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USING RESEARCH FINDINGS IN POLICY ISSUES

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I SHALL confine myself to research findings and policy issues in our field of agricultural economics. While I shall take my illustrations largely from the areas of work with which I am most familiar—the United States of America and international organizations, especially F.A.O.—I know that many parallel examples exist elsewhere, as in England, Germany, and other European countries, India, Japan, and Mexico.

During the decade of World War I, the major applied use of agricultural economics research in the United States was in production economics, with the classic arguments between Warren and Spillman on the respective places of research and extension, and with later debates as to whether cost of production computations or farm enterprise and farm income analyses provided the proper guide to war-time farm price-fixing policies. Relatively little practical use, however, was made of research conclusions as a basis for farm policies in this period.

The decade of the 1920's was dominated by the establishment of the Bureau of Agricultural Economics (B.A.E.) under Henry C. Taylor, the rapid development of quantitative studies in a number of different fields under his leadership, and the beginning of efforts to apply these results in actual policy formation. This development was assisted by the vigorous writings and ideas of John D. Black, both in his teaching at Minnesota and in his services as consultant to the B.A.E. from time to time.

Research activities. On the production economics side, extensive experiments were made under the leadership of Howard Tolley, both in the B.A.E. and in many State colleges, on the analysis of relative profitability of different systems of farm organization. These were conducted first by advanced statistical methods, including multiple correlation,¹ and later by the more satisfactory farm budget and synthetic budget methods.² A start was also made on the determination of agricultural production functions and their use to compute most

¹ M. Ezekiel, 'A Statistical Test of Measures of Farmers' Financial Results', *Journal of Farm Economics*, vol. viii, Oct. 1925, pp. 399-413.

² George Pond and Jesse Tapp, *A Study of Farm Organization in Southeastern Minn.* Minn. Bull. 205, 1923.

efficient or profitable levels of input with varying prices¹—a subject which was subsequently to become far more highly refined through linear programming and other econometric devices.² These production economics studies in time formed the basis for advice to farmers through county agents, extension economic specialists, and other extension or advisory services, but did not directly affect governmental agricultural policies in this period.

Concurrently, work on agricultural prices, supply-demand relations, and agricultural index numbers developed rapidly under the direction of O. C. Stine. Index numbers of prices of products sold by farmers, and of agricultural incomes, developed initially by Louis Bean, provided a quantitative measuring-stick for farm prices and farm welfare which soon were used widely in political discussions of the farm problem. Analyses of supply-demand relations for farm products, generally using methods pioneered by Henry L. Moore and Holbrook Working, but somewhat less highly mathematical than those developed later by Henry Schultz, led to a whole series of official price-analysis reports for many agricultural products—potatoes, wheat, cotton, maize, hogs, &c. These not only provided quantitative measurements of the elasticities of demand with respect to price and income, and of the elasticity of supply, but also experimented with methods of forecasting future prices.³

Policy applications. Early in the decade the Bureau of Agricultural Economics issued, for the first time, *The Agricultural Outlook, 1923*. This appraised the market situation, domestic and foreign, for each major farm product, and forecast the probable future development of the market for each over the next one to three years. Research on factors affecting supply and price were drawn on in this effort, together with the available crop reports and domestic and international trade information. This outlook service has been maintained ever since, gradually expanding from its original annual publication to periodical appraisals and forecasts, product by product, several times each year. Over the years this report has had an enviable record, forecasting the *direction* of change in commodity supply and demand with an accuracy of from 75 to 85 per cent. right, and the

¹ H. R. Tolley, J. D. Black, and M. J. B. Ezekiel, *Input as Related to Output in Farm Organization and Cost-of-production Studies*, U.S. Dept. of Agric. Bull. 1277, 1924, 44 pp.

² E. O. Heady, 'Elementary Models in Farm Production Economics Research', *J. Farm Economics*, vol. xxx, May 1948, p. 201; Fred V. Waugh, 'The minimum Cost Dairy Feed (an application of Linear Programming)', *J. Farm Econ.* 1951.

³ A summary of key papers in this period on production economics and supply-demand relationships is given in Ezekiel and Fox, *Methods of Correlation and Regression Analysis*, in chap. 25, pp. 434-8, 441-53, and in references nos. 3-12, 18-26, 43-45, 56-71, 73-80, 99-115, pp. 459-64; John Wiley & Sons, 1959, 548 pp.

degree of change averaging about 75 per cent. right for supply-demand conditions, and 60 per cent. right for farm prices. While originally these outlook appraisals were intended for the use of individual farmers and marketing organizations in deciding on their production and sales policy, they have increasingly been used by public bodies in dealing with farm policy matters.¹ Similar outlook work was started in Canada in 1933, suspended during the war, and renewed subsequently.

One of the first efforts to apply research directly to agricultural policy itself was made in 1929 in the form of a quantitative appraisal of what would have happened if two of the proposed forms of agricultural relief then under discussion had been in effect over the past eight years. Two alternatives were examined: storage and later resale of surplus supplies, and storage and subsequent dumping on international markets. Three commodities were studied, wheat, cotton, and corn. The analysis was based upon the available price-analysis results and, at points, took account of the elasticity of supply as well as of demand. It led to the conclusion that 'increases of returns [to farmers] . . . by various methods of disposing of annual surpluses . . . may be much less than has been currently assumed.' On the basis of a further brief study, it also reached the conclusion 'that the brightest hope for increasing returns to farmers lies in a better adjustment of production to demand'.² Many other studies of the probable consequences of various agricultural relief measures were being published at the same time, but without the use of specific quantitative or econometric calculations or projections, and with less definite conclusions.³

The 1920 decade was thus a period of rapid flowering of quantitative research in the economics of agriculture in the United States, of the application of such research to the problems of decision-making by individual farmers, and of initial experiments in the application of such research to national agricultural policies.

During the 1930's the U.S. Government intervened to try to help the steadily worsening economic position of farmers. This process

¹ O. V. Wells, *A Comparison of Outlook Statements with Subsequent Events*, U.S. Dept. of Agric. Bureau of Agric. Econ. (mimeographed report), 24 Jan. 1930. See also Ezekiel, 'Agricultural Situation and Outlook Work, National and International', *Monthly Bulletin of Agricultural Economics and Statistics*, F.A.O., vol. iii, no. 6, June 1959, pp. 18-28, especially footnotes 10 to 15.

² Ezekiel, 'A Statistical Examination of the Problem of Handling Annual Surpluses of non-perishable Farm Products', *Journal of Farm Economics*, vol. xi, No. 2, April 1929, pp. 193-226.

³ For example, Joseph Stancliffe Davis, *The Farm Export Debenture Plan*, Food Research Institute, Stanford, Calif., 1929, pp. 274.

was increasingly guided and appraised by the results of research. The initial effort was under the Federal Farm Board established by the Hoover Administration (1929-32). The Board made relatively little use of research in planning its price support and crop storage programmes, but did carefully appraise the results (or lack of them) in its annual reports. It also made use of commodity price analyses in guiding its marketing and price-support loans to co-operatives handling fruits, vegetables, and other specific commodities. The interventions of the Roosevelt Administration (from 1933 on) to raise prices and incomes to farmers were much broader in scope. Economic research and quantitative analysis were relied upon in these activities to an extent previously unprecedented in public affairs. Economic and statistical concepts such as 'fair exchange value', 'average farm price', and 'purchasing power' were written into the basic legislation, the Agricultural Adjustment Act. Further, the inauguration of commodity programmes and the levying of processing taxes were made dependent upon findings by the Secretary of Agriculture concerning statistical and economic facts.¹ Every major decision to inaugurate a 'marketing agreement' or a production control operation was based upon a formal 'docket' of facts, figures, and research conclusions, prepared by economic research specialists in each commodity unit. These analysed the steps to be undertaken and appraised their probable effects in the light of careful econometric analysis. Policy-making was further aided by detailed economic and statistical studies of world economic conditions which had contributed to the development of the emergency conditions.² These and other economic and statistical conclusions were summarized to explain and justify the actions taken.³ These statements became part of the briefs submitted to the Supreme Court when the constitutionality of the basic legislation was challenged and eventually overthrown in 1936. After that, economic and statistical research was used as a legal criterion in recovering from the meat packers and other distributors the largest part of the billion-dollar 'windfall gain' they had made as a result of having taxes refunded to them whose burden had in fact already been passed on to others.⁴

¹ *Compilation of the Agricultural Adjustment Act as Amended, and Acts Relating Thereto, as of June 29, 1934*, U.S. Dept. Agric., Agric. Adjustment Administration, U.S. Govt. Printing Office, Washington, 1934, pp. 105.

² *World Trade Barriers in Relation to American Agriculture*, Senate Document No. 70, 73rd Session, 1st Session, Washington, 5 June 1933, pp. 540.

³ Ezekiel and Louis H. Bean, *Economic Bases for the Agricultural Adjustment Act*, U.S. Dept. Agric., Dec. 1933, pp. 67.

⁴ Wirth F. Ferger, 'Measurement of Tax Shifting, Economics, and Law', *National Tax Journal*, May 1948.

This heavy use of, and dependence on, research results has continued ever since in the U.S.A. in public legislative and administrative activities; in planning, conducting, and reporting on governmental activities in agricultural and other fields; and in appraisals by private agencies of the results of such efforts.¹

Concurrent with this development and use of research for policy formation in the U.S.A. federal government were parallel developments in individual State and municipal governments, in the land grant colleges in each state, in private institutions, and in corporation and business concerns generally, which are far too vast to review in this paper. In the field of agricultural policy, the research, extension, and policy advice of the State universities was particularly important in the fields of farm management and production economics; in the detailed local application and development of the national agricultural policies under the varied conditions of each state and its different type of farming areas; and in the contributions of the local and state points of view to these national policies.

Outside the U.S.A. similar though less extensive activities were under way in the inter-war years in the conduct and application of research to public policy. One development of key importance to agriculture was the investigation and report on human nutrition by a committee of the League of Nations.² These international discussions were preceded by the publication of John Boyd Orr's famous study of food, health, and income, which became one of the dominant factors behind both the League of Nations' investigations and the eventual establishment of F.A.O.³

A third notable development was the publication of John Maynard Keynes's famous treatise,⁴ which has become the backbone of financial policy in every country of the world, whether capitalistic or socialistic in its economic organization. His theory was subject to intensive further study, both theoretical and econometric, his static analysis has been developed further into dynamic ones;⁵ and quanti-

¹ One notable independent objective study, made concurrently with the actual operations, was the Brookings Institution study of the A.A.A., reported in 5 special volumes (on wheat, cotton, livestock, dairying, and marketing agreements), plus one summary volume (Edwin G. Nourse, Joseph S. Davis, and John D. Black, *Three Years of the Agricultural Adjustment Administration*, the Brookings Institution, Washington, 1937, 600 pp.).

² *Final Report on the Relation of Nutrition to Health, Agriculture, and Economic Policy*, League of Nations, Mixed Committee on the Problem of Nutrition, Geneva, 1937, pp. 297.

³ Sir J. B. Orr, *Food, Health and Income*, Macmillan, London, 1936, pp. 72.

⁴ J. M. Keynes, *The General Theory of Employment, Interest and Money*, New York, Harcourt Brace, 1935, pp. xii, 403.

⁵ Ezekiel, 'Saving, Consumption and Investment', *American Economic Review*, vol. xxxii, Nos. 1 and 2, March and June 1942, pp. 22-99, 272-307; L. R. Klein, *Economic Fluctuations in the United States, 1921-1941*, John Wiley and Sons Inc., N.Y., 1950; Karl

tative models based upon these are used today in many countries as specific guides to fiscal and financial policies and general economic policy.

During World War II and the immediate post-war periods the development of quantitative economic research and of highly refined econometric appraisals, and their application to economic policy, both public and private, were so enormous that it is impossible even to sketch them in this paper. During the war itself public economic research, qualitative and quantitative, was developed very extensively in almost all countries for operating their war-time economies, for planning military needs and production, agricultural and industrial (as in the War Production Board of the U.S.A.); and for regulating prices or price-controls. As the war drew to an end they were applied to developing ideas for the post-war world and plans for the new institutions, national and especially international, needed to cope with them.¹ One further application of economic and econometric study and analyses was to the general economic problems of the business cycle and full employment, notably in the U.S.A. in the long hearings and investigations of the Temporary National Economic Committee, in the subsequent development and passage of the Employment Act of 1946, and in the investigations and reports of the Council of Economic Advisers established under that Act.² Problems of reconversion from war to peace, and of dealing with the expanding economies thereafter, were studied intensively and dealt with in myriads of reports, hearings, and legislative and policy actions.

Three notable new techniques during the decade of the 1950's deserve mention. The first was the making of projections of future economic magnitudes as a guide to policy, in addition to the analyses of the past and the examination of the probable results of specific proposed actions. Such projections of the future, based on most likely continued developments from previous history and current policies, have been made extensively in many countries. One of the earliest was the famous Paley report in the U.S.A.³ which provided pro-

A. Fox, 'Econometric Models of the United States', in *Econometric Analysis for Public Policy*, Iowa State College Press, 1958, pp. 255-72.

¹ Seymour E. Harris, *The Economics of American Defence*, W. W. Norton and Co., Inc., 1941, pp. 350; Id., *Economic Reconstruction*, McGraw Hill, N.Y. and London, 1945; William W. Beveridge, *Full Employment in a Free Society*, W. W. Norton and Co., Inc., N.Y., 1945, pp. 429; Ezekiel, *Towards World Prosperity through Industrial and Agricultural Development and Expansion*, Harper, N.Y. 1947, pp. 455.

² Council of Economic Advisers, *First Annual Report to the President*, Dec. 1946, 26 pp. *The Economic Report of the President transmitted to the Congress, January 8, 1947*, 54 pp.; and annual and biennial reports made subsequently.

³ *Resources for Freedom*, The President's Materials Policy Commission, U.S. G.P.O., 5 vols., June 1952.

jections up to 1975. Others, such as the U.N. estimates for population, have carried forward to 2000. In most cases, however, projections five or ten years forward have been considered sufficient.

The second development is the projection, over a given number of years ahead, of the probable consequences of given changes in public policy, as contrasted with the otherwise expected trend of development. This represents a combination of the method of analysis first developed in the late 1920's (p. 488, n. 1), with the trend projection method just referred to. Thus, the agricultural policies of the new Kennedy Administration in the U.S.A. have been based not only on extensive theoretical discussions of the probable consequences of various alternative policies,¹ on extensive public hearings of agricultural economists and others, and on staff studies and reports for legislative committees,² but also on quantitative projections of the probable future consequences of various alternative national policies.³

The third development is the greatly increased emphasis on economic development in the less developed countries. There is now an extensive literature with theoretical studies of the process of economic development. Much attention is given in many countries to the preparation of national economic programmes or plans, usually for a period of five years or so ahead. This process involves quantitative projection of all parts of the economy, with specific administrative, financial, and legislative arrangements or programmes to make those plans come true as far as possible. I shall come back to this subject again after I discuss the research and policy developments in the international agricultural field, in the light of this historical survey of some of the national developments.

International Research and Agricultural Policies

The creation of the Food and Agriculture Organization in 1945 and its subsequent development, along with that of other newly created or existing international organizations with economic func-

¹ Willard W. Cochrane, 'Farm Political Power and the U.S. Governmental Crisis'; Foreign Surplus Disposal and Domestic Supply Control'; and 'some Further Reflections on Supply Control'; *Journ. Farm. Econ.*, vol. xl, p. 1659; vol. xli, p. 697; and p. 885, 1959; and *The case for Production Control Restated*, Hearings before Sub-Com. on Agricultural Policy of the Joint Econ. Comm., U.S. Congress, 16-20 Dec. 1957, pp. 330-1.

² *Long-Range Agricultural Policy*, Committee on Agriculture, House of Representatives, 80th Congress, 2nd Session (Committee Print), 1948, 72 pp.

³ *Farm Price and Income Projections, 1960-65, under Conditions Approximating Free Production and Marketing of Agricultural Commodities*, Senate Doc. 77, 86th Congress, 2nd Session 20 Jan. 1960, 33 pp.; *Economic Policies for Agriculture in the 1960's, Implications of Four Selected Alternatives*. Materials prepared for the Joint Economic Committee and Congress of the U.S.; 86th Congress, 2nd Session, Joint Committee Print, 1960, 82 pp.

tions, has led to a great expansion of data collection, economic analysis and research, and policy discussion and formulation at the international level. The F.A.O. took over and expanded the statistical collection and publication functions of the previously existing International Institute of Agriculture, the first permanent international organization, and added new international activities in the collection and publication of data on food and agricultural conditions and commodities, on national development, and on agricultural policies generally. (Agriculture, in F.A.O. terms, includes forestry and fisheries as well as farming.) Without going into the objectives and varied activities of F.A.O., which are familiar to this audience, I will concentrate on a few selected research and international policy-formulation activities in its sixteen years of activity.

The state of food and agriculture. This annual review of agricultural developments round the world, and of key policy problems has been prepared annually since the early years of F.A.O. It has grown from a 13-page document in 1947, which dealt with supplies, priorities for the harvest, agricultural development, and local surpluses, to a document of nearly 200 pages in 1959 and 1960, covering present conditions and often future outlook for world and regional production, demand, food supplies, trade, farm prices and income, commodity situations, agricultural policies, and development plans. Special subjects are covered in more detail from time to time, such as agricultural incomes and levels of living in countries at different stages of development, general problems of agricultural development in less developed countries, and methods of programming for economic development. This publication is the basic document on which the semi-annual meeting of the F.A.O. Council and the biennial Conference of all 88 F.A.O. member countries base their discussions of international agricultural policies and problems.

Commodity outlook service and related commodity work. From 1947 on F.A.O. has prepared and published international outlook reports for markets for the major agricultural products. These international outlook forecasts have had an accuracy in general comparable with those made for the U.S.A. by the Department of Agriculture, but because of inadequate data, are less complete in their coverage.¹ In some of the tree-crop products, such as coffee and cocoa, these international outlook statements have several times reflected coming shifts in the world supply-demand picture a year or more before the markets themselves have become aware of them.

The information on commodity situations and prospects in these

¹ Loc. cit. p. 488, n. 1.

and more detailed reports have provided the bases for discussions of commodity problems, international and national, in many different inter-governmental forums—not only at the F.A.O. Conference and Council, but in the special F.A.O. Committee on Commodity Problems which meets once or twice a year, and in its inter-governmental sub-groups for many different products. These sub-groups cover wheat and coarse grains, rice, coconut oil, dairy products, citrus products, cocoa, and surplus product disposal. One formal international commodity agreement, for olive oil, has come directly out of one such group, and another, for cocoa, is now in process of development. More important than such formal commodity agreements, however, is the mutual understanding of each other's position on commodity issues between countries and their experts, the development and agreement on the facts of the different situations, and the gradual emergence of commonly agreed commodity policies, and thus of actions by each country which recognizes not only its own interests, but the interests of all other countries concerned in the steps which each one undertakes. In the field of surplus disposal, this common understanding has gone so far that an F.A.O. international code of behaviour for surplus disposal was evolved by 1954, and has been formally agreed to by 44 countries.¹ This development was aided by a number of staff studies on various different aspects of commodity and surplus disposal problems, including studies on the use of surpluses for national and international reserves, emergency relief, &c.² It was also assisted by a staff field investigation in co-operation with the Government of India of the ways and extent to which food surpluses could be used for economic development.³ This clarified the economic issues involved, and provided the basic economic justification for the great U.S.A. programme of surplus disposal under P.L. 480.

Financing economic development. Another subject in which research by an international organization had direct effects upon policies and operations is in financing international investment in less developed countries. A staff study of this subject requested by the F.A.O. Council was completed in 1949.⁴ This revealed that a large part of

¹ *Disposal of Agricultural Surpluses, and Principles Recommended by F.A.O.*, F.A.O., Rome, Dec. 1954, pp. 17.

² F.A.O. Commodity Policy Studies, No. 5, *Disposal of Agricultural Surpluses*, 1954; No. 10, *Functions of a World Food Reserve, Scope and Limitations*, 1956.

³ *Use of Agricultural Surpluses to Finance Economic Development in Under-developed Countries, A Pilot Study in India*, Commodity Policy Studies No. 6, F.A.O., Rome, June 1955, 65 pp.

⁴ *Report on International Investment and Financing Facilities*, 5th Session, F.A.O. Conf. Doc. C 49/16, Oct. 1949, 71 pp.

post-war international financial aid, bilateral and multilateral, up to that time had gone to help post-war reconstruction in Europe and other developed regions, while barely over one-third had gone to under-developed countries. Only one-fifth of the loans of the International Bank, which was just getting under way, had been for under-developed countries. The report also estimated that about \$4 billions a year of external financing would be required to cover the existing or estimated plans for economic development in the less developed parts of the world. (This was the first comprehensive estimate of this sort.) The report attracted much interest and resulted in material shifts in policies toward more emphasis on financial assistance and on International Bank Loans to under-developed countries.

During the discussion of the financing report at the 1949 Conference of F.A.O., high officials of the International Bank stated that they could not loan more to under-developed countries because such countries did not have enough suitable projects for loans. This led F.A.O. to develop special regional training institutes to teach officials of under-developed countries how to prepare and appraise suitable projects. Such training centres were conducted (in co-operation with the U.N. and the World Bank) at Lahore, Pakistan, for the Far East in 1950,¹ at Ankara, Turkey, for the Mediterranean Basin, and Santiago, Chile, for Latin America, in 1951, and at other points in later years. These helped train a large number of officials of under-developed countries in preparing and appraising development projects suitable for investment. Many of these projects have since been included in their development plans and carried into effect. In this case, research on a vital problem helped stimulate needed policy decisions, and new training and applied research stimulated by the policy discussions led to further concrete action.

Multilateral surplus disposal. More recently, the F.A.O. studies on surplus disposal, and especially on possibilities and principles in their use for the financing of economic development, have contributed to the American Food for Peace proposals backed both by the Eisenhower and Kennedy Administrations, and to the recent U.N. Assembly Resolution requesting *multilateral* action to speed the effective utilization of food surpluses by part of surplus disposals being handled by an international organization, preferably F.A.O. itself. In line with this resolution, the Director General prepared a

¹ *Formulation and Economic Appraisal of Development Projects*, U.N. and F.A.O., co-operating, Lahore, Pakistan, March 1951, 2 vols., 780 pages; *Report on the Training Institute on Economic Appraisal of Development Projects*, F.A.O. and U.N., co-operating, Tech. Asst. Admin. of the U.N., Series A, No. 1, Lahore, Pakistan, March 1951, 38 pp.

definite proposal¹ whose implementation depends upon approval by the governments concerned. This proposal at the 1961 F.A.O. Conference and U.N. Assembly is based also upon research and post-war experience with related issues such as the theory of economic development and methods of national programming, financial needs and availabilities both for domestic and international financing, capital-output ratios, and dynamic issues in development such as present and prospective changes in agricultural-industrial relations and in use of manpower resources. If this proposal is carried into effect, it will mark the first action by F.A.O. to help directly the *financing* of economic development, in addition to its earlier programmes of providing technical assistance and training, and making pre-investment surveys under U.N. Special Fund allocations.

Agricultural projections. These have become an important tool of applied research in the international field, as earlier in the national one. Projections of demand for pulp and paper have been an important part of F.A.O.'s forestry work for many years. After several years of preparatory research, F.A.O. last year prepared, in co-operation with other agencies and European regional bodies and countries, five-year projections for production and consumption of each major farm product in Europe and its several sub-regions, assuming the continuance of recent domestic agricultural policies.² The report showed that given no change in recent national farm policies, European imports of most temperate zone farm products are likely to decline over the next five years, except for meat. Great interest was expressed by all F.A.O. member countries in these results, and many under-developed countries announced their intention to take them into account in preparing their future development plans. Meantime, efforts to extend such projections to other continents will continue in F.A.O.

Freedom from hunger campaign. A different kind of activity based upon research is this campaign, now being conducted by F.A.O. in co-operation with many other organizations, inter-governmental and non-governmental, international and national. The campaign will operate over the period 1960-5. It is aimed at focusing world attention on the unsolved problem of continued hunger and malnourishment in the midst of abundance, and on the even greater future problem of the population explosion; and at creating an improved

¹ *Development through Food, A Strategy for Surplus Utilization*, F.A.O., Rome, May 1961, 122 pp.

² *Trends in European Agriculture and their Implications for other Regions*, F.A.O. Conference in Europe, Doc. EC/60(6) (mimeographed), Oct, 1960, 64 pp.; *European Agriculture in 1965*, F.A.O. and U.N., co-operating, Doc. ST/ECE/Agt./4, Geneva, 1961, 204 pp.

world understanding among all thinking people of these problems and of steps needed for their solution. It is expected to arouse a readiness to support the enlarged measures, public and private, necessary to speed up future progress. It will work in part by stimulating serious discussion of the facts and issues by citizens' groups of all sorts in all possible forums around the world. In addition to this informational and educational phase of the campaign, other phases deal with direct steps to increase agricultural development activities in under-developed countries through additional research and development projects, and with raising substantial funds from private contributions to help finance such projects.

The campaign recognizes that progress towards higher nutritional standards in less developed countries depends upon raising the *buying power* for food, as well as raising the *production* of food. It therefore gives full weight in its informational and educational side to progress needed in the non-agricultural sectors as well as in agriculture, and to the development of trained people—investment in the human mind—as well as investment in physical resources.¹

Supporting the campaign on the educational side will be a series of background documents summarizing in brief and non-technical style the accepted international facts and scientific conclusions on a number of relevant issues. These include food and population growth; present and needed world food supplies; possibilities of increasing food production; ways of improving food marketing and distribution and of using agricultural surpluses; institutional reforms and public services essential to increasing food production, with comparative data on the efforts made by individual countries; nutrition and health; the effect of nutrition on productivity; and agriculture and weather. Other background documents will summarize problems of general economic development; extent of steps taken by individual countries to speed that development; the needs for trained manpower in economic development and for balancing investments in physical construction with investments in the human mind through education and training, and the extent of such activities in individual countries. These documents are being prepared not only by F.A.O., but in part by the other competent international agencies—the U.N., W.H.O., U.N.E.S.C.O., and W.M.O. (The World Meteorological Organization).

The great informational and action effort of the Freedom from Hunger Campaign is thus based upon the distilled conclusions of

¹ T. W. Schultz, 'Investment in Human Capital', *Amer. Econ. Rev.*, vol. li, No. 1, March 1961, pp. 1-17.

research over many wide fields. It is expected itself to stimulate and finance more research as well as action; and it is aimed at the speedier achievement of world and national policies and actions consistent with these conclusions.¹

Principles of national agricultural policies. Despite the hopeful results secured in a number of cases already mentioned, research and inter-governmental discussions under F.A.O. auspices have not yet solved one of its great original basic tasks—to attain agricultural policies and programmes in member countries which produce consistent and balanced results on a world scale. In addition to the pursuit of this objective by commodity and other activities, some of which I have already referred to, another approach is under way. This is the attempt to evolve a statement on desirable agricultural price stabilization and support policies in a form which can be agreed to by member countries as a standard for their behaviour, just as the F.A.O. Principles of Surplus Disposal have been accepted in their field. While this broader step has not yet been completed, substantial progress has been made.² The most recent product—a combination of research and inter-governmental policy discussions—is before the F.A.O. Conference for its consideration when it meets in November of this year.

National economic planning. I turn now to my third post-war use of research; its use in preparing national plans. The preparation and use of national plans or programmes for the economic development of individual countries represents a very sophisticated means of combining research and policy action. Such comprehensive national development plans were first used in the Soviet Union. Interest in the use of planning for the more orderly and speedy development of private and public activities has been growing steadily ever since the 1930's in the more highly developed countries, and throughout the under-developed world since World War II. The Monnet plan for the reconstruction of France, and the successive Indian development plans are outstanding post-war examples, but there are many others. Such plans must necessarily be based upon extensive statistical fact-gathering and economic research, as well as upon a wide process of consultation and agreement among those who will participate in carrying them out.

The current modification of existing plans in the light of actual

¹ *Freedom from Hunger Campaign*, in Report of the 10th Session of the F.A.O. Conference, F.A.O., Rome, 1960, pp. 48-57; *Freedom from Hunger Campaign News*, Nos. 1-8, July 1960 to Sept. 1961, F.A.O.

² *An Enquiry into the Problems of Agricultural Price Stabilization and Support Measures*, F.A.O., Rome, 1960, 234 pp.

progress, and the development of plans for future periods, also requires continuous study and research, ranging from the simplest types to complicated econometric procedures.

National economic planning represents perhaps the present peak in the 'use of research in policy matters'; in fact it constitutes such a continuous inter-action as to be a marriage of research and policy. The only higher development might be in international planning and co-ordination of national economic development and policies, toward which the U.N., F.A.O., and other international organs are beginning to feel their way. However, as indicated earlier, only a beginning has yet been made in this direction.

Issues in Research on Policy Matters

I would like now to shift from examples of *uses made* of research for policy-making to a brief consideration of some of the philosophical issues that arise in research aimed directly at providing a basis for the choice of policies. This relates particularly to the rationale in appraising how far the adoption of a given new policy will change future events from those most likely to occur if *no change were made in the existing policies*. Such decisions in natural sciences are usually based on controlled experiments. It is rare that the social sciences can use the experimental method. One of these exceptional cases is where actions can be taken locally and affect only the local conditions. In that case one or more new policies may be tried out in practice in selected local subdivisions or units, and the policies to be used generally can be based upon the observed results in the trial areas. This is done sometimes by commercial concerns which try out one or more proposed new merchandizing or advertising practices in selected localities and compare the results before adopting any one for use on a large scale. This same experimental method has been used in some professional research projects in the marketing field.

The experimental method can be used in some cases in testing out the effectiveness of alternative public policies themselves. This was done in the later years of the Roosevelt farm policies by setting up a small number of *experimental counties* in different parts of the U.S.A., and trying out in these counties the results of various proposed modifications in public rules, regulations, and expenditures with respect to both soil conservation and crop production control practices. This was done, necessarily, in co-operation with, and agreement by, the farmers in the counties concerned. The results of these experiments then became part of the basis for the development and adoption of new policies and public administrative arrangements covering the

country as a whole. (With some 3,000 counties as local units, many with similar agricultural conditions, the opportunity for such experimental testing may be much better in the U.S.A. than in other countries with fewer local governmental units and more diversified local conditions.)

In the great majority of economic decisions and policies, however, action must be taken for provinces or countries as a whole, and cannot be tested in advance in limited areas. The process of estimating the probable results of new policies, whether projected forward or backward, then becomes a matter of contrasting what *was* with what *might have been*; or *what seems likely to be* if nothing is changed, with what *might be* if certain changes were made. Either process is at best very chancy; the first depending on the comparison of a reality with an estimate, and the second of one estimate with another. The process of making such estimates therefore involves a considerable margin of error which must be given due consideration in drawing conclusions from the results. Careful econometric work may provide some basis for estimating the extent of this range of uncertainty, while experience with a succession of such forecasts and how they seem to work in practice can determine the degree of confidence which can be placed on them. But whether the advice to adopt a new policy is followed or rejected, even *after* the event the only known fact is what happened, as influenced by the policies which were in fact followed. What *might* have happened had the older policies been maintained or an alternative new policy been adopted, can only be estimated. Even historically, the student is still comparing the actuality with the 'might-have-been'.

Conclusion

Despite the many inherent difficulties, the record of economic science, theoretical and applied, in contributing to a better ordering of the economic affairs of mankind in the twentieth century is certainly an impressive one, as some of my illustrations have shown. If in addition to these we add the constructive or creative side of social science, in helping statesmen to create new institutions to meet new needs, the record is definitely a far happier one. The fifteen years after World War II have been vastly different, in world economic affairs, from the fifteen years after World War I. As compared with the widespread deterioration or *débâcle* in international trade, prices, and exchange of the period after World War I, which crippled strong and weak countries alike, and culminated in the economic collapse of 1929-32, the period after World War II has seen substantial

economic stability and a rapid growth in nearly all countries in production, commerce, and national incomes. While wiser national policies have contributed to that, so have the new constellation of international economic institutions. The World Bank and Fund, the U.N.'s economic work, U.N.E.S.C.O., I.L.O., and F.A.O. in our agricultural field, and regional bodies of many types, together with the international technical assistance activities in varied forms, bilateral and multilateral, have all helped. How far research itself has contributed to this happier result, how far wiser national policies based on such research have contributed, how far bilateral co-operation, and how far international organizations, no man can say. But it is clear that the world is on its way towards a better living, and we hope ultimately a more peaceful living, for all its people. Within our own professional field, both research and its practical application in human affairs have become essential strands in the warp and woof of modern life.

M. SHAFI NIAZ, *Agricultural Division, Planning Commission, Karachi, Pakistan*

We are very grateful to Dr. Ezekiel for presenting this well-documented account of the history of using research findings for making policy decisions by governments and international agencies. He is a veteran in this field, and there are few who could have handled it with so much authority.

If any complaint is warranted it is that he has failed to link more intimately the early work of the pioneers in his own country with today's critical requirements in the less developed countries. One could question the application of mathematical techniques, many of which he sired, to the precarious blend of economics, sociology, and politics of Asia, Africa, and Latin America. He referred to linear programming as a modern tool which emerged from the pioneering work on quantitative analysis performed by his colleagues and himself. In the appropriate environment and in highly competent hands such tools are extremely useful. Carried to an extreme, however, they constitute a dangerous weapon. I am thinking, for example, of linear programming studies in a country in which the average size of farm is much less than a hectare and where the results establish with scholarly certainty that farmers are foolish to pour their pitifully limited resources into one rice crop after another. But the farmers are wise in the methodology of survival, and it is presumptuous for a mathematically orientated economist to belittle

them with symbols and equations. Worse still, there is always the risk that a government may be beguiled by such dubious exercises into taking utterly wrong policy decisions. It is not the student with broadly based training—training that may and should include sophisticated quantitative techniques—who poses a threat. It is those who receive an unbalanced indoctrination in specialized mathematical devices. A great scientist, Lee de Forest, who invented the audion tube and made possible the development of long-distance telephony, sound movies, and television, was recently quoted as saying, "What have they done to my child?" In looking at some of the uses being made today of methods pioneered by Dr. Ezekiel and others, one wonders whether they, too, might sometimes be uneasy about the fate of their progeny.

I agree with his implicit thesis that farmers and governments everywhere desperately need the skills of agricultural economists as a guide to decision making. On the other hand, the agricultural economist who has most to contribute is one who is master of the implements of his profession but who has not permitted them to master him. If an age of man ever demanded a whole approach to economic analysis, surely this is the time. Is it asking too much to insist that the agricultural economist sharpen his comprehension of the culture in which he operates while he learns the specifics of technical analysis? I think not, if our goals are set high. It is unfortunate that Dr. Ezekiel's otherwise excellent review of the activities of F.A.O. scarcely mentions the increasing attention it is giving to the vast complex of institutional problems in the countries which it serves. Land reform, for example, may be an ugly phrase in some circles, but as an object of almost universal concern it surely deserves some mention.

It is one of the stark realities of the present-day world that the less developed nations are not content with political bondage and mandates; protected territories, associated nations, and colonies are fast disappearing from the world. Independent nations, proud of their cultural heritage, but more or less ill-equipped with knowledge of the social sciences, are joining the United Nations with unheard of speed. Let us draw up some guide-lines so that they can have the advantage of our pooled knowledge. A note of caution has to be sounded. Fiscal policies, trade relations, development plans, and even the receipt of aid from advanced friendly nations have all to be based on a sub-stratum of hard facts which cannot be correctly ascertained unless a massive effort is put in by way of research. Thus, before we stress the importance of using research, we have to create

an awareness of the need for carrying out research. Nations, like individuals, are beset with too much optimism suggesting that they will somehow blunder through. It has to be brought home to them that economic emancipation and development follow inexorable laws and that progress will be much quicker if they follow the beaten track of orderly progress through organized research rather than if they dissipate their energies by haphazard methods. If we can bring this home to policy makers in under-developed countries, we shall have laid the foundation for orderly development.

Let me now dilate on some issues relating to agricultural planning and development which is my special field of study. I should say at the outset that the distance between the towns and villages of Pakistan should not be measured in terms of miles but in years. The peasant in a far-flung village still continues to live in the nineteenth century, or even earlier, eking out a poor subsistence from his impoverished acre. This is not very different from what anybody can see in most countries of south-east Asia and Africa or even in parts of Latin America. The labour force of Pakistan is mainly employed in agriculture and, although heroic efforts are being made in the field of industry, the economy of the country is still firmly geared to agriculture. Hence, projections of agricultural production and demand are an essential part of planned development programmes. Such projections at best are hazardous, as weather and other natural causes may upset all predictions. Dr. Ezekiel has mentioned the degree of accuracy of the *Outlook* series in the U.S.A. as being between 75 and 80 per cent. Such accuracy is not feasible in the less developed countries where financial and other resources are scarce. There is extreme urgency for setting up proper facilities for the collection of basic statistical information needed for every-day policy matters. The need is further evident from a perusal of the F.A.O. publication, the *State of Food and Agriculture*, wherein several basic figures from the less developed countries are not quoted because they are not available. Surely member nations owe this information to the F.A.O.

Serious efforts are being made in my country to improve the agricultural and other statistics, but these efforts need further improvement, and rapidly. We have come across great difficulties in formulating our agricultural development plans. For example, the greatest snag is the lack of accurate production estimates, demand projections, and allied data. Many of the countries of Asia and the Far East and of Africa may be facing the same difficulties. It would be of great value for them to have the benefit of the experience of countries where forecasting is more satisfactory.

One of the more interesting and at times baffling topics that have been discussed is the disposal of surplus agricultural commodities. Time does not allow even a cursory examination of the issues that Dr. Ezekiel raised in describing the participation of the F.A.O. in attempting to reach a solution of this problem. However, in quoting from one of his own early publications, he has advocated 'a better adjustment of production to demand' as the brightest hope for the farmers in the U.S.A. Later he cites a study in India that 'provided the basic economic justification' for aid under P.L. 480. Does this mean that a failure of domestic policy in the United States has spelled success abroad? Here we are dealing with a matter of utmost gravity to those nations who aspire to feed their populations from their own resources. If it is to be argued that the disposal of agricultural surpluses does not militate against this objective, or indeed that it facilitates its attainment, I must insist on more evidence than has been submitted so far. Of all the subjects for discussion at this Conference perhaps none commands more interest than this.

Finally, I feel that we should establish priorities in dealing with this subject. In the highly developed countries research is already an established guide for policy makers. But over almost three-quarters of the globe nations are struggling for economic emancipation. Here the idea that economic research is useful has not taken firm root. We should strive to bring home the usefulness of such studies so that policy makers give high priority to laying down the framework on which the future edifice of economic research is to be built.

L. NAPOLITAN, *Ministry of Agriculture, Fisheries and Food, London, England*

The U.S.A. has a long and impressive record of achievement in this field and it is fitting that Dr. Ezekiel should have focused attention in the first place on those achievements. But it is equally fitting that he should have spoken about the progress made by F.A.O. and other international bodies during the last fifteen years. He has been closely associated with all this, and the record would have been less favourable but for his sustained efforts on behalf of agricultural economics. But it would be wrong to sit back in reflected glory. Much remains to be done and I am sure that Dr. Ezekiel would agree that the problems facing us today are as great as at any time in the history of our profession. Even the U.S.A., with its vast accumulation of economic research, has failed to solve the problem of surplus agricultural production and low farm incomes. I have noticed a

considerable contrast between the economic appreciations which he describes and the actions actually taken by Congress. If he claims too much for the role of agricultural economists in the U.S.A., he will put them in danger of being considered responsible for the actual results.

All of us here realize that the nature and magnitude of the issues facing economic researchers vary from country to country. The discussions during the past ten days have amply recognized these differences. I need only mention that whereas some countries are faced with problems of excess production, others are having to tackle the grim realities of under-production and near-starvation. The priorities for research in an industrialized country with a commercialized agriculture are quite dissimilar from those of an emergent country still largely dependent on subsistence farming.

Dr. Ezekiel has rightly drawn attention to the importance of fact collecting and interpretation. The economic researcher requires not only a sound basis of theory, but facts to which to apply his theories. It is important for economists to help to establish what may be called an arithmetic of agriculture. For example, how much land is farmed? How many people are dependent upon the land for their livelihood? What is their contribution to economic wellbeing? What are the trends of production, and what movements are taking place in farm prices, costs, and incomes? So far as policy issues are concerned these are all part of the basic language of the agricultural economist, but the facts do not always speak for themselves. Interpretation of these facts by the economic researcher, with his special skills, is necessary. No less necessary is the communication of these interpretations to policy makers in the language they can understand. The problem is how to bridge the gap between the thoughts of economists and the actions of politicians. The importance of this has already been indicated from this platform on several occasions by Miss Cohen, Professor Nichols, Professor Kuznets, and Professor Heady among others. Nevertheless, many workers engaged in applied research need to be reminded that the purpose of their work is not just to give themselves a sense of personal satisfaction or merely to add to knowledge. Their job is not complete until the results have been interpreted for the layman as a basis for action.

Some of the quite elementary concepts which economists use seem far less simple to others than they do to us. Ministers and politicians generally are no exception. Take, for example, the concept of the margin which, if it has not been mastered by the age of twenty-five, often seems to be almost incommunicable. It is up to

us to explain to the policy makers what we mean in particular circumstances by the concept of a little more or a little less. All too often the policy maker left to himself will reason that if ten per cent. more is good, fifty per cent. more will be five times better; or that if any particular course of action has appeared successful it can be indefinitely extended. Again, if I may venture into a field in which Dr. Ezekiel made a world-wide reputation as a younger man, one of the problems facing economists who have to advise policy makers is to put over the concept of less than perfect correlation which is nevertheless significant, of multiple correlation, and of spurious correlation. There is no need to present correlations worked out to several places or exhibit one's command of the Greek alphabet. But in the world of economic causes and effects in which we move, one can be sure that the causal connexion between any two events, unless it is spelt out, will either be exaggerated if it is superficially striking, or be ignored if it is not. That has to be guarded against. Another barrier between thought and action can be broken down if, wherever possible, we substitute quantitative thinking for qualitative generalizations. It is better to convey the message in facts and figures which have a clear and decisive impact, and to accept the risk that ministers will probably overlook the margin of error attaching to any statistics put before them. Qualitative generalizations, other than the emotional kind, often repel. The purist among research workers who shudders at such use of his work is best kept apart from the policy maker; but others will necessarily have to do that part of his work for him.

Nothing in what I have said rules out the possibility of undertaking sophisticated research; it merely means that the results of that research must be presented in a readily comprehensible form. Moreover, the process of education consists not only of conveying knowledge to ministers but also of getting from them an appreciation of what is politically possible. It is only through this process of two-way exchange that acceptable prescriptions for action will ultimately emerge.

Let us consider, for example, a problem engaging the attention of economists in many countries, that of raising rural standards of living by reducing the number of farmers. This problem displays many of the steps between thought and action where it is possible to come to grief. To the economist his prescription of reducing the numbers may seem obviously right, and the politician may seem to him to be fighting against economic progress if he rejects it. But perhaps the politician has his own concept of economic progress which seems to

him perfectly valid. It is very evident that to many people progress means simply multiplication; for example, multiplication of farm output or even of numbers of farmers, and that contraction can never be progress. The moral from this is that agricultural economists have not done as much as they should in explaining and justifying their own concepts, and bringing out into the open the assumptions about economic *optima* that are common to us all, because of our education and experience, but which are not at all self-evident to others.

Again, there is room for agricultural economists to present their ideas in the language of the politically possible more often than they do. I do not consider that this need mean any distortion of the ideas or any sacrifice of professional integrity. To take a simple case, a proposal that farmers in a certain category should be displaced from their farms, when put just like that may sound horrifying. But it can wear a quite different aspect if the stress is put on making room for farmers of a worthier category, who would otherwise not have the opportunity of exercising their abilities to the full. Or, in a case where three farms are to be amalgamated into two, if the issue were presented as a contrast between two prosperous farmers and three miserable ones. That may, I fear, sound elementary. But it is only a simple instance, of which I could find many more sophisticated examples, of avoiding the spoiling of a perfectly good idea by presenting it too starkly. What we have to do is to present our ideas so far as possible in the form in which the policy maker would later expound them to the public, thus staking his political reputation on the outcome. If we do not do that, we do not help him weigh the merits of our solution against the political risk, and an all too common result will be that the risk seems too great to accept.

In opening this discussion I have wandered a little from the more factual presentation which Dr. Ezekiel has given us, but I feel that the broader issues about which I have been talking merit more attention than they have been given by him. I am sure that on many occasions he has had to face the problem of bridging the gap between thought and action, and it is apparent from what has already been said by others that this is a matter of concern to all of us.

D. K. BRITTON, *Agricultural Economics Department, University of Nottingham, England*

I want to draw together three elements which have emerged during our Conference and which have a bearing on this morning's discussion. Professor Kuznets reminded us of the importance of

studying what he called the locus of change in the structure of the agricultural economy. He wanted us to give more time to identifying the growing-points and the points of obsolescence, the different rates of change in different regions, so that we might better understand the process of change itself. Then Professor Hofstee emphasized from the sociological side that change is the characteristic of modern agriculture and rural organization. And then Mr. Oluwasanmi reminded us, through the lips of Shakespeare, of the political importance of recognizing the tide in the affairs of men and of taking it at the flood. Now all these points seem to me to emphasize the great importance of understanding the process of change itself. Politicians and those who formulate policies are aware of the major changes which are going on in their own agricultural economy—changes in the agricultural structure, in the degree of specialization of production, in the relative profitability of different types of farming, and so on—but they need a more accurate knowledge of these changes, they need to have them reported more promptly, and they need themselves to develop a more sensitive appreciation of those changes. Research workers may not always choose to measure the particular tides and currents which governments think are most relevant to their immediate problems. Research has to make its own judgements as to the potential importance of its work. For example, in the days when departments of agriculture were mainly concerned with production problems, they seldom attached much importance to independent research into food consumption patterns and elasticity of demand in relation to price and income. But today they snatch at any scraps of information on these matters because of their increased acceptance of the responsibility of matching production to demand. Whatever the degree of encouragement they receive from their governments, research workers who contribute to the analysis of significant changes in agriculture will not have worked in vain.

R. H. ROBERTS, *Arlington, Va., U.S.A.*

I want to make reference to a United States research report that was performed on an international basis under the United States *Food for Peace* programme. A mission went to Japan for two weeks, to Indonesia for two weeks, and to India for six weeks, and consisted of two representatives from Canada, one from Australia, three from the United States, with additional support from France and Argentina. Dr. S. R. Sen from India represented the F.A.O. Their report helped to clarify ways in which agricultural surpluses could be used

in under-developed countries and how their use could fit in with the development of the economy of an under-developed country and its agricultural development.

In the United States we have a great excess capacity for agricultural production, and there have been many delays in making use of the large amounts of surplus agricultural commodities that have resulted from this. Many countries apparently have felt that they lacked the opportunity to make effective use of these surpluses. In many cases, if they could develop a strong national plan for their economic growth, and were to take strong government action in borrowing money internally, there would be an increasing demand for many of these commodities. A great deal of that demand could be met by taking advantage of these surplus agricultural commodities.

K. OHKAWA, *Hitotsubashi University, Institute of Economic Research, Kunitachi, Tokyo, Japan*

The interpretation of the past trend of research findings and their application to policy involves the development of income-employment analysis in our field. I should like to elaborate Dr. Ezekiel's reference to the influence of Keynes's 'general theory'.

I myself believe that it is very important to pay particular attention to the shift of research method from the price (demand-supply) analysis to the income-employment analysis. The latter is one of the great effects of Keynes's thinking. In the field of agricultural economics this change or shift from price-commodity analysis to income-sectoral analysis deserves particular attention. This type of approach has recently contributed in many countries to the study of agriculture as a sector within the setting of the general economy. This is so not only in theory, but also in practice, for instance in the recent development of agricultural planning—in particular, integrated general planning—the income approach is dominant. The development of social accounts, in particular national income accounts, make it possible to apply the aggregate concept to empirical approach. This social accounting is still developing, and agricultural economics has a close contact with general economics in this respect. Sectoral accounting has been developing along these lines, and it is desirable that it should develop further.

M. EZEKIEL (*in reply*)

I agree with practically all the comments; many of them fill out points which I had to skip or leave brief. I agree with Mr. Niaz that

econometrics can be, and probably have been, overdone. I confess that I am aghast to find that I cannot read the Econometrics Associations' publication today, and the same applies to many of the articles in the *American Journal of Farm Economics*. Many econometricians seem to forget that only a limited proportion of economic phenomena can be stated in econometric terms. Their conviction that the only parts of economics which are important are those which can be stated in mathematical terms does not follow.

Mr. Niaz's second point was that I failed to recognize and devote more attention to the progress in institutional matters made in this field. I agree that a great deal has been done, both nationally and internationally, especially in farm tenure, also in institutions necessary for carrying through agricultural development programmes, research, extension, and all the rest. That is a very important area of work and one which I should have mentioned.

Third, he questioned me on a very interesting point: whether I had shifted my position from adjusting production to meet demand, to using surpluses for economic development, or whether the U.S. Government had done so. The present administration, as I understand, attempts to adjust production to demand, including in demand all the utilization of surpluses which they can find any use for anywhere in the world. It has been so stated by the Secretary of Agriculture. Whether it is accepted by the President or by Congress remains to be seen. But it is a fact, I believe, that underlines this whole problem of surplus disposal, that the total aid to economic development provided by the United States would probably be much larger if made partly in food and partly in cash, than if it were all made in cash. So it is probably well for the rest of the world that American farmers are very unwilling to let land lie idle while people are hungry in other parts of the world. Maybe some day a point will be reached when American manufacturers will take the same point of view.

Mr. Napolitan's points I agree with fully. One point in passing: our statistics division has done a great deal to build up the basic statistics of agriculture in the form of national and current crop estimates and especially in the ten-year censuses of agriculture. We get the facts and tabulate and publish them as rapidly as we can. His discussion of persuading politicians and statesmen to use some of the ideas made available to them by economists, including agricultural economists, was very interesting, and one with which I quite agree. In fact, I have spent most of my time for the last thirty years trying to do that kind of job. His statement of marginal possibilities is interesting. In this connexion I am reminded of something I heard

a leading farmer say in a congressional discussion in 1933. He was talking about the need for some drastic new measures and said that one of the most important things in life was to learn to co-operate with the inevitable.

I agree with Mr. Napolitan on correlation concepts and so forth, and so far as talking tactfully about the displacement of farmers is concerned, I suggest that the way to deal with that sometimes is to give the people who cannot make a decent living in agriculture an opportunity and help to shift elsewhere where they can do better. That implies seeing, not only that they are moved out, but also that they are given training and assistance in finding new jobs in the new location.

Mr. Roberts's comments I agree with, and also Dr. Ohkawa's. I was talking primarily about the field of agricultural economics, although my topic was general. This whole question of income flows and income analysis and the flow of funds is a vital part of national planning. But it is a part where the data and materials from the agricultural economists have to be combined with data from many other sources. This is done by the national planner, and he tends to be a general economist rather than an agricultural economist. That is one reason why, being short of time, I did not mention it. Also, I quite agree with several speakers that the concept of a neat inter-industry matrix with an elaborate econometric approach is unsuited to under-developed countries. In fact, I have yet to see much use made of it in developed countries. To take adequate account of all the changing coefficients resulting from rapid technological progress in a matrix table changes it so greatly that it ceases to be a nice, easy computation. While it is a useful concept to express some parts of national planning in highly developed economies, I think it is one of those econometric abstractions which are of only limited usefulness. In fact I would hazard a guess that because this method is so beautifully fitted to the operational characteristics of electronic equipment more time and energy has been spent on it than practical application really justifies.