler feed-water	$/m3 0.20	2.25	0.45	2.37	0.48	2.47	0.50
Chemicals & catalyst			0.75		0.75		0.75
Total Variable Costs			$19.83		$21.99		$29.92
Operators	$1.75/hr. 6 men/shift		0.42		0.60		1.05
Maintenance	3%/annum		1.77		2.53		4.43
Capital cost	13.5%/annum		7.97		11.39		19.95
Total Cost Per Metric Ton NH_3			$29.99		$36.51		$55.35

* 200,000 tons/year (600 metric tons/day) NH_3 plant. One centrifugal-type steam driver compressor. Battery-limits investment $118 million, see European Chemical News, Vol. 11, No. 270, March 31, 1967.

The Advantages of Anti-Cyclical Investment

In considering investment in a developing country, some account should also be taken of the level of activity in the chemical construction industry. The following chart is an attempt to project fertilizer N production on the basis of past history. This has shown a cyclical variation around a growth trend over most of this century. At the



high point of the production cycle, the level of investment in ammonia plants has tended to be low—understandably, in view of the considerable time lag before a plant can go on stream.

The construction industry has recently passed through a marked peak of activity which has led to the industry being overstretched, completion dates delayed, and even, I suspect, tendering for new business not as competitive as it might have been. The large upsurge in capacity is expected to lead to temporary overproduction and depressed fertilizer N prices over the next three to four years; in anticipation of this, a reduction in investment activity is already occurring. It takes several years, however, to plan, construct, and bring a new fertilizer complex into full production. I would suggest that the developing countries in particular should consider anticyclical investment in fertilizer N complexes—that is, they should try to build when there is a slack in the chemical construction industry. This would have the dual advantage of 1) enabling them to have their plants built in the time promised—and at very competitive prices; and 2) it would increase their indigenous supply of fertilizer N in the mid-1970s when prices on world markets will probably be rising quite rapidly.

While these are some obvious criteria which must be taken into account in deciding whether to invest in fertilizer N plants in developing countries, it should be said, first, that the decisions of private industry and the state could be different, and, second, that when all the relevant factors are taken into account almost every investment decision relating to fertilizer N plants tends to be unique. Consequently, it is a subject on which it is impossible to generalize. Equally, there can be little doubt that it will continue to make sound economic sense to import finished or semi-finished nitrogen products into the expanding markets of many of the developing countries for years to come.

[Excerpted from a speech delivered to the Canadian Fertilizers Association Twenty-Second Annual Convention, Murray Bay, Quebec, August 24-27, 1967.]

THE FERTILISER SOCIETY

THE ROLE OF THE WORLD BANK IN AGRICULTURAL DEVELOPMENT

by

O. T. W. PRICE, B.Sc., M.S., M.A., D.Phil.

To be presented at the Meeting of the Fertiliser Society, to be held in the Lecture Hall of the Geological Society, Burlington House, Piccadilly, London, W.1., on Thursday, 21st January, 1971, at 2.30 p.m.

Any account or abstract from this paper may not exceed 10 *per cent of its total length and is not to be published before the meeting.*

ALEMBIC HOUSE,
93 ALBERT EMBANKMENT,
LONDON, S.E.1.

THE ROLE OF THE WORLD BANK IN AGRICULTURAL DEVELOPMENT

by

O. T. W. PRICE, B.Sc., M.S., M.A., D.Phil.

International Bank for Reconstruction & Development, Washington, U.S.A.

Summary

Besides their own savings, the developing countries must rely to a considerable extent on foreign sources of capital for financing their development. The World Bank Group channels a small (10%), but increasing, share of these capital transfers through either the Group's main organisation, the International Bank for Reconstruction and Development (I.B.R.D.), or its two affiliates, the International Development Association (I.D.A.), and the International Finance Corporation (I.F.C.). The Group obtains its operating funds from private and governmental sources and commits them under widely varying conditions. Annual commitments have trebled during the last decade, reaching $2,300 million in the financial year 1970. Actual disbursements average about $1,000 million per year.

The developing world's heavy dependence on agriculture is reflected by the emphasis which loans for agriculture receive, and these involve both import substituting and export expanding types of projects. About one-fifth of all I.B.R.D./I.D.A. commitments are for agricultural projects and an additional important share of I.F.C.'s investment is in the fertiliser and food processing industries. Through its capital subscription, bond purchases and as a source for I.D.A. funds, the U.K. plays a considerable financial role in the Group's activities. Against this outflow of funds, however, stand the orders obtained by British industry and consulting firms for the supply of goods and services to Bank-financed projects.

Preface

I would like to take this opportunity to thank your venerable Society for showing an interest in the World Bank which is a yearling in comparison, by asking me to address you today on "the role of the World Bank in Agricultural Development." Some of the founder members of this Society such as Lawes, if my memory serves me right, played an important role in introducing artificial fertilisers to agriculture; a substantial ingredient in the development of British agriculture and one which has a significant role yet to play in the developing world.

Turning to today's topic, I would like to give you the framework of my talk. Firstly, I shall review the broad needs of the developing countries and the place of the World Bank in the process of development (including what it is and what it does). I will then describe more specifically the Bank Groups' activities in agriculture. I have chosen to close my talk with a few observations on the contributions which the United Kingdom has made to the Bank and the benefits which it has derived from being a shareholder.

General Introduction

In order to place the subject in perspective it is helpful to describe very briefly but in general terms some of the characteristics of the less developed countries (L.D.C.) of the world. They have relatively low incomes per head, high population growth rates (often 2·5% per annum) and relatively low growth in incomes per head (sometimes 1% or less). In addition they invariably have a high proportion of their working population engaged in agriculture (frequently over 50%).

In these circumstances it is understandable that much thought and effort is being devoted in the developing world to means of accelerating growth in the gross national product per head and more recently to the role which agriculture can play towards this end. While politicians, economists, sociologists and others in the developed world may be concerned with the environment, welfare considerations and more equitable distribution of income and wealth, countries of the developing world are still mainly preoccupied with finding means of accelerating their rate of economic growth, i.e. with the creation of wealth as distinct from its distribution. In some ways "An Inquiry into the Nature and Causes of the Wealth of Nations" published by Adam Smith in 1776 might be more relevant to the developing world than the scores of books on welfare, social security and environment that grace western bookshelves and often even the bookshelves of westerners working in the developing world.[1]

While there are other social, political and economic considerations relevant to the developing world there can be little doubt that one of the major objectives of the less developed countries at their present stage of development must be to accelerate the growth of gross national product (for the creation of goods and service) per head. It is also a brutal fact that one of the few means available to a developing country to achieve this growth by its own initiative is by making the labourer produce more than he is "permitted to consume"* thus creating a surplus (or savings) which can be invested in order to raise the productivity of labour and its wealth creating ability still further. This is of the essence of economic growth at the early stages of development almost regardless of the political regime chosen to accomplish it (cf. the early development of the United States of America, the United Kingdom or the U.S.S.R.).

In recent years, much attention has been given to means of alleviating the gruelling pressures associated with the early stages of economic development and to accelerating the process itself. It is not my intention to describe all of these but merely to highlight the role of the "World Bank Group" in this area.

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[1]This is a personal view of the author.

*This rationing is usually achieved by establishing high prices for essential consumer goods, keeping wages low, or taxation. The surplus may be collected by capitalists or the state.

In July, 1944 at Bretton Woods, New Hampshire, U.S.A., the representatives of 44 nations completed final drafts of the Articles of Agreement for the International Monetary Fund and the International Bank for Reconstruction and Development (the World Bank); two complimentary financial institutions.

The purpose of the International Monetary Fund (I.M.F.) was to promote international currency stability by helping to finance temporary balance of payments deficits and by providing for the progressive elimination of exchange restrictions and the observance of accepted rules of international financial conduct. In some respects its activities are better known in the developed world than those of the World Bank. Today, however, I wish to confine my observations to the latter institution.

The participants at Bretton Woods recognised that at the end of the war there would be a pressing need both for capital to help finance the reconstruction of production facilities destroyed by war, principally in Western Europe; and to provide capital to help raise productivity and living standards in the under-developed areas of the world. The World Bank was created to fulfil both these roles and it opened its doors for business in 1946. After the European Recovery Program (E.R.P.) arising from the Marshall Plan became operational in 1948, however, the World Bank turned its attention from the immediate problems of reconstruction in Europe to the financing of development; this has remained its major activity.

In effect, the major function of the World Bank, even from its early days, has been that of augmenting the capital supplies of the developing countries in order to accelerate the process of growth and alleviate some of the suffering and drudgery normally associated with the early stages of economic and social development. It was recognised at its inception that while the capital needs of the developing countries would be very large, the risks associated with investment in these countries were such that private capital would often be unwilling to fulfil them without some form of guarantee. The World Bank was created to help overcome this difficulty. It was authorised to make or guarantee loans both with its own capital funds and with private capital which it could raise on the money markets of the world. In order to attract private capital its financial structure was designed in such a manner that the risks on its investments would be shared by all member governments roughly in accordance with their economic strength. Furthermore the risk cover was virtually complete since the total outstanding amount of the loans made or guaranteed by the Bank was not to exceed the total of its unpaid subscribed capital, reserves and surplus. These features are incorporated in the Bank's Articles of Agreement.

The Articles establish the Bank as an intergovernmental institution, corporate in form but with all its capital stock being owned by member governments. The Bank's authorised capital is now equivalent to $24,000 million (£10,000 million) of which the

equivalent of approximately $23,159 million had been subscribed as of June 30, 1970. However, only one tenth of this or $2,316 million is paid in.

The Bank obtains the bulk of the funds required for its lending through Bond issues in the capital markets of the world. The security for this borrowing is based on the Bank reserves and the unpaid element of the Bank member Government's subscriptions.

TABLE 1. *Source of Funds for Loan Disbursements.*

	Cumulative to June 30, 1969		*Fiscal* 1969		*Fiscal* 1970	
	$m	%	$m	%	$m	%
Borrowings	4,222	38	689	64	923	54
Sale of loans	2,177	20	35	3	195	12
Usable subscriptions	1,912	17	6	1	39	2
Repayment of principal	1,798	16	298	27	329	19
TOTAL	11,074	100	1,702	100	1,092	100

Table 1 which gives the Bank's sources of Funds for disbursement serves to illustrate the importance of the capital markets to the Bank's operations. It also highlights the key role which the Bank serves as a bridge for private capital. It is one of the unique features of the Bank that, although it is an inter-governmental organisation, it relies heavily upon private capital for its financial resources.

The Articles of Agreement of the Bank also contain several provisions and guide lines which have proved invaluable over the years in ensuring that the Bank operates along sound financial and economic lines. The Articles of Agreement enjoin the Bank to act "prudently" in making loans paying "due regard to the prospects that the borrower . . . will be in a position to meet its obligations under the loan". It is also urged to ensure "that the more useful and urgent projects large and small alike, will be dealt with first". It is expected and encouraged to "promote the long range balanced growth of international trade and the maintenance of equilibrium in balances of payments by encouraging international investment for the development of productive resources of members". It is prohibited from making "tied" loans since it must not impose any conditions requiring the proceeds of its loans to be spent in any particular member country or countries. Furthermore only financial and economic considerations shall be relevant to the Bank's decisions; it must not be influenced by the political character of the country to which it is lending. Nor must the Bank and its officers interfere in the political affairs of any member.

Two other significant provisions in the Bank's Articles of Agreement are of general interest. The Bank's loans, except in special circumstances must be used to meet the foreign exchange requirements of specific projects. Also the Bank must be satisfied before making a loan that the borrower would be unable to obtain the loan from other sources on conditions reasonable for the borrower. In effect the Bank should not act in competition with the private capital but help to supplement it.

Since its inception in 1946 the Bank has sprouted two affiliate institutions, namely, the International Finance Corporation (I.F.C.) in 1956 and the International Development Association (I.D.A.) in 1960. Collectively the three institutions are known as the World Bank Group. The World Bank, the senior institution, only makes loans to governments or, under the cover of a government guarantee, to other institutions. I.F.C. supplements the activities of the Bank by making investments on commercial terms (and without government guarantees) in productive private enterprises in developing member countries. I.D.A. loans are approved on similar criteria to Bank loans but on terms which place a much lighter burden on the borrowing country. For example World Bank Loans currently carry an interest charge of $7\frac{1}{4}\%$ whereas I.D.A. loans have no interest charge and only carry a charge of $\frac{3}{4}\%$ which serves to defray the cost of administering the loan. Funds for I.D.A. lending are obtained from grants made by the developed member countries and therefore have to be distinguished from Bank loans, out of borrowing in the world markets.

The following facts will help to place the Bank Group's lending activities in perspective. Currently the net flow of financial resources to the developing world is approaching 13 thousand million dollars. Over half of this comes from government sources and the remainder is private capital movements. The Bank Group's share of the total financial flows is around 10% and is rising at a time when other international financial support, and particularly that from official bilateral resources, is tending to stagnate and in some important instances to decline. (The World Bank, as has already been indicated, derives its funds from both official and private sources).

Annual loan commitments entered into by the Bank Group have more than trebled during the last decade while disbursements have more than doubled. (See Annex, Table 1). The Bank Group's loan commitments (including I.F.C.) reached $2·3 billion in the financial year 1970 making it for the first time probably the largest development agency in the world and exceeding the U.S. foreign aid bill of $1·8 billion. Money committed however, is money pledged but not invested or disbursed. Disbursements in the last 3 years have fluctuated around a thousand million dollars but there are prospects that the rate of disbursement will be raised in the near future as the capital adsorptive capacity of the developing world is improved in a variety of ways.

World Bank and Agriculture

General:

The World Bank under the direction of its current President, Robert S. McNamara, is in the process of expanding considerably its lending operations. The President has also chosen to give special emphasis to agriculture, education and population control. These are mutually related facets of the general objective of raising productivity and the quality of living of individuals at an accelerated pace. As you will recall in my opening paragraph I emphasised that one of the characteristics of the developing world was a heavy dependence on agriculture. Many of the problems of development—raising productivity per head, creating a surplus and generating savings (some of which can be used for building other sectors of the economy)—have to be sought in agriculture.

Despite the fact that foreign capital inflows play an important part in financing investment in the developing world and particularly in providing much needed foreign exchange and technology it is well to remember that the export of goods and services of the developing countries provide 85% of their foreign exchange needs. Even more significant is the fact that some 88% of their export earnings are derived from the sales of primary products. Agricultural products dominate the export earnings of many of these countries. Owing to the large and rapidly expanding populations of some of the L.D.C.'s food imports also often absorb a substantial part of their extremely scarce foreign exchange earnings.

The agricultural sector it will be seen has a strategic role to play as an engine of growth in economic development of these countries. Yet in the early 1960's many were despondent of rapid economic progress simply because of the poor growth in the agricultural sector in relation to population growth—the latter has often been growing at between 2 and 3%.

TABLE 2. *Average Annual Rate of Growth in Agricultural Production.*

(Percent)	1960–1966
Developing countries:	
Africa	2·1
S. Asia	0·6
E. Asia	3·2
S. Europe	3·7
Latin America	2·9
Middle East	4·1
Industrialised countries:	1·8

Agricultural development efforts fall in the main into two categories namely those concerned with import saving and those

directed towards expanding the earnings from export crops. At later stages of development other considerations assume greater significance.

Food Crops

In most of the developing countries raising agricultural production in order to reduce imports involves increasing the production of locally produced food at a faster rate than population. The application of science and technology to food crop production in the L.D.C.'s has achieved dramatic results in the latter part of the 1960's. The development of the low photo-sensitive varieties of rice at the International Rice Research Institute at Los Banos and of dwarf wheat by CYMMIT (Mexico) have led to substantial increases in the production of these crops in some of the developing countries. Their impact has sometimes been referred to as the "Green Revolution."

While plant breeding and selection is undoubtedly opening up the prospects for an improvement in the supply of indigenously produced foods in the developing world and thus reducing its dependence on imports it is mistaken to assume that the expansion in production can be achieved with new varieties alone. A whole range of factors affects the rate of adoption of these new varieties and the prospects of continuing increases in production.

In many of the developing countries of Asia a perennial irrigation supply is probably the first priority in ensuring the adoption and spread of improved food crop varieties. New varieties will only give major increases in yield if they have adequate water and this in turn needs to be supplemented with heavy rates of fertiliser dressing and timely application of pesticides and fungicides. I need hardly point out to the Fertiliser Society that the nutrient requirements of a wheat crop producing on average 8 cwts. per acre (traditional variety) is very different from a crop of Mexi-pak wheat yielding 1½ tons or more per acre. (Nitrogen was frequently the only nutrient which gave an economic response at the low yield potential of the old varieties). Economic responses to phosphatic and potassic fertilisers tend to emerge following the removal of considerably more nutrients which results from the harvesting of much heavier crops.

The increases in production made possible with the new rice varieties, provided perennial irrigation is available, are spectacular. Take the case of the high yielding varieties of paddy moving into commercial use in the Philippines. These are capable of out-yielding the local varieties at least two-fold under general farming conditions. Couple with this the facts that (i) the local varieties take 140-180 days to mature compared with 100-130 days for the new varieties and (ii) that the new varieties because of their low photo-sensitivity can be grown at any time of the year thus enabling 2½ crops to be

grown in 12 months. In theory the production potential per hectare has been raised as follows:—

	Yield per hectare	
	Non-irrigated	*Irrigated* (new variety)
	(metric tons paddy)	
1st crop	1·5	2·8
2nd crop	—	3·2
½ 3rd crop	—	1·6
	1·5	7·6

In this illustration the annual yield per hectare under year-round irrigation could be five times as great as that from monsoon fed non-irrigated paddy. To make these results possible, however, the following conditions have to be fulfilled:

(a) an adequate and year-round supply of water from canals or tubewells;
(b) adequate supplies of good seed, fertilisers and pesticides available at the appropriate time and at reasonable prices;
(c) credit facilities which enable peasant farmers to purchase the requisite inputs at interest rates which are not usurous;
(d) price/cost relationships for farm products and inputs which provide an economic stimulus to adopt improved farming methods;
(e) the provision of grain drying, storage (and possibly harvesting) facilities. (Marketing and transport facilities may also be required).

Crops grown with irrigation outside the monsoonal rain period may give higher yields because of greater sunshine during the growing period but infrequently have to be harvested during the monsoon rains. The increased production can only be realised if drying and storage facilities are available otherwise part of the crop will rot. Where the increased production is surplus to local absorption it is also essential that transport and marketing facilities are available to handle the crops.

These features of the "Green Revolution" serve to highlight the need for additional capital in the lesser developed countries if they are to realise some of the opportunities now becoming available for raising the production of staple foods.

About half the volume of lending of the World Bank Group to agriculture in the developing countries is still directed towards extending or improving irrigation facilities and irrigation water storage and drainage. Other loans directed at accelerating the adoption of new food grain varieties are concerned with seed multiplication, grain storage, drying and improved milling facilities, fertiliser plants in the public and private sectors, and agricultural credit institutions. (The volume and types of loans to agriculture are discussed more fully later).

Export Crops

The developing countries are extremely dependent on primary products for generation of foreign exchange. At present nearly 90% of their export earnings are derived from this source. Furthermore, these earnings are usually determined by the fortunes of a narrow range of products: almost half of the L.D.C.'s depend on a single commodity for more than 50% of their total exports and three-quarters derive more than 60% of their export earnings from three primary products. It follows that the import capacity and developmental potential of these countries are extremely sensitive to changes in prices and market opportunities for one or two products only.

In general, markets have been growing relatively slowly for many of the products which the L.D.C. have to sell and prices have also fluctuated widely. The major markets for many of their agricultural exports, e.g. cocoa, coffee, tea, have been the developed countries which enjoy relatively high living standards and where consequently changes in incomes and prices have had relatively small effect on the demand for these products. Certain primary products have been under pressure because of the development of synthetic substitutes, e.g. cotton, jute, wool, rubber, etc. Also, in the case of certain agricultural products trade has been restricted because of protection given primary producers in the industrial countries. In view of some of these difficulties facing the primary producers in the lesser developed countries, the Board of Governors of the I.M.F./I.B.R.D./I.D.A. at its Twenty-Second Annual Meeting in Rio de Janeiro, on September 29, 1967, passed a resolution asking the staff of these three organisations to consider what measures should be taken by both the developing and developed countries to help stabilize the prices of primary products.

As an outcome of these studies it was decided that the International Monetary Fund should be prepared to extend assistance to members in connection with the financing of international buffer stocks of primary products subject to certain principles and limitations.

It was agreed that I.B.R.D.'s contribution in this area should be "within the framework of the Bank Group's regular lending standards and procedures as well as of its technical assistance and advisory activities." Among the various ways it was considered that the Bank might help, the following deserve particular mention:

(i) Diversification of production. It is clear that the Bank should attempt to finance projects to produce primary products that appear to face relatively favourable market prospects. It should also help finance projects which might provide alternative employment to factors currently being used in the production of surplus commodities;

(ii) Strengthen the competitiveness of primary products. This it can do by helping to finance cost-reducing techniques of production, e.g. replanting with high-yielding clones of rubber,

or oil palm or tea, which have considerably higher yields but lower costs per unit of output. Costs of natural rubber in particular are being reduced considerably by the introduction of high-yielding clones, new tapping techniques and even new processing and marketing methods. The Bank Group will also participate in financing research aimed at reducing production costs and developing new uses for primary products.

Livestock Products

The consumption of livestock products are low in the developing countries and at GNP of $100-$250 per head, these tend to be luxury products which few can afford to purchase. Vegetable sources and fish usually provide most of the somewhat inadequate protein intake in these countries. Poultry meat is frequently more expensive than the small quantities of red meat available from buffaloes and other draft animals as they reach the end of their productive life.

Despite this situation the Bank Group makes substantial loans to the livestock industry. In many instances by helping to finance improved feed grain production and modern pig and poultry production installations, it is possible to reduce the cost of these meats substantially. In other areas which have extensive land areas climatically suited to beef production, substantial loans are being made to foster the production of cattle for meat export purposes and thus increase the foreign exchange supplies of the country. The price and income elasticities of demand for beef in the developed countries are appreciably higher than for many of the traditional agricultural exports of the L.D.C.'s. Projects of this type are in less danger of creating a surplus situation than many of the more traditional exports.

Some Banking Operations

A brief description of the modus operandi of I.B.R.D. helps to indicate more clearly the way the World Bank views agriculture in its overall operations. The Bank sends an economic mission to its member countries at regular intervals. Some of the larger countries are visited annually while others are visited less frequently. The composition of these missions are partly determined by the nature of the country being reviewed but usually consist of general eoncomists, fiscal economists, and sector specialists. Almost every mission would have an agricultural sector specialist and some might include a transport economist, an industrial economist, etc.

In general a country economic mission will report on the following items:

(i) The country's credit-worthiness (this would include an analysis of the foreign interest and principal repayment commitments in relation to export earnings—the debt-service ratio).

(ii) The investment and foreign currency needs of the country as indicated by the gap between its own resources (or earnings prospects) and its needs.

(iii) The priorities or emphasis between sectors that should be given in the country's development and investment program.

Agriculture usually figures as one of the high priority sectors in country economic reports.

The economic mission to a country is primarily concerned with establishing priorities between sectors of the economy in order to determine the broad pattern of emphasis in development and bank investment strategy. In order to help identify the priorities within sectors the Bank sends sector review missions and project identification missions to various countries. In the case of agriculture the latter are sometimes undertaken by the F.A.O./I.B.R.D. Co-operative Program or by the F.A.O. on behalf of the United Nations Development Programme (U.N.D.P.).

Either through the country's own initiative or following some assistance from the Cooperative Program or U.N.D.P., projects are formally submitted to the Bank with a request for Bank assistance in their financing. At this juncture the Bank sends a project appraisal team to the country to scrutinize the project (or to use the technical term to "appraise it"). The team is normally composed of technical experts appropriate to the projects (e.g. experts on natural rubber production, tea production, irrigation) plus an economist and a financial analyst.

The appraisal team's report is comprehensive and covers the technical, commercial, managerial, organisational, financial and economic aspects of a project. It will deal with the following:

(i) Financial rate of return from the project. (The discounted cash flow technique is most commonly used, although other aspects are also considered).

(ii) The economic rate of return. Using the ruling, prices in a country may sometimes give a misleading indication of the value of a project to the economy of that country. An unrealistic exchange rate, tariffs and subsidies, wage rates which give an erroneous impression of the opportunity cost of labour under conditions of serious unemployment, all these and other factors must be taken into account in assessing the economic rate of return of a project to the national economy.

(iii) The cash-flow position. An estimate must be made of the cash flow generated by a project to determine whether the borrower can meet the obligations of repaying the interest and principal.

(iv) A set of covenants or conditions for the loan which will help to ensure the success of the investment. These cover a wide range of factors which are germane. They will always contain clauses relating to the terms of repayment of principal and interest. They may include conditions relating to institutions, pricing and management appointments and structure.

This brief sketch indicates the way in which the Bank gathers and processes information to determine its lending strategy and to choose the projects which it supports financially. It will be seen that

agricultural projects are not chosen in isolation but as a part of the Bank's assessment of the role of agriculture in overall development.

Loans to Agriculture: The Record

Objectives are sometimes more easily defined than achieved. The developing countries frequently have difficulty in preparing a project and establishing the institutional, economic, fiscal and agricultural policy framework which will ensure its viability. It follows that the pace at which the Bank Group can expand its lending activities is to some extent outside its own control. It is given some support in achieving its objectives however by the United Nations Development Program which attempts to undertake the preinvestment studies necessary to prepare a program. It is also helped more directly by the F.A.O./I.B.R.D. Cooperative Program which is largely financed by the World Bank and whose main function is to help member countries prepare projects to the stage at which Bank staff can appraise them for a loan. To enable the World Bank increase its agricultural lending activities, both the Bank staff and the F.A.O./I.B.R.D. Cooperative Program staff have been expanded considerably over the last year or two. The Agricultural Projects Department is now the largest in the Bank and its professional staff number has been increased from around 60 in mid-1967 to over 100 at present, and is expected to reach 120 by about June 1971.

Between 1965/66 and 1969/70 the I.B.R.D./I.D.A. loan commitments have doubled and those to agriculture have nearly trebled (see Annex, Table 2). Loans to agriculture reached $413 million in 1969/70 and are running at about a fifth of the total I.B.R.D./I.D.A. loan commitments. Total I.F.C. loan and equity capital commitments per annum are around $100 million at present and over the last three years some 12% was invested in the fertiliser industry and about 5% in food and food processing.

The types of loans made to agriculture and the countries being served vary from year to year depending on the projects becoming available for financing. Loans to agriculture signed by the Bank in the financial year 1969/70 serve to illustrate the types of loans which the Bank makes and the wide geographical dispersal of its lending activities in any one year.

In 1969/70 about half the I.B.R.D./I.D.A. loans made to agriculture were for irrigation and drainage facilities. This was the major type of loan made in that year. It will also be seen that a high proportion of the loans are concerned with raising production in agriculture. Over the next few years investment in storage, marketing and processing facilities are likely to appear more frequently than in the past. While lending for large scale irrigation and flood control projects have remained an important part of operations in this sector, financing activities by the Bank and I.D.A. have been widened to include projects covering a broad range of agricultural requirements.

TABLE 3. *Bank Loans and I.D.A. Credits* 1969/70 *by Purpose.*
(*Expressed in millions U.S.* $).

	Bank	I.D.A.	Total
Agriculture:			
Afghanistan—Agricultural credit	—	5·00	5·00
Bolivia—Livestock	—	1·40	1·40
Ceylon—Irrigation and drainage	13·60	5·10	18·70
Ceylon—Drainage	—	2·50	2·50
Colombia—Livestock	18·30	—	18·30
Ecuador—Livestock	—	1·50	1·50
Ethiopia—General agricultural development	—	3·10	3·10
Ethiopia—General agricultural development	—	3·50	3·50
Ghana—Fisheries	—	1·30	1·30
Ghana—Cocoa production	—	8·50	8·50
Honduras—Livestock	—	2·60	2·60
India—Irrigation	—	35·00	35·00
India—Agricultural credit	—	35·00	35·00
India—Agricultural credit	—	27·50	27·50
Indonesia—Agricultural estates	—	17·00	17·00
Indonesia—Irrigation	—	18·50	18·50
Iran—Agricultural credit	6·50	—	6·50
Ivory Coast—Cocoa production	7·50	—	7·50
Kenya—Forestry	2·60	—	2·60
Malaysia—Land settlement and development	13·00	—	13·00
Malaysia—Forestry	8·50	—	8·50
Morocco—Irrigation	46·00	—	46·00
Niger—Agricultural credit	—	0·58	0·58
Pakistan—Irrigation	—	13·00	13·00
Pakistan—Irrigation	—	14·00	14·00
Papua and New Guinea—Oil palm, coconuts, and cattle	—	5·00	5·00
Philippines—Irrigation	34·00	—	34·00
Spain—Livestock	25·00	—	25·00
United Arab Republic—Drainage	—	26·00	26·00
Uruguay—Livestock	6·30	—	6·30
Zambia—Commercial farming	5·50	—	5·50
	186·80	226·08	412·88

The United Kingdom and the World Bank Group (as of June, 1970)
U.K. Outflows

I would like to conclude my talk with some observations on the contribution which the United Kingdom had made to the World Bank Group and also the benefits which it has derived from it. Its contributions to the Bank comprises the paid-in portion of its capital subscription, amounting to the equivalent of U.S. $260 million, which is free of interest, fully convertible and available for lending by the Bank. The total capital subscription entitles the United Kingdom to 10·1% of the total voting power exercised by the Bank's 113 member countries as of June, 1970. To this must be added contributions to I.D.A. amounting to $383·26 million. Another major U.K. outflow to the Bank has been funds (net of repayments) which the World Bank has borrowed in the form of bonds in Britain. These bonds have a triple A rating as security at

their going rate of interest which of course flows back into the U.K. Finally the country has made not an inconsequential contribution to the staffing of the World Bank. Currently about 15% of the professional positions in the Bank and I.F.C. are held by British nationals.

TABLE 4. *U.K. and the World Bank.*

Inflows		Outflows	
	$ million equivalent		$ million equivalent
Goods and services purchased in the U.K. under:		Share subscription	260
		Contribution to IDA	383
IBRD projects	1125·6	3 Bond issues in £ Sterling	(48)
IDA projects	328·9		
Interest on Bank loans and bonds held		Outstanding 30.6.70	31
	*	U.K. purchase of U.S. $ Bonds (outstanding 30.6.70)	·9
		U.K. portfolio purchases of Bank commitments	(26)
		(Outstanding 30.6.70)	3
TOTAL	1454·5		686

*Not known precisely probably not over $2 million.

U.K. Inflows or Benefits

The principal benefit which the United Kingdom derives from membership in the World Bank has been the orders obtained by British industry for the supply of goods and services for projects being assisted by World Bank loans. The Bank requires its borrowers to make procurements with its finance under conditions of international competitive bidding among member countries of the Bank and Switzerland.

Up to the end of June 1970 payments received by the U.K. for such orders totalled U.S. $1,125·6 million for Bank projects which is more than four times the U.K.'s paid in capital subscription. It also obtained business worth U.S. $328·9 million for I.D.A. projects.

These disbursements covered a wide range of activities and a variety of goods and services as will be seen from Tables 5a and 5b.

As an international civil servant I feel restrained from commenting on these two tables in a national context. One feature that deserves comment, however, is the use of British consultants. In the process of expanding its lending activities the Bank has turned

TABLE 5A. *Disbursements in the U.K.*

Purpose of Loan	I.B.R.D.	I.D.A.
	(amount in U.S. $ million equiv. as of 30.6.70)	
Electric power	337·5	10·6
Transportation	458·1	81·1
Telecommunications	12·6	3·4
Agriculture	40·2	32·5
Industry: (of which fertiliser 0·4)	105·8	180·4
Water Supply	6·5	2·6
Education	2·0	5·0
Development Finance Companies	130·0	2·8
Multi-purpose loans	30·2	10·0
Engineering Surveys		0·5
International Finance Corporations	1·9	
Others	0·8	
TOTAL	1125·6	328·9

TABLE 5B. *Disbursements in the U.K.*

By category of goods and services	I.B.R.D.	I.D.A.
	(amount in U.S. $ million equiv. as of 30.6.70)	
Chemicals	0·1	1·0
Construction materials	7·7	3·8
Construction equipment	9·3	6·2
Mechanical equipment	52·4	21·5
Textile machinery	51·9	0·8
Agricultural machinery	6·5	24·1
Electrical equipment	59·4	23·6
Automotive machinery and equipment	3·0	75·5
Vessels and floating equipment	8·6	0·5
Materials and equipment for railways	20·0	13·1
School equipment and supplies	1·3	1·6
Civil works	43·8	23·2
Consultants services	24·0	8·3
Freight and Insurance	4·4	1·6
Loan charges	3·5	
Prior to 7.1.66	829·6	123·6
Miscellaneous	1·5	0·3
TOTAL	1125·6	328·9

increasingly to the use of consultants' services in recent years. It may surprise some to see that the U.K. earned the equivalent of U.S. $32·3 million in consulting fees since the 1st July, 1966 from Bank and I.D.A. financed projects. As the Bank's operations expand over the next few years there are clearly further opportunities for the U.K. to benefit from Bank Group operations provided its tenders for goods and services are competitive.

I trust that this rapid survey of the World Bank's role in agriculture has given you some insight into the institution's objectives and modus operandi. The role that the World Bank will have to play in helping development in the years ahead is likely to increase. To expand its business in some of the poorest countries, however, will need a continuance of a blend of soft (I.D.A. type) loans as well as hard loans. Developed countries will need to cooperate with the World Bank to make this expansion possible.

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ANNEX

TABLE 1. *The Record for Ten Years*—1961–1970. (*Expressed in millions U.S.* $).

	Fiscal Year									
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
WORLD BANK										
Loans: Number	27	29	28	37	38	37	46	44	84	70
Loans: Amount	$610	$882	$449	$810	$1,023	$839	$877	$847	$1,399	$1,680
Disbursements	398	485	620	559	606	668	790	772	762	772
Repayments to Bank	101	104	113	117	137	166	188	237	298	329
Gross Income	167	188	204	219	267	292	331	356	410	504
Net Income	63	70	83	97	137	144	170	169	171	213
Total Reserves	602	699	813	846	895	954	1,023	1,160	1,254	1,329
Borrowings: Gross	787	271	121	100	598	288	729	735	1,224	735
Borrowings: Net	300	104	−5	−32	250	64	503	215	698	299
Subscribed Capital	20,093	20,485	20,730	21,186	21,669	22,426	22,850	22,942	23,036	23,159
Member Countries	68	75	85	102	102	103	106	107	110	113
I.D.A.										
Credits: Number	4	18	17	18	20	12	20	18	38	56
Credits: Amount	$101	$134	$260	$283	$309	$284	$354	$107	$385	$606
Disbursements	—	12	56	124	222	267	342	319	256	143
Subscribed Capital	906	917	969	987	996	999	1,000	1,000	1,013	1,014
Supplementary Resources and special contributions	—	—	6	679	756	763	768	773	1,054	1,950
Member Countries	51	62	76	93	94	96	97	98	102	105
Professional Staff	317	349	406	444	496	615	685	740	917	1,166

ANNEX

TABLE 1. *Loans Signed by I.B.R.D./I.D.A. Total Aid to Agriculture* 1965/66-1969/70. (*In $ million equivalents*).

	1965/66	1966/67	1967/68	1968/69	1969/70
IBRD Total ($m)	839	877*	847	1399	1680
Agriculture	121	61	145	278	187
Agr. as % of total	14%	7%	21%	20%	11%
IDA Total	284	353	107	385	606
Agriculture	32	26	27	89	226
IBRD/IDA Total	1123	1230	954	1784	2286
Agriculture	152	87	172	367	413
Agr. as % of total	14%	7%	18%	21%	18%

*$100 million to I.F.C.
Source: I.B.R.D./I.D.A. Annual Reports.

TABLE 2. *Disbursements as of June* 30, 1970. (*Expressed in millions of U.S.* $)

Country	Bank	I.D.A.
United Kingdom	1,125·6	328·9
Total identifiable disbursements	7,396·9	1,429·4
Other disbursements:		
Local	731·9	231·1
Undetermined	2,226·0	81·1
GRAND TOTAL	$10,354·8	$1,741·6

ANNEX

TABLE 3. *Bank Loans and I.D.A. Credits by Purpose and Area. Cumulative Total, June 30, 1970. (Millions of U.S. Dollars, initial commitment of cancellations and refundings)*

Purpose	Total Bank and I.D.A.	Bank Loans by Area: Total	Africa	Asia and Middle East	Australasia	Europe	Western Hemisphere	I.D.A. Credits by Area: I.F.C.	Total	Africa	Asia and Middle East	Europe	Western Hemisphere
GRAND TOTAL	$17,047·7	$14,274·6	$2,014·5	$4,628·2	$415·6	$2,565·1	$4,352·2	$200·0	$2,773·1	$548·1	$1,989·6	$92·3	$143·1
ELECTRIC POWER	4,805·0	4,642·2	512·4	956·3	148·2	646·1	2,379·1	—	162·8	15·3	89·9	25·7	31·9
TRANSPORTATION	5,252·1	4,405·4	915·8	1,750·3	58·0	585·6	1,095·8	—	846·7	267·1	502·3	—	77·3
Railways	2,042·2	1,688·8	446·8	734·1	42·0	272·4	193·5	—	353·4	26·6	326·8	—	—
Shipping	12·0	12·0	—	—	—	12·0	—	—	—	—	—	—	—
Ports and waterways	519·2	481·9	169·6	162·0	6·7	98·4	45·3	—	37·3	11·7	25·6	—	—
Roads	2,527·3	2,071·3	249·4	792·5	—	195·6	833·8	—	456·0	228·8	149·9	—	77·3
Airlines and airports	22·0	22·0	—	5·6	9·2	7·2	—	—	—	—	—	—	—
Pipelines	129·5	129·5	50·0	56·2	—	—	23·3	—	—	—	—	—	—
TELECOMMUNICATIONS	379·7	243·9	37·1	65·4	—	40·3	101·1	—	135·8	0·8	135·0	—	—
AGRICULTURE, FORESTRY AND FISHING	1,919·1	1,294·1	199·1	536·8	—	124·8	433·5	—	625·0	119·9	450·3	31·9	22·9
Farm mechanisation	24·4	24·4	5·0	9·0	—	2·0	8·4	—	—	—	—	—	—
Irrigation and flood control	1,029·1	707·1	81·0	429·9	—	85·3	111·0*	—	322·0	39·0	251·1	31·9	—
Land clearance, farm improvement, etc.	107·6	80·7	24·2	45·3	—	2·2	9·0	—	26·9	26·9	—	—	—
Crop processing and storage	38·1	12·2	5·2	2·0	—	4·2	0·8	—	25·9	6·7	19·2	—	—
Livestock improvement	234·1	203·3	5·3	4·4	—	25·0	168·6	—	30·8	7·9	—	—	22·9
Forestry and fishing	42·9	41·6	7·9	22·2	—	6·2	5·3	—	1·3	1·3	—	—	—
Agricultural credit	358·8	197·1	42·8	24·0	—	—	130·4	—	161·7	21·2	140·5	—	—
Smallholders and plantations	84·1	27·7	27·7	—	—	—	—	—	56·4	16·9	39·5	—	—
INDUSTRY	2,269·8	2,165·8	249·0	1,141·5	—	555·7	219·6	—	104·0	5·0	64·3	34·7	—
Iron and steel	399·0	399·0	—	344·1	—	25·0	30·0	—	—	—	—	—	—
Pulp and paper	133·7	133·7	—	4·2	—	109·5	20·0	—	—	—	—	—	—
Fertiliser and other chemicals	171·4	141·4	30·0	57·0	—	54·4	—	—	30·0	—	30·0	—	—
Other industries	274·1	264·7	20·5	5·2	—	203·6	35·4	—	9·4	—	9·4	—	—
Mining, other extractive	179·1	179·1	101·0	19·5	—	11·9	46·7	—	—	—	—	—	—
Development finance companies	1,112·6	1,048·0	97·5	711·6	—	151·4	87·5	—	64·6	5·0	24·9	34·7	—
GENERAL DEVELOPMENT AND PROGRAM LOANS	1,207·3	552·3	40·0	103·8	308·5	100·0	—	—	655·0	—	655·0	—	—
EDUCATION	323·7	144·5	40·3	29·8	—	12·0	62·4	—	179·2	118·9	52·3	—	8·0
FAMILY PLANNING	2·0	2·0	—	—	—	—	2·0	—	—	—	—	—	—
WATER SYSTEMS	175·1	127·1	20·0	44·4	—	3·9	58·8	—	48·0	15·1	29·9	—	3·0
POST-WAR RECONSTRUCTION	496·8	496·8	—	—	—	496·8	—	—	—	—	—	—	—
PROJECT PREPARATION AND TECHNICAL ASSISTANCE	17·6	0·9	0·9	—	—	—	—	—	16·7	6·1	10·6	—	—
FINANCING LOAN (IFC)	200·0	200·0	—	—	—	—	—	200·0	—	—	—	—	—

Note: Multipurpose loans are distributed according to each purpose and not assigned to the major purpose. Detail may not add to totals because of rounding.
*Includes Loan No. 559 Guyana. Sea defence project.

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THE FERTILISER SOCIETY

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by

O. W. T. PRICE, B.Sc., M.S., M.A., D.Phil.

Paper read before The Fertiliser Society of London
on 21st January, 1971.

ALEMBIC HOUSE,
93 ALBERT EMBANKMENT,
LONDON, SE1 7TU.

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International Bank for Reconstruction & Development, Washington, U.S.A.

Summary

Besides their own savings, the developing countries must rely to a considerable extent on foreign sources of capital for financing their development. The World Bank Group channels a small (10%), but increasing, share of these capital transfers through either the Group's main organisation, the International Bank for Reconstruction and Development (I.B.R.D.), or its two affiliates, the International Development Association (I.D.A.), and the International Finance Corporation (I.F.C.). The Group obtains its operating funds from private and governmental sources and commits them under widely varying conditions. Annual commitments have trebled during the last decade, reaching $2,300 million in the financial year 1970. Actual disbursements average about $1,000 million per year.

The developing world's heavy dependence on agriculture is reflected by the emphasis which loans for agriculture receive, and these involve both import substituting and export expanding types of projects. About one-fifth of all I.B.R.D./I.D.A. commitments are for agricultural projects and an additional important share of I.F.C.'s investment is in the fertiliser and food processing industries. Through its capital subscription, bond purchases and as a source for I.D.A. funds, the U.K. plays a considerable financial role in the Group's activities. Against this outflow of funds, however, stand the orders obtained by British industry and consulting firms for the supply of goods and services to Bank-financed projects.

Preface

I would like to take this opportunity to thank your Society for showing an interest in the World Bank by asking me to address you today on "the role of the World Bank in Agricultural Development."

Turning to today's topic, I would like to give you the framework of my talk. Firstly, I shall review the broad needs of the developing countries and the place of the World Bank in the process of development (including what it is and what it does). I will then describe more specifically the Bank Groups' activities in agriculture. I have chosen to close my talk with a few observations on the contributions which the United Kingdom has made to the Bank and the benefits which it has derived from being a shareholder.

General Introduction

In order to place the subject in perspective it is helpful to describe very briefly but in general terms some of the characteristics of the less developed countries (L.D.C.) of the world. They have relatively low incomes per head, high population growth rates (often 2·5% per annum) and relatively low growth in incomes per head (sometimes 1% or less). In addition they invariably have a high proportion of their working population engaged in agriculture (frequently over 50%).

In these circumstances it is understandable that much thought and effort is being devoted in the developing world to means of accelerating growth in the gross national product per head and more recently to the role which agriculture can play towards this end. While politicians, economists, sociologists and others in the developed world may be concerned with the environment, welfare considerations and more equitable distribution of income and wealth, countries of the developing world are still mainly preoccupied with finding means of accelerating their rate of economic growth, i.e. with the creation of wealth as distinct from its distribution. In some ways "An Inquiry into the Nature and Causes of the Wealth of Nations" published by Adam Smith in 1776 might be more relevant to the developing world than the scores of books on welfare, social security and environment that grace western bookshelves and often even the bookshelves of westerners working in the developing world.[1]

While there are other social, political and economic considerations relevant to the developing world there can be little doubt that one of the major objectives of the less developed countries at their present stage of development must be to accelerate the growth of gross national product (for the creation of goods and service) per head. It is also a brutal fact that one of the few means available to a developing country to achieve this growth by its own initiative is by making the labourer produce more than he is "permitted to consume"* thus creating a surplus (or savings) which can be invested in order to raise the productivity of labour and its wealth creating ability still further. This is of the essence of economic growth at the early stages of development almost regardless of the political regime chosen to accomplish it (cf. the early development of the United States of America, the United Kingdom or the U.S.S.R.).

In recent years, much attention has been given to means of alleviating the gruelling pressures associated with the early stages of economic development and to accelerating the process itself. It is not my intention to describe all of these but merely to highlight the role of the "World Bank Group" in this area.

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[1]This is a personal view of the author.

*This rationing is usually achieved by establishing high prices for essential consumer goods, keeping wages low, or taxation. The surplus may be collected by capitalists or the state.

In July, 1944 at Bretton Woods, New Hampshire, U.S.A., the representatives of 44 nations completed final drafts of the Articles of Agreement for the International Monetary Fund and the International Bank for Reconstruction and Development (the World Bank); two complimentary financial institutions.

The purpose of the International Monetary Fund (I.M.F.) was to promote international currency stability by helping to finance temporary balance of payments deficits and by providing for the progressive elimination of exchange restrictions and the observance of accepted rules of international financial conduct. In some respects its activities are better known in the developed world than those of the World Bank. Today, however, I wish to confine my observations to the latter institution.

The participants at Bretton Woods recognised that at the end of the war there would be a pressing need both for capital to help finance the reconstruction of production facilities destroyed by war, principally in Western Europe; and to provide capital to help raise productivity and living standards in the under-developed areas of the world. The World Bank was created to fulfil both these roles and it opened its doors for business in 1946. After the European Recovery Program (E.R.P.) arising from the Marshall Plan became operational in 1948, however, the World Bank turned its attention from the immediate problems of reconstruction in Europe to the financing of development; this has remained its major activity.

In effect, the major function of the World Bank, even from its early days, has been that of augmenting the capital supplies of the developing countries in order to accelerate the process of growth and alleviate some of the suffering and drudgery normally associated with the early stages of economic and social development. It was recognised at its inception that while the capital needs of the developing countries would be very large, the risks associated with investment in these countries were such that private capital would often be unwilling to fulfil them without some form of guarantee. The World Bank was created to help overcome this difficulty. It was authorised to make or guarantee loans both with its own capital funds and with private capital which it could raise on the money markets of the world. In order to attract private capital its financial structure was designed in such a manner that the risks on its investments would be shared by all member governments roughly in accordance with their economic strength. Furthermore the risk cover was virtually complete since the total outstanding amount of the loans made or guaranteed by the Bank was not to exceed the total of its unpaid subscribed capital, reserves and surplus. These features are incorporated in the Bank's Articles of Agreement.

The Articles establish the Bank as an intergovernmental institution, corporate in form but with all its capital stock being owned by member governments. The Bank's authorised capital is now equivalent to $24,000 million (£10,000 million) of which the

equivalent of approximately $23,159 million had been subscribed as of June 30, 1970. However, only one tenth of this or $2,316 million is paid in.

The Bank obtains the bulk of the funds required for its lending through Bond issues in the capital markets of the world. The security for this borrowing is based on the Bank reserves and the unpaid element of the Bank member Government's subscriptions.

TABLE 1. *Source of Funds for Loan Disbursements.*

	Cumulative to June 30, 1969		*Fiscal* 1969		*Fiscal* 1970	
	$m	%	$m	%	$m	%
Borrowings	4,222	38	689	64	923	54
Sale of loans	2,177	20	35	3	195	12
Usable subscriptions	1,912	17	6	1	39	2
Repayment of principal	1,798	16	298	27	329	19
TOTAL	11,074	100	1,702	100	1,092	100

Table 1 which gives the Bank's sources of Funds for disbursement serves to illustrate the importance of the capital markets to the Bank's operations. It also highlights the key role which the Bank serves as a bridge for private capital. It is one of the unique features of the Bank that, although it is an inter-governmental organisation, it relies heavily upon private capital for its financial resources.

The Articles of Agreement of the Bank also contain several provisions and guide lines which have proved invaluable over the years in ensuring that the Bank operates along sound financial and economic lines. The Articles of Agreement enjoin the Bank to act "prudently" in making loans paying "due regard to the prospects that the borrower . . . will be in a position to meet its obligations under the loan". It is also urged to ensure "that the more useful and urgent projects large and small alike, will be dealt with first". It is expected and encouraged to "promote the long range balanced growth of international trade and the maintenance of equilibrium in balances of payments by encouraging international investment for the development of productive resources of members". It is prohibited from making "tied" loans since it must not impose any conditions requiring the proceeds of its loans to be spent in any particular member country or countries. Furthermore only financial and economic considerations shall be relevant to the Bank's decisions; it must not be influenced by the political character of the country to which it is lending. Nor must the Bank and its officers interfere in the political affairs of any member.

Two other significant provisions in the Bank's Articles of Agreement are of general interest. The Bank's loans, except in special circumstances must be used to meet the foreign exchange requirements of specific projects. Also the Bank must be satisfied before making a loan that the borrower would be unable to obtain the loan from other sources on conditions reasonable for the borrower. In effect the Bank should not act in competition with the private capital but help to supplement it.

Since its inception in 1946 the Bank has sprouted two affiliate institutions, namely, the International Finance Corporation (I.F.C.) in 1956 and the International Development Association (I.D.A.) in 1960. Collectively the three institutions are known as the World Bank Group. The World Bank, the senior institution, only makes loans to governments or, under the cover of a government guarantee, to other institutions. I.F.C. supplements the activities of the Bank by making investments on commercial terms (and without government guarantees) in productive private enterprises in developing member countries. I.D.A. loans are approved on similar criteria to Bank loans but on terms which place a much lighter burden on the borrowing country. For example World Bank Loans currently carry an interest charge of $7\frac{1}{4}\%$ whereas I.D.A. loans have no interest charge and only carry a charge of $\frac{3}{4}\%$ which serves to defray the cost of administering the loan. Funds for I.D.A. lending are obtained from grants made by the developed member countries and therefore have to be distinguished from Bank loans, out of borrowing in the world markets.

The following facts will help to place the Bank Group's lending activities in perspective. Currently the net flow of financial resources to the developing world is approaching 13 thousand million dollars. Over half of this comes from government sources and the remainder is private capital movements. The Bank Group's share of the total financial flows is around 10% and is rising at a time when other international financial support, and particularly that from official bilateral resources, is tending to stagnate and in some important instances to decline. (The World Bank, as has already been indicated, derives its funds from both official and private sources).

Annual loan commitments entered into by the Bank Group have more than trebled during the last decade while disbursements have more than doubled. (See Annex, Table 1). The Bank Group's loan commitments (including I.F.C.) reached \$2·3 billion in the financial year 1970 making it for the first time probably the largest development agency in the world and exceeding the U.S. foreign aid bill of \$1·8 billion. Money committed however, is money pledged but not invested or disbursed. Disbursements in the last 3 years have fluctuated around a thousand million dollars but there are prospects that the rate of disbursement will be raised in the near future as the capital adsorptive capacity of the developing world is improved in a variety of ways.

World Bank and Agriculture

General:

The World Bank under the direction of its current President, Robert S. McNamara, is in the process of expanding considerably its lending operations. The President has also chosen to give special emphasis to agriculture, education and population control. These are mutually related facets of the general objective of raising productivity and the quality of living of individuals at an accelerated pace. As you will recall in my opening paragraph I emphasised that one of the characteristics of the developing world was a heavy dependence on agriculture. Many of the problems of development—raising productivity per head, creating a surplus and generating savings (some of which can be used for building other sectors of the economy)—have to be sought in agriculture.

Despite the fact that foreign capital inflows play an important part in financing investment in the developing world and particularly in providing much needed foreign exchange and technology it is well to remember that the export of goods and services of the developing countries provide 85% of their foreign exchange needs. Even more significant is the fact that some 88% of their export earnings are derived from the sales of primary products. Agricultural products dominate the export earnings of many of these countries. Owing to the large and rapidly expanding populations of some of the L.D.C.'s food imports also often absorb a substantial part of their extremely scarce foreign exchange earnings.

The agricultural sector it will be seen has a strategic role to play as an engine of growth in economic development of these countries. Yet in the early 1960's many were despondent of rapid economic progress simply because of the poor growth in the agricultural sector in relation to population growth—the latter has often been growing at between 2 and 3%.

TABLE 2. *Average Annual Rate of Growth in Agricultural Production.*

(Percent)	1960–1966
Developing countries:	
Africa	2·1
S. Asia	0·6
E. Asia	3·2
S. Europe	3·7
Latin America	2·9
Middle East	4·1
Industrialised countries:	1·8

Agricultural development efforts fall in the main into two categories namely those concerned with import saving and those

directed towards expanding the earnings from export crops. At later stages of development other considerations assume greater significance.

Food Crops

In most of the developing countries raising agricultural production in order to reduce imports involves increasing the production of locally produced food at a faster rate than population. The application of science and technology to food crop production in the L.D.C.'s has achieved dramatic results in the latter part of the 1960's. The development of the low photo-sensitive varieties of rice at the International Rice Research Institute at Los Banos and of dwarf wheat by CYMMIT (Mexico) have led to substantial increases in the production of these crops in some of the developing countries. Their impact has sometimes been referred to as the "Green Revolution."

While plant breeding and selection is undoubtedly opening up the prospects for an improvement in the supply of indigenously produced foods in the developing world and thus reducing its dependence on imports it is mistaken to assume that the expansion in production can be achieved with new varieties alone. A whole range of factors affects the rate of adoption of these new varieties and the prospects of continuing increases in production.

In many of the developing countries of Asia a perennial irrigation supply is probably the first priority in ensuring the adoption and spread of improved food crop varieties. New varieties will only give major increases in yield if they have adequate water and this in turn needs to be supplemented with heavy rates of fertiliser dressing and timely application of pesticides and fungicides. I need hardly point out to the Fertiliser Society that the nutrient requirements of a wheat crop producing on average 8 cwts. per acre (traditional variety) is very different from a crop of Mexi-pak wheat yielding 1½ tons or more per acre. (Nitrogen was frequently the only nutrient which gave an economic response at the low yield potential of the old varieties). Economic responses to phosphatic and potassic fertilisers tend to emerge following the removal of considerably more nutrients which results from the harvesting of much heavier crops.

The increases in production made possible with the new rice varieties, provided perennial irrigation is available, are spectacular. Take the case of the high yielding varieties of paddy moving into commercial use in the Philippines. These are capable of out-yielding the local varieties at least two-fold under general farming conditions. Couple with this the facts that (i) the local varieties take 140-180 days to mature compared with 100-130 days for the new varieties and (ii) that the new varieties because of their low photo-sensitivity can be grown at any time of the year thus enabling 2½ crops to be

grown in 12 months. In theory the production potential per hectare has been raised as follows:—

	Yield per hectare	
	Non-irrigated	*Irrigated* (new variety)
	(metric tons paddy)	
1st crop	1·5	2·8
2nd crop	—	3·2
½ 3rd crop	—	1·6
	1·5	7·6

In this illustration the annual yield per hectare under year-round irrigation could be five times as great as that from monsoon fed non-irrigated paddy. To make these results possible, however, the following conditions have to be fulfilled:

(a) an adequate and year-round supply of water from canals or tubewells;
(b) adequate supplies of good seed, fertilisers and pesticides available at the appropriate time and at reasonable prices;
(c) credit facilities which enable peasant farmers to purchase the requisite inputs at interest rates which are not usurous;
(d) price/cost relationships for farm products and inputs which provide an economic stimulus to adopt improved farming methods;
(e) the provision of grain drying, storage (and possibly harvesting) facilities. (Marketing and transport facilities may also be required).

Crops grown with irrigation outside the monsoonal rain period may give higher yields because of greater sunshine during the growing period but infrequently have to be harvested during the monsoon rains. The increased production can only be realised if drying and storage facilities are available otherwise part of the crop will rot. Where the increased production is surplus to local absorption it is also essential that transport and marketing facilities are available to handle the crops.

These features of the "Green Revolution" serve to highlight the need for additional capital in the lesser developed countries if they are to realise some of the opportunities now becoming available for raising the production of staple foods.

About half the volume of lending of the World Bank Group to agriculture in the developing countries is still directed towards extending or improving irrigation facilities and irrigation water storage and drainage. Other loans directed at accelerating the adoption of new food grain varieties are concerned with seed multiplication, grain storage, drying and improved milling facilities, fertiliser plants in the public and private sectors, and agricultural credit institutions. (The volume and types of loans to agriculture are discussed more fully later).

Export Crops

The developing countries are extremely dependent on primary products for generation of foreign exchange. At present nearly 90% of their export earnings are derived from this source. Furthermore, these earnings are usually determined by the fortunes of a narrow range of products: almost half of the L.D.C.'s depend on a single commodity for more than 50% of their total exports and three-quarters derive more than 60% of their export earnings from three primary products. It follows that the import capacity and developmental potential of these countries are extremely sensitive to changes in prices and market opportunities for one or two products only.

In general, markets have been growing relatively slowly for many of the products which the L.D.C. have to sell and prices have also fluctuated widely. The major markets for many of their agricultural exports, e.g. cocoa, coffee, tea, have been the developed countries which enjoy relatively high living standards and where consequently changes in incomes and prices have had relatively small effect on the demand for these products. Certain primary products have been under pressure because of the development of synthetic substitutes, e.g. cotton, jute, wool, rubber, etc. Also, in the case of certain agricultural products trade has been restricted because of protection given primary producers in the industrial countries. In view of some of these difficulties facing the primary producers in the lesser developed countries, the Board of Governors of the I.M.F./I.B.R.D./I.D.A. at its Twenty-Second Annual Meeting in Rio de Janeiro, on September 29, 1967, passed a resolution asking the staff of these three organisations to consider what measures should be taken by both the developing and developed countries to help stabilize the prices of primary products.

As an outcome of these studies it was decided that the International Monetary Fund should be prepared to extend assistance to members in connection with the financing of international buffer stocks of primary products subject to certain principles and limitations.

It was agreed that I.B.R.D.'s contribution in this area should be "within the framework of the Bank Group's regular lending standards and procedures as well as of its technical assistance and advisory activities." Among the various ways it was considered that the Bank might help, the following deserve particular mention:

(i) Diversification of production. It is clear that the Bank should attempt to finance projects to produce primary products that appear to face relatively favourable market prospects. It should also help finance projects which might provide alternative employment to factors currently being used in the production of surplus commodities;

(ii) Strengthen the competitiveness of primary products. This it can do by helping to finance cost-reducing techniques of production, e.g. replanting with high-yielding clones of rubber,

or oil palm or tea, which have considerably higher yields but lower costs per unit of output. Costs of natural rubber in particular are being reduced considerably by the introduction of high-yielding clones, new tapping techniques and even new processing and marketing methods. The Bank Group will also participate in financing research aimed at reducing production costs and developing new uses for primary products.

Livestock Products

The consumption of livestock products are low in the developing countries and at GNP of $100-$250 per head, these tend to be luxury products which few can afford to purchase. Vegetable sources and fish usually provide most of the somewhat inadequate protein intake in these countries. Poultry meat is frequently more expensive than the small quantities of red meat available from buffaloes and other draft animals as they reach the end of their productive life.

Despite this situation the Bank Group makes substantial loans to the livestock industry. In many instances by helping to finance improved feed grain production and modern pig and poultry production installations, it is possible to reduce the cost of these meats substantially. In other areas which have extensive land areas climatically suited to beef production, substantial loans are being made to foster the production of cattle for meat export purposes and thus increase the foreign exchange supplies of the country. The price and income elasticities of demand for beef in the developed countries are appreciably higher than for many of the traditional agricultural exports of the L.D.C.'s. Projects of this type are in less danger of creating a surplus situation than many of the more traditional exports.

Some Banking Operations

A brief description of the modus operandi of I.B.R.D. helps to indicate more clearly the way the World Bank views agriculture in its overall operations. The Bank sends an economic mission to its member countries at regular intervals. Some of the larger countries are visited annually while others are visited less frequently. The composition of these missions are partly determined by the nature of the country being reviewed but usually consist of general eoncomists, fiscal economists, and sector specialists. Almost every mission would have an agricultural sector specialist and some might include a transport economist, an industrial economist, etc.

In general a country economic mission will report on the following items:

(i) The country's credit-worthiness (this would include an analysis of the foreign interest and principal repayment commitments in relation to export earnings—the debt-service ratio).

(ii) The investment and foreign currency needs of the country as indicated by the gap between its own resources (or earnings prospects) and its needs.

(iii) The priorities or emphasis between sectors that should be given in the country's development and investment program.

Agriculture usually figures as one of the high priority sectors in country economic reports.

The economic mission to a country is primarily concerned with establishing priorities between sectors of the economy in order to determine the broad pattern of emphasis in development and bank investment strategy. In order to help identify the priorities within sectors the Bank sends sector review missions and project identification missions to various countries. In the case of agriculture the latter are sometimes undertaken by the F.A.O./I.B.R.D. Cooperative Program or by the F.A.O. on behalf of the United Nations Development Programme (U.N.D.P.).

Either through the country's own initiative or following some assistance from the Cooperative Program or U.N.D.P., projects are formally submitted to the Bank with a request for Bank assistance in their financing. At this juncture the Bank sends a project appraisal team to the country to scrutinize the project (or to use the technical term to "appraise it"). The team is normally composed of technical experts appropriate to the projects (e.g. experts on natural rubber production, tea production, irrigation) plus an economist and a financial analyst.

The appraisal team's report is comprehensive and covers the technical, commercial, managerial, organisational, financial and economic aspects of a project. It will deal with the following:

(i) Financial rate of return from the project. (The discounted cash flow technique is most commonly used, although other aspects are also considered).

(ii) The economic rate of return. Using the ruling, prices in a country may sometimes give a misleading indication of the value of a project to the economy of that country. An unrealistic exchange rate, tariffs and subsidies, wage rates which give an erroneous impression of the opportunity cost of labour under conditions of serious unemployment, all these and other factors must be taken into account in assessing the economic rate of return of a project to the national economy.

(iii) The cash-flow position. An estimate must be made of the cash flow generated by a project to determine whether the borrower can meet the obligations of repaying the interest and principal.

(iv) A set of covenants or conditions for the loan which will help to ensure the success of the investment. These cover a wide range of factors which are germane. They will always contain clauses relating to the terms of repayment of principal and interest. They may include conditions relating to institutions, pricing and management appointments and structure.

This brief sketch indicates the way in which the Bank gathers and processes information to determine its lending strategy and to choose the projects which it supports financially. It will be seen that

agricultural projects are not chosen in isolation but as a part of the Bank's assessment of the role of agriculture in overall development.

Loans to Agriculture: The Record

Objectives are sometimes more easily defined than achieved. The developing countries frequently have difficulty in preparing a project and establishing the institutional, economic, fiscal and agricultural policy framework which will ensure its viability. It follows that the pace at which the Bank Group can expand its lending activities is to some extent outside its own control. It is given some support in achieving its objectives however by the United Nations Development Program which attempts to undertake the preinvestment studies necessary to prepare a program. It is also helped more directly by the F.A.O./I.B.R.D. Cooperative Program which is largely financed by the World Bank and whose main function is to help member countries prepare projects to the stage at which Bank staff can appraise them for a loan. To enable the World Bank increase its agricultural lending activities, both the Bank staff and the F.A.O./I.B.R.D. Cooperative Program staff have been expanded considerably over the last year or two. The Agricultural Projects Department is now the largest in the Bank and its professional staff number has been increased from around 60 in mid-1967 to over 100 at present, and is expected to reach 120 by about June 1971.

Between 1965/66 and 1969/70 the I.B.R.D./I.D.A. loan commitments have doubled and those to agriculture have nearly trebled (see Annex, Table 2). Loans to agriculture reached $413 million in 1969/70 and are running at about a fifth of the total I.B.R.D./I.D.A. loan commitments. Total I.F.C. loan and equity capital commitments per annum are around $100 million at present and over the last three years some 12% was invested in the fertiliser industry and about 5% in food and food processing.

The types of loans made to agriculture and the countries being served vary from year to year depending on the projects becoming available for financing. Loans to agriculture signed by the Bank in the financial year 1969/70 serve to illustrate the types of loans which the Bank makes and the wide geographical dispersal of its lending activities in any one year.

In 1969/70 about half the I.B.R.D./I.D.A. loans made to agriculture were for irrigation and drainage facilities. This was the major type of loan made in that year. It will also be seen that a high proportion of the loans are concerned with raising production in agriculture. Over the next few years investment in storage, marketing and processing facilities are likely to appear more frequently than in the past. While lending for large scale irrigation and flood control projects have remained an important part of operations in this sector, financing activities by the Bank and I.D.A. have been widened to include projects covering a broad range of agricultural requirements.

TABLE 3. *Bank Loans and I.D.A. Credits* 1969/70 *by Purpose.*
(*Expressed in millions U.S.* $).

	Bank	I.D.A.	Total
Agriculture:			
Afghanistan—Agricultural credit	—	5·00	5·00
Bolivia—Livestock	—	1·40	1·40
Ceylon—Irrigation and drainage	13·60	5·10	18·70
Ceylon—Drainage	—	2·50	2·50
Colombia—Livestock	18·30	—	18·30
Ecuador—Livestock	—	1·50	1·50
Ethiopia—General agricultural development	—	3·10	3·10
Ethiopia—General agricultural development	—	3·50	3·50
Ghana—Fisheries	—	1·30	1·30
Ghana—Cocoa production	—	8·50	8·50
Honduras—Livestock	—	2·60	2·60
India—Irrigation	—	35·00	35·00
India—Agricultural credit	—	35·00	35·00
India—Agricultural credit	—	27·50	27·50
Indonesia—Agricultural estates	—	17·00	17·00
Indonesia—Irrigation	—	18·50	18·50
Iran—Agricultural credit	6·50	—	6·50
Ivory Coast—Cocoa production	7·50	—	7·50
Kenya—Forestry	2·60	—	2·60
Malaysia—Land settlement and development	13·00	—	13·00
Malaysia—Forestry	8·50	—	8·50
Morocco—Irrigation	46·00	—	46·00
Niger—Agricultural credit	—	0·58	0·58
Pakistan—Irrigation	—	13·00	13·00
Pakistan—Irrigation	—	14·00	14·00
Papua and New Guinea—Oil palm, coconuts, and cattle	—	5·00	5·00
Philippines—Irrigation	34·00	—	34·00
Spain—Livestock	25·00	—	25·00
United Arab Republic—Drainage	—	26·00	26·00
Uruguay—Livestock	6·30	—	6·30
Zambia—Commercial farming	5·50	—	5·50
	186·80	226·08	412·88

The United Kingdom and the World Bank Group (as of June, 1970)
U.K. Outflows

I would like to conclude my talk with some observations on the contribution which the United Kingdom had made to the World Bank Group and also the benefits which it has derived from it. Its contributions to the Bank comprises the paid-in portion of its capital subscription, amounting to the equivalent of U.S. $260 million, which is free of interest, fully convertible and available for lending by the Bank. The total capital subscription entitles the United Kingdom to 10·1% of the total voting power exercised by the Bank's 113 member countries as of June, 1970. To this must be added contributions to I.D.A. amounting to $383·26 million. Another major U.K. outflow to the Bank has been funds (net of repayments) which the World Bank has borrowed in the form of bonds in Britain. These bonds have a triple A rating as security at

their going rate of interest which of course flows back into the U.K. Finally the country has made not an inconsequential contribution to the staffing of the World Bank. Currently about 15% of the professional positions in the Bank and I.F.C. are held by British nationals.

TABLE 4. *U.K. and the World Bank.*

Inflows		Outflows	
	$ million equivalent		$ million equivalent
Goods and services purchased in the U.K. under:		Share subscription	260
		Contribution to IDA	383
IBRD projects IDA projects	1125·6 328·9	3 Bond issues in £ Sterling	(48)
Interest on Bank loans and bonds held	*	Outstanding 30.6.70	31
		U.K. purchase of U.S. $ Bonds (outstanding 30.6.70)	·9
		U.K. portfolio purchases of Bank commitments	(26)
		(Outstanding 30.6.70)	3
TOTAL	1454·5		686

*Not known precisely probably not over $2 million.

U.K. Inflows or Benefits

The principal benefit which the United Kingdom derives from membership in the World Bank has been the orders obtained by British industry for the supply of goods and services for projects being assisted by World Bank loans. The Bank requires its borrowers to make procurements with its finance under conditions of international competitive bidding among member countries of the Bank and Switzerland.

Up to the end of June 1970 payments received by the U.K. for such orders totalled U.S. $1,125·6 million for Bank projects which is more than four times the U.K.'s paid in capital subscription. It also obtained business worth U.S. $328·9 million for I.D.A. projects.

These disbursements covered a wide range of activities and a variety of goods and services as will be seen from Tables 5a and 5b.

As an international civil servant I feel restrained from commenting on these two tables in a national context. One feature that deserves comment, however, is the use of British consultants. In the process of expanding its lending activities the Bank has turned

TABLE 5A. *Disbursements in the U.K.*

Purpose of Loan	I.B.R.D.	I.D.A.
	(amount in U.S. $ million equiv. as of 30 6.70)	
Electric power	337·5	10·6
Transportation	458·1	81·1
Telecommunications	12·6	3·4
Agriculture	40·2	32·5
Industry:	105·8	180·4
(of which fertiliser 0·4)		
Water Supply	6·5	2·6
Education	2·0	5·0
Development Finance Companies	130·0	2·8
Multi-purpose loans	30·2	10·0
Engineering Surveys		0·5
International Finance Corporations	1·9	
Others	0·8	
TOTAL	1125·6	328·9

TABLE 5B. *Disbursements in the U.K.*

By category of goods and services	I.B.R.D.	I.D.A.
	(amount in U.S. $ million equiv. as of 30.6.70)	
Chemicals	0·1	1·0
Construction materials	7·7	3·8
Construction equipment	9·3	6·2
Mechanical equipment	52·4	21·5
Textile machinery	51·9	0·8
Agricultural machinery	6·5	24·1
Electrical equipment	59·4	23·6
Automotive machinery and equipment	3·0	75·5
Vessels and floating equipment	8·6	0·5
Materials and equipment for railways	20·0	13·1
School equipment and supplies	1·3	1·6
Civil works	43·8	23·2
Consultants services	24·0	8·3
Freight and Insurance	4·4	1·6
Loan charges	3·5	
Prior to 7.1.66	829·6	123·6
Miscellaneous	1·5	0·3
TOTAL	1125·6	328·9

increasingly to the use of consultants' services in recent years. It may surprise some to see that the U.K. earned the equivalent of U.S. $32·3 million in consulting fees since the 1st July, 1966 from Bank and I.D.A. financed projects. As the Bank's operations expand over the next few years there are clearly further opportunities for the U.K. to benefit from Bank Group operations provided its tenders for goods and services are competitive.

I trust that this rapid survey of the World Bank's role in agriculture has given you some insight into the institution's objectives and modus operandi. The role that the World Bank will have to play in helping development in the years ahead is likely to increase. To expand its business in some of the poorest countries, however, will need a continuance of a blend of soft (I.D.A. type) loans as well as hard loans. Developed countries will need to cooperate with the World Bank to make this expansion possible.

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TABLE 1. *The Record for Ten Years*—1961–1970. (*Expressed in millions U.S. $*).

	Fiscal Year									
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
WORLD BANK										
Loans: Number	27	29	28	37	38	37	46	44	84	70
Loans: Amount	$610	$882	$449	$810	$1,023	$839	$877	$847	$1,399	$1,680
Disbursements	398	485	620	559	606	668	790	772	762	772
Repayments to Bank	101	104	113	117	137	166	188	237	298	329
Gross Income	167	188	204	219	267	292	331	356	410	504
Net Income	63	70	83	97	137	144	170	169	171	213
Total Reserves	602	699	813	846	895	954	1,023	1,160	1,254	1,329
Borrowings: Gross	787	271	121	100	598	288	729	735	1,224	735
Borrowings: Net	300	104	−5	−32	250	64	503	215	698	299
Subscribed Capital	20,093	20,485	20,730	21,186	21,669	22,426	22,850	22,942	23,036	23,159
Member Countries	68	75	85	102	102	103	106	107	110	113
I.D.A.										
Credits: Number	4	18	17	18	20	12	20	18	38	56
Credits: Amount	$101	$134	$260	$283	$309	$284	$354	$107	$385	$606
Disbursements	—	12	56	124	222	267	342	319	256	143
Subscribed Capital	906	917	969	987	996	999	1,000	1,000	1,013	1,014
Supplementary Resources and special contributions	—	—	6	679	756	763	768	773	1,054	1,950
Member Countries	51	62	76	93	94	96	97	98	102	105
Professional Staff	317	349	406	444	496	615	685	740	917	1,166

ANNEX

TABLE 2(a). *Loans Signed by I.B.R.D./I.D.A. Total Aid to Agriculture 1965/66-1969/70. (In $ million equivalents).*

	1965/66	1966/67	1967/68	1968/69	1969/70
IBRD Total ($m)	839	877*	847	1399	1680
Agriculture	121	61	145	278	187
Agr. as % of total	14%	7%	21%	20%	11%
IDA Total	284	353	107	385	606
Agriculture	32	26	27	89	226
IBRD/IDA Total	1123	1230	954	1784	2286
Agriculture	152	87	172	367	413
Agr. as % of total	14%	7%	18%	21%	18%

*$100 million to I.F.C.
Source: I.B.R.D./I.D.A. Annual Reports.

TABLE 2(b). *Disbursements as of June* 30, 1970. (*Expressed in millions of U.S.* $)

Country	Bank	I.D.A.
United Kingdom	1,125·6	328·9
Total identifiable disbursements	7,396·9	1,429·4
Other disbursements:		
Local	731·9	231·1
Undetermined	2,226·0	81·1
GRAND TOTAL	$10,354·8	$1,741·6

TABLE 3. *Bank Loans and I.D.A. Credits by Purpose and Area. Cumulative Total, June 30, 1970. (Millions of U.S. Dollars, initial commitment of cancellations and refundings)*

Purpose	Total Bank and I.D.A.	Bank Loans by Area: Total	Africa	Asia and Middle East	Australasia	Europe	Western Hemisphere	I.D.A. Credits by Area: I.F.C.	Total	Africa	Asia and Middle East	Europe	Western Hemisphere
GRAND TOTAL	$17,047·7	$14,274·6	$2,014·5	$4,628·2	$415·6	$2,565·1	$4,352·2	$200·0	$2,773·1	$548·1	$1,989·6	$92·3	$143·1
ELECTRIC POWER	4,805·0	4,642·2	512·4	956·3	148·2	646·1	2,379·1	—	162·8	15·3	89·9	25·7	31·9
TRANSPORTATION	5,252·1	4,405·4	915·8	1,750·3	58·0	585·6	1,095·8	—	846·7	267·1	502·3	—	77·3
Railways	2,042·2	1,688·8	446·8	734·1	42·0	272·4	193·5	—	353·4	26·6	326·8	—	—
Shipping	12·0	12·0	—	—	—	12·0	—	—	—	—	—	—	—
Ports and waterways	519·2	481·9	169·6	162·0	6·7	98·4	45·3	—	37·3	11·7	25·6	—	—
Roads	2,527·3	2,071·3	249·4	792·5	—	195·6	833·8	—	456·0	228·8	149·9	—	77·3
Airlines and airports	22·0	22·0	—	5·6	9·2	7·2	—	—	—	—	—	—	—
Pipelines	129·5	129·5	50·0	56·2	—	—	23·3	—	—	—	—	—	—
TELECOMMUNICATIONS	379·7	243·9	37·1	65·4	—	40·3	101·1	—	135·8	0·8	135·0	—	—
AGRICULTURE, FORESTRY AND FISHING	1,919·1	1,294·1	199·1	536·8	—	124·8	433·5	—	625·0	119·9	450·3	31·9	22·9
Farm mechanisation	24·4	24·4	5·0	9·0	—	2·0	8·4	—	—	—	—	—	—
Irrigation and flood control	1,029·1	707·1	81·0	429·9	—	85·3	111·0*	—	322·0	39·0	251·1	31·9	—
Land clearance, farm improvement, etc.	107·6	80·7	24·2	45·3	—	2·2	9·0	—	26·9	26·9	—	—	—
Crop processing and storage	38·1	12·2	5·2	2·0	—	4·2	0·8	—	25·9	6·7	19·2	—	—
Livestock improvement	234·1	203·3	5·3	4·4	—	25·0	168·6	—	30·8	7·9	—	—	22·9
Forestry and fishing	42·9	41·6	7·9	22·2	—	6·2	5·3	—	1·3	1·3	—	—	—
Agricultural credit	358·8	197·1	42·8	24·0	—	—	130·4	—	161·7	21·2	140·5	—	—
Smallholders and plantations	84·1	27·7	27·7	—	—	—	—	—	56·4	16·9	39·5	—	—
INDUSTRY	2,269·8	2,165·8	249·0	1,141·5	—	555·7	219·6	—	104·0	5·0	64·3	34·7	—
Iron and steel	399·0	399·0	—	344·1	—	25·0	30·0	—	—	—	—	—	—
Pulp and paper	133·7	133·7	—	4·2	—	109·5	20·0	—	—	—	—	—	—
Fertiliser and other chemicals	171·4	141·4	30·0	57·0	—	54·4	—	—	30·0	—	30·0	—	—
Other industries	274·1	264·7	20·5	5·2	—	203·6	35·4	—	9·4	—	9·4	—	—
Mining, other extractive	179·1	179·1	101·0	19·5	—	11·9	46·7	—	—	—	—	—	—
Development finance companies	1,112·6	1,048·0	97·5	711·6	—	151·4	87·5	—	64·6	5·0	24·9	34·7	—
GENERAL DEVELOPMENT AND PROGRAM LOANS	1,207·3	552·3	40·0	103·8	308·5	100·0	—	—	655·0	—	655·0	—	—
EDUCATION	323·7	144·5	40·3	29·8	—	12·0	62·4	—	179·2	118·9	52·3	—	8·0
FAMILY PLANNING	2·0	2·0	—	—	—	—	2·0	—	—	—	—	—	—
WATER SYSTEMS	175·1	127·1	20·0	44·4	—	3·9	58·8	—	48·0	15·1	29·9	—	3·0
POST-WAR RECONSTRUCTION	496·8	496·8	—	—	—	496·8	—	—	—	—	—	—	—
PROJECT PREPARATION AND TECHNICAL ASSISTANCE	17·6	0·9	0·9	—	—	—	—	—	16·7	6·1	10·6	—	—
FINANCING LOAN (IFC)	200·0	200·0	—	—	—	—	—	200·0	—	—	—	—	—

Note: Multipurpose loans are distributed according to each purpose and not assigned to the major purpose. Detail may not add to totals because of rounding.
*Includes Loan No. 559 Guyana. Sea defence project.

PROCEEDINGS

THE PRESIDENT: MR. P. L. BALDWIN.

THE PRESIDENT: Ladies and Gentlemen, I am going now to open the fourth meeting of the Society for this season at which we are going to hear about the World Bank. This paper is being given by Dr. Price.

Dr. Owen Price was brought up on a 400-acre livestock farm in Breconshire, and studied under Professor A. W. Ashby at Aberystwyth. He graduated in 1946, and in 1947 was awarded a research scholarship by the Ministry of Agriculture which enabled him to take an M.Sc. course at the University of Wisconsin and an M.A. and doctorate at Oxford, based on a thesis on economics of land use.

After three years lecturing at Oxford he joined I.C.I. where he studied agricultural policy and carried out market forecasting of products for the agricultural industry. His list of publications shows a particular interest in marginal farming and in capital accumulation in the agricultural industry. In 1955 he collaborated with Mr. S. W. Cheveley in producing a booklet entitled, "Capital in U.K. Agriculture—Present and Future", which must have played a significant part in the formulation of the Government's Farm Improvement Scheme.

In the early 1960's he travelled extensively for I.C.I.'s Agricultural Division to assess overseas fertiliser markets, and also in connexion with the company's international policy in agricultural chemicals.

In 1967 he joined the World Bank. He explains that he sees the problems of agricultural investment in the developing countries as a challenge. He recognises that in the International Bank for Reconstruction and Development (the I.B.R.D.) there is a first-hand opportunity to become directly involved in this work. His duties have taken him to many countries, especially in Asia, and today we are able to welcome him, during one stop on his travels, to talk about the organisation which he represents. His title since 1969 has been Deputy Chief of the Economics and Preinvestment Studies Division of the Agricultural Projects Department.

He has called this paper, "The Role of the World Bank in Agricultural Development".

Dr. O. T. W. Price (Presented a paper, "The Role of the World Bank in Agricultural Development"):

THE PRESIDENT: Thank you.

May I welcome our guests this afternoon. Now we are going on to the discussion period and I should like to call on Mr. Windridge to open the discussion.

MR. K. L. WINDRIDGE: I should like to congratulate Dr. Price on his excellent outline of the functions and activities of the World Bank in relation to agricultural development. This is an institution with an awe-inspiring name, rendered nonetheless impressive by Dr. Price's claim that it is "probably the largest development agency in the world". I find it a little surprising that he does not also point out that it is far and away the largest agricultural development agency in the world. The statistical problem of calculating what is properly attributable to agriculture is almost impossibly complicated. But, to give perhaps the most obvious comparison, the figure of 413 million dollars committed to agriculture in 1969/70 by I.B.R.D. and I.D.A. is roughly 6 times the current budget of the F.A.O. and about twice as much as the F.A.O. administers on behalf of the U.N.D.P. And I find it salutary to reflect that since, as Dr. Price says, the staff of the agricultural department of the World Bank numbers only 100, then the ratio of staff to loans committed is one person to 4 million dollars per year.

As Dr. Price points out, the expansion of bank commitments in the field of agriculture has been very rapid in the last 3 years. Still, considering the substantial publicity with which the Bank has been attempting to persuade the world that it is now paying more attention to agriculture, it is a little disappointing to note from Table 2(a), Page 19, of Dr. Price's paper, that taking I.B.R.D. and I.D.A. together the percentage of total bank commitments which is attributable to agriculture has remained static at around 18-20 per cent.

Moreover, I find it somewhat disturbing to note the growing gap between commitments and disbursements. In 1970, I believe for the first time, total bank disbursements were exceeded by undisbursed commitments. I don't know whether this situation applies to a greater or lesser extent in the agricultural sector than in other sectors of the Bank's activities, and Dr. Price may care to comment. But I should also like him to comment on his statement at the bottom of Page 6 that "there are prospects that the rate of disbursement will be raised in the near future as the capital adsorptive capacity of the developing world is improved in a variety of ways." How does the Bank propose to do this? I think this is important, because, on the one hand, the longer the pipeline of undisbursed commitments, the more difficult it may become to raise fresh private capital; and on the other hand, it would be most unfortunate if this situation were to cause the Bank to lower its

sights in the selection of new projects merely in order to dispose of money faster.

What also makes me a little uneasy is the emphasis which comes out right through this paper of the overriding role of economic and financial considerations governing the selection of projects. Let me give a few examples. Dr. Price says that Adam Smith might be more relevant to the developing world than books on welfare, social security and environment. Again, at the bottom of Page 5 we find that "only financial and economic considerations shall be relevant to the Bank's decisions." At the bottom of Page 7 we find that agricultural development efforts fall into those concerned with import saving and those concerned with export earnings. And on Pages 11 and 12 we find that, when the Bank sends a mission to survey the needs of a country, apparently no sociologist is included and the mission's report is considered to be comprehensive if it covers technical, commercial, managerial, organisational, financial and economic aspects of a project. Perhaps I am being a little unfair here, but the point I wish to make is that in a number of developing countries, particularly the poorer and more populous ones and particularly those where the green revolution in cereals cultivation is having its effect, social considerations are, in my view, becoming of vital concern.

Where there is such a terrible disparity between the riches of a tiny urban elite and the great mass of the population—the majority enagaged in agriculture—the poorer dryland farmers will not, in the long run, tolerate the sight of their more fortunate brothers in irrigated areas reaping the very considerable benefits obtainable from the new improved and highly yielding varieties. The cities are mostly overflowing with humanity, so there is really no reasonable escape in that direction, and too large a jump in grain production can depress grain prices, driving the poorer farmers to desperation. One appreciates that the Bank is a bank and that it must not be influenced by the political character of a country. All the same, the amount of money it wields constitutes considerable power which it can certainly exercise in the selection of projects. Money can be used in ways which either alleviate or exacerbate social tensions, and in my view, anything which does the latter at this point in the history of the human race is to be condemned, whatever the apparent economic advantage compared with a project which does the former. Perhaps Dr. Price would care to comment.

For example, it is of course true that, to achieve maximum crop production, crops must have optimum supplies of water and plant nutrients. But to achieve a given food production target, a government may choose theoretically to invest a given amount of scarce capital in more water and less fertiliser, or more fertiliser and less water. Of course, the latter may be less economic, but it may be politically preferable for sociological reasons, because you can spread fertiliser around more widely than you can spread irrigation.

Indeed, if we look at Dr. Price's figures on Page 9, where he quotes the theoretical potential production of rice from multiple cropping on irrigated land with new high yielding varieties, we can imagine the plight of the poor farmers condemned to farm the non-irrigated land if this situation materialised on a large scale in any country and if the poor farmers were unable to diversify, as is often the case.

Dr. Price quotes a number of conditions on Page 9 which have to be fulfilled before the full benefits of high yielding varieties can be realised. But again, I find the human, social aspect missing, because it seems to me essential that the farmers themselves should be sufficiently educated to know how to realise these splendid results, but, above all, that they should be suitably motivated to want to do so. Neither of these points can be taken for granted in the developing countries.

What would interest me would be to learn from Dr. Price whether the World Bank formulates a general agricultural strategy—and if so, how—and what is it? Or does it operate from project to project largely on an ad hoc basis within the context of national circumstances? For example, as Dr. Price points out, a lot of money can be spent—and is being spent—on improving the productivity of cash crops in developing countries to increase export earnings. But there is a limit to the amount of tea, coffee and cocoa which the slowly increasing populations of the Western world can absorb, and economies achieved in jute and natural rubber production tend to be matched by the march of technological progress in the production of synthetic substitutes. Of course, this is a wicked simplification, and the battle must go on; but I suppose the Bank must have some mechanism for weighing long-term international, even global interests against short-term national interests within the agricultural sector.

Investment in water has always been regarded by the Bank as capital investment whilst investment in fertilisers has been regarded as non-capital investment. This distinction has been convenient for the Bank but has always been regarded by outsiders as somewhat artificial, and Dr. Price's indications of greater flexibility in Bank policy are to be welcomed. As shown in Table 3 on Page 14, agricultural credit is now taking a considerable proportion of Bank lending in this sector, and some of this credit is for short-term purposes, such as the purchase of fertilisers and pesticides. Not much of it so far and, as far as I understand, not much effort to direct it towards the specific purchase of fertilisers and pesticides.

This raises the question: to what extent are there differences between the agricultural development strategy of the World Bank and that of the F.A.O.? Or can they be equated? One welcomes the World Bank's efforts at aid coordination and, in particular, the F.A.O./I.B.R.D. Cooperative Programme. The F.A.O. published last year its extremely detailed "Provisional Indicative World Plan for Agricultural Development". This estimates that by 1985 fertiliser consumption in the developing countries studied—in fact most of

them were included—must rise to 31 million tons of nutrients from the present level of about 6½ million tons. By that time, fertilisers and pesticides will require 9 billion dollars of annual credit to farmers, or nearly two-thirds of the credit required for all agricultural in-puts, compared with roughly one-third today. Fertilisers alone are estimated to account for 45 per cent of the value of crop inputs in developing countries by 1985 compared with about half this figure at present. Farmers in these developing countries will need to spent 7·8 billion dollars per year by 1985 just to purchase fertilisers, and this compares with an estimated 36 billion dollars as the total amount estimated as required for irrigation investment during the whole period from 1962 to 1985. I believe the F.A.O. Indicative World Plan shows a clear shift in emphasis toward the growing importance of fertilisers and it would be interesting to note to what extent the World Bank shares this view and is prepared to act upon it.

The Bank is primarily concerned with the foreign exchange problem and thus, perhaps even more impressive than the F.A.O. figures, are the figures of the O.E.C.D. report on the prospect for fertilisers in the developing countries, published two years ago. This report estimated that by 1980 the developing countries would need 4·7 billion dollars of foreign exchange annually to import fertilisers and the raw materials needed for local production compared with only 1·4 billion dollars today. Another 845 million dollars of foreign exchange would be needed by 1980 to finance local production facilities, making a grand total of 5½ billion dollars annually of foreign exchange for fertilisers alone.

What is the answer? Build more fertiliser factories in the developing countries? That is what the I.F.C. is contributing to. I estimate that it and the World Bank itself have collectively sunk about 85 million dollars into fertiliser production capacity, and yet the world is witnessing the greatest excess of fertiliser production capacity which it has ever known. In these circumstances if capital is a scarce commodity in the developing countries, it should not be employed in capital intensive industries like the fertiliser industry which contribute very little to alleviating the chronic unemployment which exists in many of these countries.

In the light of these remarks, I should like to ask the following questions:

1. Following the World Bank's decision to finance the foreign exchange needed to buy certain industrial equipment in India which seems a clear departure from previous emphasis on project aid, is there any sign that the World Bank would be willing to consider financing fertiliser imports or, possibly, assume responsibility for the financial management of a world food production resources pool, such as that suggested by the Director General of F.A.O., in the light of the F.A.O. and O.E.C.D. estimates of the foreign exchange capital and credit

requirements of developing countries to finance their future fertiliser supplies?

2. Does Dr. Price envisage an extension of World Bank financing for short term agricultural credit for purchase of agricultural inputs? For example, does he think the World Bank would be likely to be interested in assisting the later stages of F.A.O. fertiliser programme projects, following up on the programme of demonstrations and trials in farmers' fields and going beyond the pilot schemes for credit and distribution of fertilisers?

3. Does the World Bank, in planning irrigation projects, give automatic consideration to the fertiliser requirements of the region irrigated, without which the full benefit of investment in irrigation will not be realised?

Finally, Mr. President, with regard to the final section of Dr. Price's paper I can only say how pleased I am as a shareholder in British industry to note that it gets 2 dollars out of the efforts of the World Bank for every one dollar put in by the British investor and tax payer. I suspect that this is not terribly significant but, like Dr. Price, as the servant of an international organisation, I feel I should refrain from comment.

THE PRESIDENT: Thank you. Dr. Price will find it a formidable task to attempt to reply to all that and, therefore, I am going to remind him that he will have the opportunity to add written comments to his replies.

Perhaps he would just like to comment on one or two of them and leave time for questions from the floor. He can then have a chance to do his homework on Mr. Windridge's contribution a little later.

DR. O. T. W. PRICE: I would like to thank Mr. Windridge for his obviously keen interest in the Bank's work. I will not attempt to answer all his points but I hope in the course of this discussion to cover the major questions he has raised.

The general observation that the Bank does not pay sufficient attention to social aspects or gives too much attention to economic and financial matters to the exclusion of others deserves serious consideration. It is not possible in a short paper to describe all the activities of the Bank and I have attempted to give a thumb-nail sketch concentrating perhaps rather heavily on project work. Project appraisal is almost the last step in the chain of the Bank's lending activities. The economic missions and sector missions which I have not described in detail are more concerned with the broad issue of development, including employment generation, income distribution, transfer of resources between various sectors of the economy, impact of population growth on quality of life and general social considerations. Sociologists (as well as other types

of experts) have been used on these general mssions and even occasionally on project appraisal missions. It is possible that the expertise of sociologists should be used more extensively but at least I can assure Mr. Windridge that the Bank is constantly seeking new yardsticks by which to judge a project's impact on the overall development of a country as distinct from simply its direct financial benefits. I.B.R.D. does in fact attempt to evolve a development and associated lending strategy generally and for each country in which it operates.[7]

Indeed the Bank tries to take a wider view of social considerations that even the sociologist alone can offer as evidenced by the fact that it tries to take account of the effect of a project on the environment. I.B.R.D. now has environmentalists on its staff. These experts attempt to measure the repercussions which a scheme may have on parties which do not directly benefit from it e.g. a dam which benefits agriculture may put several thousand fishermen out of work. This is a difficult area to measure and appraise. I should point out that the Bank's President is also extremely concerned about the social as well as the economic facets of development and has repeatedly urged his staff (and publicly) the need to seek "quality" as well as "quantity" in measuring development. [7,8] I am sure Mr. Windridge would agree with our President however that "this concern must, of course be as rigorous, factual and informed as any of our other economic analyses and forecasts".[8]

When the Bank appraises a project general considerations indicating the relevance of the project to the overall wellbeing and development of the country have already been reviewed. At the appraisal stage the Bank concentrates on tangible measures of efficient resource allocation and use. One of the services that the Bank attempts to offer at this stage is financial, commercial and economic discipline in the use of inputs. It is perhaps well to remember that the contribution of the developed world to the developing world in terms of capital flow is only some 10 to 15 per cent of their total. The remaining 85 per cent comes from the export earnings of these countries. (Included in the 10-15 per cent are loans from the World Bank). Should the World Bank gets its lending priorities wrong in some countries from a development viewpoint—and its staff are human and fallible — then the politicians of the developing countries still have some room to manoeuvre in the allocation of their own foreign exchange resources.

There is a further consideration. The World Bank's objective of raising substantially its level of lending can only be achieved and sustained by raising its volume of borrowing on the money markets of the world. The Bank has had to assure certain quarters that it is not relaxing its conditions of lending and that it is upholding certain accepted financial economic and commercial criteria.

To sum up I think Mr. Windridge will appreciate that while the Bank is constantly trying to improve its techniques and criteria

for lending it has to sail between Scylla and Charybdis. It is both a development and banking institution and as such has sometimes to sail in unchartered waters. It must not veer at any one time too far into the "social" sector or too far into the "traditional banking" sector without being accused by one interest or another. All I can say is that the Bank's staff is still learning in this area and is aware that there is room for improvement.

Mr. Windridge comments on the new cereal varieties bringing high incomes to some farmers and depressed earnings to other farmers as surpluses lead to falling prices and incomes. I think it is necessary at this juncture to think very broadly about the development process. The surplus created by the Green Revolution has to benefit both rural and urban peoples in the developing countries. Food costs are a major part of the cost of living in a developing country and a substantial drop in the price of rice for example has a significant effect in raising the real income or wellbeing of an urban worker. It is essential however that a part of the benefit from increased yield is also enjoyed by the peasant farmer. This can only be achieved if the resources released (including labour) from producing cereals can be gainfully employed in some other activity. In its agricultural sector work the Bank staff encourages certain member countries to plan ahead in order to anticipate and avoid serious surpluses by developing alternative crop rotations. Agricultural taxation of the large farmers and even subsidies to the small farmers in certain circumstances also have a part to play in facilitating a change in land use and in reducing individual hardships.

Mr. Windridge who has a vested interest in fertiliser promotion quite naturally dwells rather heavily on the subject of financing fertiliser purchases. The Bank tends rightly to concentrate on financing capital expenditure as distinct from current expenditure although it is not precluded from financing the latter where it leads to "the encouragement of the development of productive facilities and resources in less developed countries". Basically capital expenditures are those which result in the *creation of an asset* which gives rise to a stream of benefits over a number of years whereas current expenditures give rise to benefits which are short lived and current expenditures must be repeated frequently. The Bank has financed the import of fertilisers and other inputs but it prefers to do so where it can demonstrate that this creates an asset. One example of this is the financing of fertiliser imports as part of a "seeding programme" to develop a market for a fertiliser plant that is being constructed in a country partly with the help of I.B.R.D. or I.F.C. funds. In a similar way in the case of livestock projects which entail pasture improvement the Bank has occasionally financed fertiliser imports during the early phases. Fertilisers and agricultural chemical imports might also be justified in some instances for rehabilitation schemes e.g. tea, rubber, etc. These are examples of asset creation. I would agree with Mr. Windridge that the use of fertilisers will

need to increase considerably over the next decade. I believe however there will be an increasing number of instances where the Bank will be able to finance such imports in the process of raising the level of fertility and technology in agriculture.

The Bank and I.F.C. also lend money for the construction of fertiliser plants in developing countries. I am sure that in this instance Mr. Windridge would wish the Bank to follow strict commercial and financial criteria. The Bank does take into account, among other things, size of markets, trends in world prices of fertilisers and economies of scale in deciding whether or not to offer financial support to a plant in a developing country. It is important to realise however that the "shadow" price of foreign exchange might be such in a developing country that whereas a plant might not seem justified to a fertiliser producer in a developed country it might make "economic and social" sense in a developing country which is desperately short of foreign exchange.

Mr. Windridge when drawing attention to Table 2(a) concludes that the percentage of Bank commitments to agriculture have remained static. I should have taken a longer period I suppose to demonstrate my point more convincingly but this table does show in 1965/6—1966/7 the proportion lent to agriculture fluctuated between 14 and 7 per cent whereas between 1967/8 and 1969/70 the figure is near 20 per cent. Fluctuations inevitably occur from year to year but the achievements and plans are decidedly upwards. Over the last decade lending to agriculture in absolute amounts and proportionately have increased substantially.

He is quite rightly disturbed at the rate of disbursements of Bank Loans. As I have indicated in my paper I.B.R.D. is also concerned about this feature and for this very reason, recently the monitoring of loan disbursements and their supervision has been given top priority in the Bank's activity even taking precedence over the appraisal of new projects. This should ensure effective disbursement and enable the Bank to spot quickly any constraints and bottlenecks to project execution. Past experience indicates that there is no cause for immediate alarm however. Historically the Bank's lending profile shows clearly that disbursements to developing countries never really begin to come on stream in any significant way until the second, third or fourth years after the date of loan signing. Thus it should be no surprise that there has been a gap between commitments and disbursements in fiscal 1970 or even fiscal 1969. The higher lending of the last two fiscal years won't begin to have a major impact on disbursements until fiscal 1971 and especially the following one or two years.

Apart from helping with its own staff the Bank also assists in various ways to train a country's nationals. The Economic Development Institute—a wing of the Bank—brings to Washington each year a number of people who are given a training in project preparation and project appraisal. Slow dispersal of loans is not infrequently due to inadequate preparation of the project within

the country. This frequently reflects in a dearth of local people who are fully aware of the objectives or workings of the project and are consequently unable to carry it out.

The Bank has also trained within its operating Divisions staff to run and operate agricultural credit institutions in their own countries. It also helps to recruit and finance expatriate staff which have technical and managerial expertise necessary for the success of a project.

Critics might rightly say that the Bank should do more along these lines to expedite loan disbursements. It should not be forgotten, however, that certain developing countries rightly or wrongly resent the use of expatriate staff. Once again I.B.R.D. has to steer that difficult course I mentioned earlier between Scylla and Charbydis.

THE PRESIDENT: I should like now to throw the Meeting open, because I do not want to deny anyone the opportunity of asking questions. If we have time later we will return to this question. The meeting is now open for contributions from the floor.

MR. C. J. CLARK: Mr. President, I was very interested to hear Dr. Price mention the support of research and should be grateful if he could say a few words about the basis on which the World Bank now are prepared to support research.

DR. PRICE: Until recently the Bank has tended to lend money to finance construction and equipment associated with teaching and research institutions but it has not financed the salaries of trained staff or research programmes as such. It has occasionally financed developmental research integrally related to the success of a specific project and in these cases financing has been part of a general project loan. At the present time the Bank is engaged for the first time in preparing and appraising a research project for a specific country*. The Bank is also considerably impressed with the "returns" which investment in the rice programme of I.R.R.I. and the wheat programme of C.Y.M.M.I.T. have yielded. In consequence it is actively promoting discussions between international organisations and donor countries which might increase the financial resources available for agricultural research on an international basis. Apart from finance, the Bank in its work has views on development priorities in its member countries and will probably be able to contribute in discussions on research priorities. In agriculture as in other sectors research is frequently the necessary precursor to investment. The work at the International Rice Research Institute has indirectly generated some investment needs in irrigation for example.

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*The World Bank's first loan directed entirely to research was signed on May 20, 1971. This was a loan of U.S.$12·7 million for agricultural research in Spain.

MR. HEMSLEY: I am a simple fertiliser engineer and I am not sure what a sociologist does, or even an environmentalist. I think my company would like me to know; also I am going to talk on the record!

It seems to me that the most important thing that one should do first of all, and something which I don't think Dr. Price has touched upon in any detail, is to consider the technical viability of a project. To me, this is the first and most important aspect. The technical viability is not only important to the loan agent-in terms of whether he gets his money back or not—but also to the people who are operating the factory and to the country in which the factory exists. Is it the best factory for that country? This seems very simple, but I have travelled around—I have been to Pakistan, Africa and Brazil—and I have seen some queer projects put up with Western finance.

I am just wondering how the World Bank, in its appraisal of projects, uses the services of experts who are experienced in the field and who are experienced in operating factories. Some five or six years ago the great United States fertiliser depression started and there was tremendous over-capacity. A little before that we had a technical advance in the United States with the development of di-ammonium phosphate. The one good thing that has come out of the fertiliser industry in the United States is the manufacture of di-ammonium phosphate; it is a first class invention. However, because there was over-capacity in D.A.P. and because the United States wanted to invest indirectly in the under-developed—or more fashionably the emergent—countries, we have D.A.P. exported to these countries, and we have D.A.P. projects in many areas where it is the wrong fertiliser for the particular crop, the particular climate, or the particular soil.

DR. PRICE: Thank you very much. I agree fully with the point you make. In fact, you have answered one of Mr. Windridge's criticisms, by underlining the fact that the Bank must endeavour to bring into these countries technical and management expertise. The Bank must insist on high standards of technical competence and this is perhaps one of the biggest contributions it can make in some of the developing countries. The Bank cannot have experts in everything—it is not quite as good as Mr. Windridge made out and it does not quite achieve £4 million of loans per person—but to compensate for this it hires experts on a consulting basis quite extensively. When the Bank appraises a project it employs consultants whenever it does not have available in-house expertise. It tries to employ consultants who are not only technical experts, but are also familiar with the physical conditions and the cultural, social and economic environment of the country in which the project is based. Considerable effort is spent in trying to find experts who are best suited for appraising specific projects. Again, however, pressures of time and availability sometimes result in the Bank not being entirely successful in its choice of mission members.

MR. J. N. BENGE: Fortunately we have, in the last two months, been appointed technical advisers to a company in Indonesia building a urea plant, and a lot of what Dr. Price has said is very apt and very pertinent to our immediate future.

If I may just go back to environment, one surprising thing is that there have been a lot of reports prepared in connexion with the project, but there has been no mention of pollution. It has been left to us to advise, and we are in the unenviable position of trying to build a cheap plant for our client while, at the same time, bearing in mind what the long-term effects for putting a lot of effluent into a river may be. I am vaguely surprised that the World Bank did not pay a little more attention to this point.

We have talked once or twice this afternoon about the rate of disbursement of the loan, and in fact we have ourselves to apply our expertise to this problem and advise our engineers and client on this. One of the problems, as we see it, is that the World Bank have certain guidelines for procurement which I am sure a lot of people who have been in this business have had to study, and they are very specific for a particular type of purchase. I wondered if Dr. Price could comment on the possibility of perhaps classifying these so that they are more apt to a particular project. You get the same type of conditions whether you are buying a tractor, 30,000 tons of urea, or a fertiliser plant.

Finally, I should like to ask for some advice as to how British companies can get a little closer to the World Bank. In our case, it was a certain element of luck that enabled us to conclude our contract, but we found it terribly difficult to know where to start. It seemed that there was very little coordination between the local World Bank office in Djakarta and Washington. We were very much up against a lot of American companies having permanent representation in Washington. The third thing we found was that a lot of the preliminary study work had been done under U.S. aid programmes and, as such, certain other consultants had a head start on us in getting their proposals in front of the World Bank. It seems to me that we as a country really should try, perhaps, to investigate how we can jointly pool some of the resources and expertise between producer, contractor and consultant to make a little more of an impact on the World Bank in a competitive field.

DR. PRICE: I would advise anyone who wishes to learn more about procurement and tendering conditions to obtain the most recent brochure from the I.B.R.D. London office. In general terms however the Bank insists on international competitive tendering.

In reply to your second question of how do British firms get to know of business financed by the Bank Group I would say this. Consultants who wish to be employed directly by the Bank for mission or consultancy work should register their organisation and services with the Projects Department of the Bank. Forms for this

purpose are available in the London Office. I should point out however that in many instances contracts arising from Bank financed projects are advertised and awarded by member countries and not directly by the Bank. Nevertheless the U.K. executive director of the Bank would be aware of these opportunities and also presumably the Department of Trade and Industry. Certain government departments or government journals in several developed countries inform their nationals of business opportunities arising in developing countries.

MR. BENGE: If I may come back on one point, this is not a criticism, but a thing I heard recently was that the British members of the World Bank tend to be a little fairer than other nationalities and, if anything, they bend over backwards not to be seen to favour their own compatriots and give them a little tip-off. I would not want a comment on that. It is just an observation.

DR. PRICE: I shall not comment on your specific observation. I can say more generally however that similar criticism has been made of certain other nationals in the Bank by their fellow countrymen.

MR. D. KEENS: May I ask Dr. Price's opinion on the period over which a foreign company with a new overseas venture, such as a big fertiliser plant, should consider the employment of expatriate staff, such as maintenance people, factory managers and analysts. These are expensive when salary, living allowances and western style housing costs are added up. Should we think of one year, two years, three years? How should the number be progressively decreased over a time scale?

DR. PRICE: I cannot give a specific answer as the situation must vary from one country to another. You obviously start from the assumption that sooner or later the plant must be run by local people, then you should probably try to quantify the effect on the productivity of the plant of different rates of handover. This would highlight the sensitive areas where the greatest training is required and it would also help to determine a reasonable rate of handover which would be acceptable to the country and project under review.

THE PRESIDENT: I wonder if I could comment on this particular topic.

I think the social attitude of the developed countries is very important in this particular respect. As well as thinking of putting one's hand in one's pocket and handing out the odd million dollars to the developing countries, one needs to develop a willingness, particularly among young people, to go there to work so that it is, in fact, talent, culture and experience which makes a contribution. I am talking about developing the attitude that seeking employment in the developing countries is a fine thing to do.

The expatriate operator and manager has a contribution to make, but it can be more or less valuable according to how it is done. He should not go in and behave as a master of his private skills, so that when he goes he is missed desperately. He should go in to stand in the background and support somebody who is nominally holding the office as the local man. If he knows that he can turn and quietly ask a person from outside for help if he gets stuck, this is very much healthier and humbler, and a much more valuable contribution, and it avoids many of these problems about pulling out and leaving a vacuum if the expatriate works manager disappears one day

DR. PRICE: Yes, the only comment I can make is to say that I agree whole heartedly with what you have said. Some of the developing countries have reacted to the use of expatriates for precisely the reason you give, the people have gone in and done an efficient job technically and they have done very little to train people to take over their jobs. It is vital that this aspect is seen to.

I also know of some very successful instances of handover. In order to accomplish this it is some times necessary not only for staff to be transferred from a developed country to work in a developing country but also to reverse the flow by bringing some staff from a developing country to undertake a specific job in a developed country. I am not talking about getting general training, but specific training. If someone is sent for training to run an ammonia plant, for example, and goes back to his home country to run an ammonia plant, that is useful. If he goes back and does something else, this is frequently a loss.

DR. P. V. CLIFTON: One of the conditions of contract with you gentlemen was that we should train a certain number of Indonesians in London. These gentlemen are now being involved from the very beginning of the project throughout purchasing, procurement and start-up. Hopefully, after three and a half or four years they will be skilled.

THE PRESIDENT: I am going to ask another question. This is possibly rather unfair, but I hope you will forgive me. You said at the beginning that the World Bank was, in fact, making a profit. If you lend this money so cheaply, and you have some bad debts to contend with I am quite sure, how do you manage to make a profit?

DR. PRICE: As you will have noticed, we are lending through credit institutions, and one of the principles we try to teach the credit institutions that we help to set up is that they should charge a higher interest rate for the money they lend than for the money they borrow. In the case of I.B.R.D. or credit institutions which have to borrow money it is essential to demonstrate that they can manage their affairs in such a way as to make a profit. Few indi-

viduals or institutions are likely to lend money to an organisation which runs at a loss. As a development institution, however, the Bank makes a contribution from its profits to the International Development Association funds from time to time.

MR. WINDRIDGE: There was the point about irrigation projects, and whether you take into account the fertiliser requirements which they must use in order to derive the maximum benefit from the investment, would you like to deal with that?

DR. PRICE: Agricultural development seldom depends on a single input. It usually comprises a package which might include term capital as well as current inputs (including fertilisers). Not infrequently it also entails institutional and policy changes as well. As I indicated in my paper in looking at our broad lending programme for a country we must look at all foreign exchange requirements including fertiliser imports and export earnings in order to estimate a country's creditworthiness and resource gap. At the project appraisal level we would also take account of fertiliser purchases in looking at the cash flows, and economic and financial rates of return.

One of the frequent difficulties with investment in irrigation is that having built the dams, government, public and private authorities fail to build channels to deliver water to the fields. The imports of fertiliser in these instances are more frequently restricted by lack of water than lack of money to import fertilisers. Indeed the opportunity to use fertiliser effectively on the part of the peasant farmer is often lacking because of the absence of water. It is remarkable and indeed serious that some countries may have many millions of dollars invested in dams and are only irrigating a few hundred acres of land due to failure to construct channels to convey water to the farmers.

MR. WINDRIDGE: If I could just come back on that, is that a good reason for lessening the proportion of Bank funds invested in irrigation, and does it reflect any inability of the Bank to ensure that governments carry through their obligation in terms of follow-up activity?

DR. PRICE: No, I do not think it is a reason for us to stop investing in water in these countries. Let me give you Iran as an example. Excluding the Caspian area, much of Iran is incapable of growing crops intensively or justifying the use of fertiliser in the absence of water. I don't think any fertiliser expert would advocate the use of much fertilisers on land with a rainfall of 4 in. per annum. Khuzestan however with irrigation water and the use of fertilisers produces up to 12 tons of refined sugar per hectare. Improved irrigation facilities and the new rice varieties which facilitate double cropping have led to substantial increases in fertiliser use. We only invest in irrigation facilities when these are shown to be economically

and financially justified. In these situations increased expenditure on fertilisers alone would usually be uneconomic. In countries with rainfed agriculture increased use of fertilisers may well be justified but these alternatives don't often exist in countries where the Bank invests in irrigation facilities. In the latter case I.B.R.D. often makes a loan to meet term credit needs which facilitate the intensification of agriculture and thus leads to increased fertiliser use, e.g., establish or support of a credit institution, seeds project, grain storage and drying facilities etc.

Mr. Windridge is quite right in drawing the Bank's attention to the need to ensure that governments carry through their objectives in terms of following through a project to its logical conclusion. As I indicated earlier the Bank is giving top priority to supervision of on-going projects this year. In some instances the Bank is also coming forward with complementary loan schemes to assist countries in financing channels and on farm levelling. It is important to realise, however, that failure to realise the benefits from an irrigation project frequently arise from political and organisational difficulties. The Ministry of Water and Power might build a dam but the Ministry of Agriculture might be responsible for getting water on the land. Not infrequently the former wields more political and financial power than the latter.

THE PRESIDENT: I will call upon Mr. Sharples to propose a vote of thanks.

MR. K. SHARPLES: Mr. President, Dr. Price, Members, Guests, it is always a pleasure to propose votes of thanks when one has really enjoyed the paper and the discussion.

Dr. Price has given a very vivid and clear exposition of a most difficult subject and on behalf of the Fertiliser Society, I should like to thank him for the paper, and ask all the audience to endorse this very sincere vote of thanks. (*Applause*).

THE PRESIDENT: Thank you very much. That concludes the afternoon's business. Thank you.

(*The Meeting closed at* 16.30 *hours*)

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1972 Annual Report (p.67) mentions a paper presented at the third UNCTAD in Santiago. This is apparently the paper; Mr. Price has no objection to its being given out.

DRAFT
OTWPrice/hl
November 3, 1971

The Bank Group and Diversification

Objectives

Most Bank Group projects contribute in some degree to the broad objective of economic diversification in the lesser developed countries. Some investments have this as a specific objective while others may only contribute in part and indirectly to this end. Bank Group projects directed towards diversification of a country's economy have in practice served one or more of the following objectives:

(a) Reducing a country's dependence on a small number of traditional export commodities. Almost half of the LDC's depend on a single commodity for more than 50 percent of their total exports and three-quarters derive more than 60 percent of their export earnings from three primary products. Many investments are directed towards widening the export-earning base of a country and thus its vulnerability to the vicissitudes in the fortunes of one or two commodities.

(b) Reducing a country's dependence on imports of key staple foods. Staple foods such as rice have in the past frequently pre-empted a substantial part of the foreign exchange earnings of a country. The demand for these products is highly inelastic, with the consequence that variations in domestic or world supplies have led to considerable fluctuations in foreign exchange expenditure on these products and thus made it difficult for a country to plan its development program on the basis of available foreign exchange.

(c) Investment in infrastructure which will facilitate the realization of objectives (a) and (b). Investments in irrigation and drainage schemes figure prominently in this category. Irrigation schemes serve not only to increase production but also to reduce variations in agricultural production and thus make predictions of foreign exchange availability (either through export earnings or import savings) more reliable.

(d) Reducing a country's dependence on agricultural production and increasing the proportion of its earnings from processing and manufactures.

(e) Lending for infrastructure development related to tourism and tourism enterprises.

(f) Fostering regional cooperation among developing countries particularly where this is likely to lead to an accelerated rate of development in secondary and tertiary industries.

(g) Fostering directly (or indirectly) agricultural and other research which facilitates diversification.

(h) Providing on a grant or loan basis technical assistance to member countries to assist them in the preparation of programs and projects including feasibility studies aimed at encouraging diversification.

Financial and Technical Assistance (FYs 1968-1971)

Since the Second UNCTAD meeting the Bank Group has sanctioned loans totalling $7.8 billion and the total capital cost of these projects amounted to $16.0 billion. Much of this investment will contribute directly or indirectly to economic diversification. Table 1 provides an estimate of the

value of Bank supported schemes with the specific diversification objectives noted earlier.

Table 1: BANK GROUP FINANCED DIVERSIFICATION PROJECTS (FYs 1968-1971)

(Million US dollars)

Type of diversi-fication	IBRD Loan	IDA Loan	IFC loan or equity	Total Group Loans	Total Capital Cost
(a)	66.3	53.8		120.1	217.5
(b)	2.0	1.3		3.3	5.4
(c)	30.0	3.1		33.1	74.3
Mixed (a)-(c)	97.9	26.7		124.6	274.5
(d)	43.5	37.0		80.5	413.8
(e)	50.0	10.5	0.8	61.3	169.7
(f)	107.2		10.0	117.2	215.2
Total	396.9	132.4	10.8	540.1	1,370.4
Total operations	5,722.0	1,682.0	357.0	7,761.0	

In several Bank agricultural projects a part of the loan is earmarked for adaptive research and developmental work. These are invariably projects introducing new enterprises and/or new agricultural technology to a country or region. Such funds are specifically directed towards facilitating diversification in a country's agriculture. IDA credit projects in Ecuador, Ethiopia, Indonesia, the Malagasy Republic and Tanzania afford examples of this type.

The Spanish agricultural research project which was signed in June 1971 provides a Bank loan of $12.7 million for agricultural research and training. This is the first loan of its kind made by the Bank and it is envisaged that it will contribute to opening up new opportunities in Spanish agriculture. There will probably be others of a similar nature. The Bank Group has also played an active part in co-sponsoring a consortium for financing international agricultural research institutions. It seems probable that a substantial part of the research financed by the consortium will be directed towards finding new opportunities for agriculture in the tropics and sub-tropics.

A high proportion of the technical assistance afforded by the UN agencies in project preparation and feasibility studies is directed towards finding means of diversifying the economic activity of member countries. The Bank Group plays an active part in this work in a variety of ways. The provision of technical assistance in project preparation is a regular part of the work of the Bank's permanent missions in East and West Africa and of its resident staff in Indonesia. In addition, technical help is frequently built into Bank financed agricultural projects.

Most of the work of the FAO/IBRD Cooperative Program - which is substantially Bank financed - is directed towards assisting member countries in preparing viable projects. IDA credits have also been used to finance project preparation and pre-investment studies, while the Bank staff may become directly involved in preparation and feasibility studies when the Bank acts as an Executing Agency for an UNDP project.

Methods of Project Selection

As the Bank has increased its lending activities in the LDC's it has inevitably had to devote greater attention to its lending strategy. This process is still evolving.

The Bank economic mission serves a key role in determining the strategy for Bank lending in a country. The economic mission to a country will report on a number of items - not all of which are relevant to the subject under review. Increasingly these missions are becoming concerned with (a) assessing the development strategy suitable for the country being visited, (b) the investment and foreign currency needs of the country as indicated by the gap between its own resources (or earnings prospects) and its needs and (c) the priorities or emphasis between sectors that should be given in the country's development and investment program.

A second type of Bank country mission that is increasing rapidly in number is that of sector study missions. These missions normally consist of a few general economists and a number of within sector specialists. These missions concentrate on exploring the constraints and opportunities for development within a sector which has already been focussed upon for special attention by the economic mission. These sector missions attempt to identify

investment possibilities within a sector such as agriculture, and also any pre-investment studies which might be a prerequisite to project preparation. They also frequently outline policy or institutional features which may need changing or amending to make a project feasible. In effect, they outline some of the conditions necessary for the success of a project.

The general economic and sector mission reports in effect indicate to the Bank the developmental and associated lending strategy which seems appropriate for a country. The final reports and conclusions are always the product of intensive dialogue and consultations between the Bank, the government officials of that country and the UN agencies operating in the field. They serve increasingly as a basis for the Bank Group's lending program, and for scheduling pre-investment, project identification, and project preparation missions.

Inter-agency Cooperation

The Bank Group already cooperates in a variety of ways with other UN agencies on matters relating to economic diversification within and out of primary commodities. This cooperation occurs at the informal as well as the official level. Exchange of information occurs relating to market prospects for primary commodities, LDC's development plans and programs, research and pre-investment study requirements, technical assistance and project preparation needs.

In September 1970 the Bank initiated and set up formal consultative arrangements with a number of international commodity bodies for the purpose of exchanging views when the Bank considers projects which raise the world production of primary commodities. Eleven study groups administered by FAO have agreed to participate. The commodities covered by the

groups are as follows: bananas, citrus fruits, cocoa, fats and oils, grains, hard fibers, meat, rice, tea, fish and fish products and forest products. Five independent international commodity organizations - the International Coffee Organization (ICO), the International Sugar Organization (ISO), the International Cotton Advisory Committee (ICAC), the International Rubber Study Group (IRSG), and the International Wheat Council (IWC) have been contacted. The ICO and the ISO have agreed to participate in the consultative arrangements. Although the ICAC and the IRSG have declined to participate, they have emphasized the value which they place on the cooperation and exchange of views which take place informally between their staffs and the Bank staff. We expect to receive a decision from the IWC before the end of November 1971.

If and when other intergovernmental bodies are set up for a specific commodity, not already included in the above list, the Bank would like to initiate similar consultative arrangements. Most minerals (including petroleum) are not covered by intergovernmental study groups.1/ This is an area where the Bank Group would welcome UNCTAD taking a lead in establishing consultative machinery which would represent governments of both the producing and consuming countries.

Where intergovernmental study groups exist, not only does the Bank Group consult with these bodies but it also feeds in any information it may have on commodity prospects and plans.

The Bank Group economic and sector missions always liaison closely with the UN resident representative and his team in every country. This provides the Bank with up-to-date information on the pre-investment and

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1/ One exception is the UNCTAD Committee on Tungsten.

country program studies being undertaken by other agencies. In addition, Bank missions quite frequently have some mission members from UN agencies and especially FAO.

Improvements in Existing Arrangements

It is too early to judge the effectiveness of the liaison between various international agencies in relation to diversification development strategy. Some little time should be allowed to elapse following the inception of the UNDP studies of country development programs before reaching any conclusions on the efficacy of this innovation.

The Bank Group has been very satisfied with the consultative arrangements it has established with intergovernment commodity study groups. It would like to see these extended to other commodities at present not being covered.

IBRD/IDA-FINANCED AGRICULTURE PROJECTS CONTRIBUTING TO THE DIVERSIFICATION OF THE LDC ECONOMIES (1968-71)

(million US dollars)

Country	Project	Total Cost	Financing IBRD	Financing IDA	Date Signed	Diversification Category	Main Features	Remarks
Fiscal Year 1968								
Ceylon	Lift Irrigation	3.3	-	2.0	6/19/68	(b)&(c)	Import substitution for chillies & onions	Irrigation project to bring more land under cultivation
Kenya	Tea II	9.1	-	2.1	6/17/68	(a)	Tea exports	Planting 35,000 acres of smallholder tea
Korea	Pyongtaek Kumgang Irrigation	89.9	45.0	-	5/23/69	(b)&(c)	Replacement of food grain imports by domestic products	Project will expand and rehabilitate irrigation facilities, reclaim land and increase yields
Papua & New Guinea	New Britain Small Holder	3.3	-	1.5	1/21/69	(a)&(c)	Cultivation of oil palm on newly resettled land	Resettlement scheme for small holders
Zambia	Industrial Forestry	11.1	5.3	-	10/5/68	(a)&(b)	Pine & Eucalyptus plantation	
Fiscal Year 1969								
Cameroon	Oil Palm	14.1	7.9	-	4/15/69	(a)	Oil palm cultivation	
Dahomey	Hinvi Palm Oil	9.6	-	4.6	3/5/69	(a)&(c)	Oil palm & annual crop cultivation	Project includes setting up of 10 cooperatives

Country	Project	Total Cost	Financing IBRD	Financing IDA	Date Signed	Diversification Category	Main Features	Remarks
Ecuador	Fisheries	6.6	5.3	-	9/5/68	(a)	Export of tuna	Project includes construction of 12 tuna purse seiners; training program for the crew; and harbor studies
Iran	Dez Stage I Irrig.	74.3	30.0	-	4/18/69	(c)	Cultivation of a variety of crops	New irrigation & drainage system in Upper Khuzshan Plain
ry Coast	(Industrial Oil Palm Plantations	29.1	3.3	-	6/13/69	(a)&(c)	Cultivation of oil palm & coconut for export	Project consists of (i) establishment of 16,000 hectares under oil palm; (ii) construction of palm oil mill; and (iii) 6,500 hectares for coconut
" "	(Palm Oil Processing		4.8	-				
" "	(Oil Palm Outgrowers & Coconut		9.0	-				
Fi al Year 1970								
Ceylon	(Mahaweli Ganga		13.6	5.1	1/30/70	(b)&(c)	Import substitution in rice & sugar	Irrigation project includes construction of a hydro-electric power plant
"	(Drainage & Reclamation	50.0	-	2.5				
Ethiopia	Wolamo Agr.Dev.	5.1	-	3.5	11/26/69	(a)(b)(c)	Land development to encourage maize for subsistence; chillies for exports; & cotton for import substitution	Resettlement scheme

Country	Project	Total Cost	Financing IBRD	Financing IDA	Date Signed	Diversification Category	Main Features	Remarks
Ethiopia	Humera Agr. Dev.	4.4	-	3.1	5/28/70	(c)	Land development for non-traditional crops, e.g., sorghum, cotton, sesame	Project will involve construction of access road, demonstration farm, water supply system, etc.
Ghana	Fisheries	2.3	-	1.3	9/25/69	(b)	Expansion of fishing industry	Project will involve construction of 40 purse seiners which will be used to fish sardinella
Ivory Coast	Cocoa	13.6	7.5	-	6/5/70	(a)	Cocoa production and export	
Kenya	Forest Plantations	4.0	2.6	-	11/7/69	(a)&(b)	Planting of saw-wood and pulpwood	Project is expected to make Kenya not only self-sufficient in forest products, but also realize an export surplus
Malaysia "	(Land Settlement (Jengka Forestry	41.0	13.0 8.5	- -	5/20/70	(a)&(c)	Production of oil palm, rubber & forestry products	Resettlement of landless peasants
Papua & New Guinea	Oil Palms	8.8	-	5.0	1/31/70	(a)(b)(c)	Main emphasis on oil palm cultivation & livestock breeding	
Zambia	Commercial Crops Farming	11.1	5.5	-	6/5/70	(a)&(c)	Production of tobacco & maize	Project will introduce farmers to cash crop cultivation

Country	Project	Total Cost	Financing IBRD	Financing IDA	Date Signed	Diversification Category	Main Features	Remarks
Fiscal Year 1971								
Colombia	Caqueta Land Settlement	21.6	8.1	-	5/28/71	(b)&(c)	Production of rice & breeding of cattle & pigs for domestic consumption	Project would resettle peasants from overcrowded areas
Indonesia	Fisheries	4.3	-	3.5	7/13/70	(a)	Export of skipjack tuna	Renovation of fishing equipment, including vessels, refrigeration & storage facilities
"	Tea Production	25.0	-	15.0	6/24/71	(a)	Tea production expanded	Rehabilitation of old estates
Israel	Agr. Credit	48.8	20.0	-	10/21/70	(a)	New export crops, e.g., flowers, fruits & vegetables	Investment in greenhouses, packing & handling facilities and irrigation
Ivory Coast	(Oil Palm Processing II	17.6	1.9	-	6/22/71	(a)	Exports of palm oil & coconut oil	Project includes setting up of a palm oil mill
" "	(Oil Palm & Coconut II		5.1	-				
Malagasy Rep.	Lake Aloatra Irrig.	8.2	-	5.0	8/17/70	(a)&(c)	Export of rice	
Mauritius	Tea Development	7.0	-	5.2	4/9/71	(a)	Export of tea	

Country	Project	Total Cost	Financing IBRD	Financing IDA	Date Signed	Diversification Category	Main Features	Remarks
Tanzania	Flue-Cured tobacco	14.7	-	9.0	10/9/70	(a)	Export of tobacco	Project includes additional acreage under tobacco & other production & marketing facilities
Turkey	Fruits & Vegetables	44.0	10.0	15.0	2/22/71	(a)	Exports of fruits & vegetables	Improvement of all aspects of production & marketing
Uganda	Tobacco Production	7.3	-	4.0	7/24/70	(a)	Export of tobacco	Project will affect smallholders
Fiscal Year 1972								
Panama	Fisheries	5.4	3.4	-	8/2/71	(a)	Export of shrimp	Replacement of fishing boats
Tunisia	Fisheries	3.1	2.0	-	9/24/71	(b)	Increase domestic consumption of proteins	Replacement of obsolete fishing boats

Source: Agriculture Projects Department, IBRD

TOTAL COST AND BANK'S SHARE OF DIVERSIFICATION PROJECTS
(FYs 1968-1971)

Loan/ Credit No.	Country	Type of Project	Total Project Cost	Bank Group Contribution IBRD	IDA	IFC
			---------- (Million US dollars) ----------			
(d) Country Industrial Projects:						
646	Dominican Republic	IBRD loan for facilities for nickel mining and processing project	195.0	25.0		
169	Ethiopia	Coffee processing factories included in Wolamo Agricultural Project supported by IDA	5.1		3.5	
193	Indonesia	IDA credit for fertilizer plant	84.4		30.0	
211	Indonesia	IDA fisheries credit for freezing and cold storage facilities	4.3		3.5	
654	Yugoslavia	IBRD loan for automotive and steel industries	125.0	18.5		

Loan/ Credit No.	Country	Type of Project	Total Project Cost	Bank Group Contribution IBRD	IDA	IFC
(f) Regional Industrial Projects:			---------- (Million US dollars) ----------			
635	Bolivia	Bank loan for natural gas pipeline to Argentina	46.6	23.3		
632	Costa Rica	Telecommunications loan included special provisions to encourage procurement in countries of the Central American Common Market	9.5	6.5		
638	East African Harbors Corp.	Bank loan for ports	58.3	35.0*		
674	East African Railways Corp.	Bank loan for railways	90.8	42.4		
182IU	Latin America	IFC loan to ADELA	10.0			10.0

* To be reduced to $32.5 million if part of the project can be arranged by the borrower with the African Development Bank.

Loan/ Credit No.	Country	Type of Project	Total Project Cost	Bank Group Contribution IBRD	IDA	IFC
(e) Projects for infrastructure related to tourism:			---------- (Million US dollars) ----------			
17400	Colombia	IFC investment in hotels in Cali	4.2			0.8
704	Morocco	Bank loan to finance tourist hotels	10.0	10.0		
209	Tunisia	IDA credit for water supply in cities including tourist areas	58.0		10.5	
678	Yugoslavia	Bank loan for highways	97.5	40.0		