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TWO SYNOPTIC VIEWS

I. ALBERTO VALDÉS*

Colombia

In the past, two participants of these Conferences have been asked to present an overview of the proceedings, summarizing the scientific findings and contributions of our gatherings.

For very sound reasons, the organizers of the 1973 Conference have modified the purpose of these summary statements. On this occasion your '*synoptic viewers*' have been asked to highlight the unfinished business of the Agricultural Economist which emerges from this meeting.

My role is to present the view of an economist from the Third World, who lives and works in this region.

Participants will, I hope, agree that it is impossible for me to be 'objective' and offer a balanced perspective of the topics we have been discussing. For one thing, my professional experience has been in Latin America, alone. Inevitably, this synopsis will be a reflection of that part of our unfinished business which I personally believe is important.

Let me present my first bias, which is that the main theme of this Conference, *The Future of Agriculture*, has proven to be almost intractable. The future of agriculture with all its ramifications represents the totality of our scientific endeavours—it is all unfinished business.

The issues we have discussed have been extremely broad. This breadth of scope has undoubtedly added a richness to our debates which would have been lacking had we adopted too narrow a focus. A very real benefit of our gatherings comes from a broadening of our peripheral vision. However, from the presentations at this Conference I confess I have failed to perceive any clear prescriptions for identifying future research priorities.

This fact, Mr President, has induced me to concentrate my remarks on the short and perhaps medium term, rather than address the long-term perspective of world agricultural development, which you suggested in your opening statement.

With these few introductory comments, I wish to focus now on five specific aspects, which I feel represent the principal areas of unfinished business of this Conference.

These are:

(1) The participation of LDC Economists
(2) World Trade
(3) Technology and Institutions
(4) Poverty
(5) Some methodological issues

* I am indebted for some extremely useful comments to Grant M. Scobie.

First, let us consider the participation of economists from the LDCs in this Conference.

We would be ignoring a serious problem if we failed to recognize the very limited number of LDC economists here in São Paulo.

Of a total of 670 participants registered at this Conference, 38 come from Asia, 8 from Middle East, 6 from Africa and only 27 are from Latin America, excluding Brasil and DC economists working in the LDCs. The total number from LDCs is 79. Why?

Maximization of the number of delegates from any specific region is clearly *not* an objective of our meetings, *per se*. However, we have failed to attract many competent agricultural economists from Latin America, and it is my impression that this is also true for Asia. This is a serious matter which calls for the undivided attention of those responsible for the planning of the next Conference in 1976.

Is it a question of lack of information, or of lack of money, or of language barriers; or is it perhaps their disillusionment with our programme? These aspects are, of course, not mutually exclusive.

As for money, there may well have been valid reasons for Asian and African economists. But I seriously doubt that this factor can explain the absence of so many Latin Americans.

With respect to the programme, I hope my colleagues from the LDCs would agree on the need for an exchange of ideas with economists from developed countries, at least every 3 years. After all, many of the theoretical and methodological advances in our discipline, have in the past, at least, originated in the developed countries. To argue that these lack any relevance to problems in the LDCs would reflect extreme naivety. Combating scientific and professional dependence with ignorance, has no merit.

However, I do see the need to organize a programme which has a different intra-professional allocation of topics, so that the interests of the LDC economists are better served. The theory and tools of contemporary economic analysis have not always proved to be relevant for attacking some of the most pressing problems of agricultural development in the LDCs. The areas of agrarian reform, malnutrition and poverty are striking examples. These problems call for the combined efforts of the *best* human capital in our discipline, from all regions of the world.

The decision to hold the next Conference in Kenya should afford a valuable opportunity to focus our attention on African agriculture. Perhaps a similar focus on Latin America could have negated the abysmal attendance of Latin American economists at this Conference.

Let me turn now to the areas of World Trade and the Present Food Situation.

I feel a valuable lesson for organizers of our future conferences can be drawn from the level of interest and discussion stimulated by the *ad hoc* meeting on the World Food Situation. This fortuitous event of only 90 minutes, for me, was a highlight of our special group programmes.

The present world food situation certainly presents an area of

unfinished business. We must ask if we are currently in a temporary situation with high prices resulting from unfavourable weather conditions affecting supplies—or, as suggested by Paarlberg, we have also unusual but temporary demand position due to the levels of international monetary reserves.

An alternative view is that the current situation reflects a more basic underlying change, with demand outgrowing supplies, implying a longer-term trend to higher commodity prices. If these price trends do continue, and in the LDCs we are faced with food shortages, the attention of the profession may well move away from conditions of human welfare and into the areas of production, management and technical change, alone.

The implications of these price changes are too important to the LDC importers and exporters for us to adopt a 'wait and see' strategy towards understanding the current situation. The future pattern of world grain trade is likely to be very different, and we need a much better understanding of the forces of supply and demand. Our knowledge of the influence of population and income on the future demands of the LDCs is sketchy, and the import demands of the U.S.S.R. and China are treated as no more than random events.

With regard to global supplies, we need carefully to assess the possibilities of expanded production in the U.S.A. It was suggested that the relaxation of production controls will have relatively little impact on total output. This is a convincing proposition when one recalls the numerous occasions in which the relative ineffectiveness of the controls in reducing supply has been demonstrated. In addition, we know little about the impact of higher prices for energy sources on the output of foodstuffs—in particular the impact of the scarcity of nitrogenous fertilizers mentioned by Allen, and the rising prices of fuel oil.

Hathaway has raised some crucial longer-term questions on that classic misnamed phenomenon, the 'Green Revolution'. Is the revolutionary movement waning through an inability to supply associated inputs, and have we overestimated the area to which these technologies are applicable?

Lastly in the area of trade, it was suggested we should review the impact of protectionism in the developed countries on the exports of the LDCs. We have advanced in our analysis of this issue. We are now stronger in pointing out the dangers of price distortions, but we are still far from defining the 'right' price system in an international context as Josling pointed out. Further, if we are successful in obtaining trade concessions for farm products in the EEC and the U.S.A., we were reminded by Paiva and a delegate from Bangladesh that Asia, Africa and much of Latin America will gain very little—a lion's share of the rewards going to such countries as Australia, New Zealand, Argentina and Canada. These issues, together with the effect of changes in economic groupings on world food trade, call for closer study.

Focusing now on the area of *Technology and Institutions*, I feel there is a concensus amongst the participants as to the need for a concentrated

research effort in this area.

In retrospect, the discussion at this Conference centred around the theory of induced innovations as developed by Hayami and Ruttan, and discussed personally by Ruttan in the second plenary session. His paper provided an excellent framework for this discussion, and I wish to congratulate Ruttan on his presentation and the programme committee for its selection.

The implications of this theory with its attempt to incorporate institutional evolution into the realm of the economic system is becoming a controversial theme in the LDCs, and should continue to do so for a long time.

We have been presented with an attempt to develop a theory of induced innovation in agriculture. To be useful, this theory must offer more than an *ex post* analysis of the nature and direction of the technological change in two selected countries. What implications can we draw from the theory? It appears that we should devote more effort to discovering how we can accelerate the adjustment of our institutions to generate appropriate new technology. One of the crucial elements is to institutionalize the relevant agricultural research in the public sector. Differences in factor endowments call for a more decentralized research effort amongst regions and countries.

It would seem that the essential elements of our future research agenda should recognize the following points:

(*a*) A limitation of the theory, as recognized by Ruttan, is that it offers no guidance as to why many agricultural and semi-industrialized countries have failed to generate the necessary institutional changes which would have allowed them to obtain the benefits of technological change.

(*b*) For those countries whose agricultural sectors have become technologically advanced, the theory seems valid for predicting the direction but not the rate of technological change.

(*c*) There is a well-founded concern that in societies with an unequal distribution of political and economic power, the groups possessing this power will succeed in internalizing the gains stemming from technological advance. Even if agricultural research is socialized, these groups could, in fact, manipulate the direction of the research to serve their own special interests. This may result in a divergence from the socially optimal path of technological advance, dictated by relative factor endowments.

(*d*) Poverty. The absolute poverty of groups within the agricultural sector is the most striking difference between the LDCs and the DCs. Despite the uncharted nature of this terrain for agricultural economists, I feel the profession has the competence and the obligation to address itself to the diagnosis and prescription for this malady.

While we lack an adequate theoretical framework and suffer from the eternal scarcity of data, we should not be deterred from mounting a serious attack on this fundamental problem.

The fact that value judgments are an integral part of such work is no defence for inactivity. As Petit stressed, we must recognize that we are

both moralists and analysts.

We now have ample historical evidence that economic growth and even massive land-reform programmes have too frequently by-passed significant sections of the rural poor.

Raising the level of employment is one of the most effective means of distributing the gain from growth and eliminating poverty.

I suppose we could all agree that this refers to employment both in the farm and non-farm sectors.

While there has been an increased demand for rural labour resulting from the so-called Green Revolution, I believe that its employment generating effect can readily be overridden by inappropriate macro-economic policies. In particular, both trade and factor pricing policies commonly adopted have led a negative influence on employment.

Where explicit social policies aimed at alleviating poverty have been implemented, they have tended to overlook the enormous social heterogeneity of the poor.

Some are poor because they are old. Some are poor because they are illiterate, some are isolated in depressed regions. For some, the symptom of their poverty is malnutrition, for some ill health, and for others in-adequate housing. The standard instruments of wage policy and income transfer, even if effectively administered, often fail to reach many of the poor. Children, the elderly, the sick, and the self-employed receive little or no benefit.

A vital area for us is to identify who are the poor? What are the problems facing them? and how they can be reached? We have to recognize the fact that the limited resources of most LDCs precludes any grandiose plans. What we must do is focus our attention on the design of selective policies, be they in the fields of expanded food production, health, education, or nutrition and aim our programmes at the poorest 10 or 15 per cent of the population.

The essence of these remarks is the need for us to shift our attention from sectoral to individual 'protection' for the underprivileged. Similar ideas were expressed by Simantov and Westermarck in relation to Dcs.

It would be regrettable if we allowed ourselves to be deterred by the obvious inadequacies of presently available data. Neither should we feel confined to the traditional scope of agricultural economics. Surely we have a comparative advantage in the fields of marketing and consumption which could be brought to bear on the potential contribution of the fishing industry to alleviating malnutrition.

Finally, let us briefly consider the *methodological contributions* to this Conference. Have these contributions really offered us any significant additions to our arsenal for attacking the problems I have outlined?

On one hand we have the exploratory but imaginative discussion on the economics of agricultural science and technology. The interesting focus which arose was not so much the well-recognized demand for new technology, nor problems subsequent to its adoption, but rather, the concern with the supply of technology. Questions were raised, such as:

(*a*) How can we design an economic model of the production of knowledge?

(*b*) Who should bear the cost of the production of new technology?

and (*c*) What special problems are associated with the efficient allocation of resources in the 'industries' producing technology?

On the other hand we have less reason to be optimistic about the theoretical and methodological bases of research in agrarian reform. It is evident that such reforms will continue to be implemented, with or without the technical support of the agricultural economist. The missionary nature of the research up till now has not advanced our understanding of the economic and social complexities of this subject. Perhaps it was unfortunate that the theme paper on agrarian reform was not delivered. Our existing tools are woefully inadequate—this area surely represents a challenge to the profession.

Methodological progress has been substantial in the area of programming, simulation and decision theory models. Throsby's monumental directory of recent research on micro-economic models bears witness to this. It is regrettable that we have had no real opportunity to learn of the experiences of the Eastern European countries and the U.S.S.R. in the application of mathematical models to problems at both the micro and macro level.

One would hope that these models could make a real contribution to the solution of problems in the LDCs. However, based on the limited experience to date, we still have a very large gap between what the models can deliver and the requirements for policy formulation.

In addition, the manpower needs of these models are frequently far in excess of the skilled resources available in the LDCs, except when such models 'decend' in the form of unsolicited foreign aid. Could we think in terms of making packages of models available in LDC economists through a type of 'library' aimed at providing this international service, and so reducing the real cost of access to them?

Mr President, the supply of unfinished business is infinitely elastic; what I have tried to offer is some insights related to the demand.

II. GUNTHER WEINSCHENCK

West Germany

The future of agriculture had many dimensions. Consequently this congress has covered a wide field reaching from world trade, via political problems in developing and developed countries, the organization of production, marketing and processing to methodological problems and the future of forecasting.

The future is open at one end and at the other limited by the present time. If one leaves this limit, the results of scientific analysis soon become vague and look more or less unscientific to many people. Probably this is the major reason, that most of the contributions treated problems of the

present time rather than of the future, unless one assumes, certainly not without justification, that many of the present problems will last for the next decade or at least the next few years.

Considering the complexity and number of subjects which we have covered in the last 10 days, it is impossible to do justice to all contributions. I can only select a few of the problems, which seem to me the most relevant for the future.

Aspects of the methodological and theoretical development

The historical development of our discipline is not straightforward. One can observe both the development of new methods and tools and the renaissance of old, sometimes almost forgotten, theories frequently known only to part of the profession. In this context, the paper on Induced Technical and Institutional Change and the Future of Agriculture, given by Dr Ruttan, was the most notable event of the Conference. In his model of induced technical change, Ruttan has developed thoughts which will be familiar to those who know the German literature of the last 50 years.[1]

The extension of the thought of Aereboe and Brinkmann put forward by Herlemann and Stamer already in 1958 using the well-known factor triangle as a main tool of analysis, leads to the same results which Ruttan has derived from his analysis of the economic development of the agricultural sectors of several countries. Economic development and technical change are not autonomous processes which occur according to similar patterns in all countries but they depend on special conditions like the relation of factor prices. Consequently one can distinguish different types of development, of which the 'labour-intensive type and the capital-intensive type' are probably only examples very likely subject to more refined classification in the future.

The renaissance of the old, mainly descriptive, development theories seems to me no accident. The discipline of agricultural economics has experienced a period of rapid methodological development. During the last 20 years a permanently and rapidly growing number of more and more refined methods and models have been developed. Comparison of Dr Throsby's[2] and Dr Heidhues'[3] paper with corresponding earlier papers[4] suggest, that the development might slow down, concentrating mainly on refinement of existing methods and meeting growing scepticism if the refinement goes beyond a certain level.

One might summarize the present situation in the field of methods and models as follows: On the farm level modern planning methods of the programming type and extensions have become established procedures. Practice frequently uses simplified versions of the programme type, while science has moved towards sophisticated attacks on the problems of risk and uncertainty.

Optimal programmes for partial or total co-operations of groups of farms with their special requirements for income distribution, division of labour and distribution of tools like machinery, etc., will probably catch the imagination of farm planners in the near future.

The data problem has at least partly been solved by the provision of data collections at least in some of the developed countries, and maybe some of the less-developed countries might find it useful to proceed in the same way. When data collections do not exist, the data problem can be frequently solved *ad hoc* by intelligent interviewing as far as the critical data for farm plans are concerned. The problem of making appropriate use of the knowledge accumulated in books and brains has become in many countries exclusively a question of implementation.

Frequently the problems exist, the people exist who know how to solve them, but it takes money, imagination, motivation and incentives to bring both together. The problems remain unsolved in the countryside and the educated people remain in the city, kept by higher wages and better living conditions.

On the aggregated level, things appear slightly different. The gap between the availability of data and the needs of the refined methods has grown continuously. The call for better and more adequate data did not find the response by the statisticians and the people who allocate the money for collecting statistical information. Admittedly economists have developed great skill in estimating or creating non-existing data, but specially in less-developed countries, though by no means only there, the applications of aggregate planning and development models on the regional or macro level meets the strong restrictions of inadequate data. The further refinement of the quantitative tools meets therefore growing scepticism, as the discussion on new analytical tools has shown.

However the lack of operation effectiveness because of the lack of data is only one of the reasons responsible for the scepticism which became apparent in the discussion. Another one is the philosophical aspect put forward by Dillon and McFarquhar. It is based on the familiar distinction between positive and normative consideration. It might be useful to modify this distinction slightly and separate decision-making models from descriptive predictive or explanation models. By a decision-making model one finds the optimal solution for a problem. Provided that no mistakes have been made, the solution is relevant or irrelevant depending on whether the structure of the model corresponds to the structure of the problems or not. But the solution has not to undergo the test of verification in order to be valid as it has in descriptive development or predictive models.

The combination of elements of decision-making models with positive elements in the recursive type of programming models creates some discomfort at least among part of the profession.

The achieved results remain in the range of non-verified hypothesis as long as the model applied does not succeed in proving that the objective function of these models is equivalent to the behavioural functions of the decision-making units.

Those who have tried to describe the past empirical development of a given region by a recursive programming model know how difficult this is.

Usually one has to experiment so long with different restrictions and

behavioural functions, that one does not know in the end if the range of validity of the solution can be extended beyond the region and beyond the time period under investigation. However, the high input on labour and sophisticated intelligence which is needed to construct such models is justified only if the range of application goes beyond at least the time period under investigation. The crucial problem to be solved is the determination of the range of validity of the results of the analysis of regional development models. Before one begins the long and laborious work of setting up an *ex post* development model for a given region and a given time period, one should answer the question. What do we really know if we indeed find out what we want to find out by our analysis?

The problem of extending the range of application of existing development models can be attacked in two ways:

(1) By intensifying behavioural research and determining the range of validity of given patterns of behaviour. The determination of the relations between the age structure and the willingness to leave the agricultural sector is one example in this field.
(2) The determination of problem structures for which similar development strategies are optimal and for which one can expect similar empirical development.

The way mentioned under (2) calls for identification and classification of problem structures emphasized recently mainly by the system analysis approach.

It is the strongest argument for the likely renaissance of development and equilibrium theories. Economists might again find it useful to employ these theories for a better understanding of their problems and for a determination and classification of problem structures. Types of development, of which the labour-intensive type and the capital-intensive type distinguished by Ruttan are only examples will be defined. The vertical classification of development types might be complemented by a horizontal classification of which Rostow's stages of economic growth are an example.

However, types of development will not only be classified, it might be useful to simulate the development path of different types by applying mathematical models developed recently.

In other words, the future calls for a closer combination of economic theory and mathematical models, thus quantifying the mainly descriptive development theories, in order to discover and understand critical points of existing development structures more easily.

Vertical and horizontal classification of problem structures requires greater emphasis of international comparison and of empirical analysis of actual development paths, frequently by the simple tools of comparative statics.

This development makes closer communication necessary not only with respect to the exchange of methods and models, but also with respect to the empirical performance of the agricultural sector. The transparency of

the empirical work of agricultural economists gains the same weight as the transparency of their theoretical and methodological work.

The international transparency of the work of agricultural economists has been considerably improved by the World Agricultural and Rural Sociology Abstracts but we are still faced with the fact that little is known about the empirical work of our friends in the Eastern countries, or that only the English literature is known or acknowledged even on such special regional problems as the development of the productivity in European agriculture or the political problems in the European Common Market. To overcome the existing shortcomings at least within the framework of this association, it might be useful to invite survey papers on the recent development of the most important parts of the world. These papers should cover the actual development in agriculture and the methodological development in the years since the last Conference. They should not be presented at the Conference, but delivered as basic material, maybe for discussion groups, which could be organized either according to regions with more or less homogenous structures or according to problems which have been relevant at least for a group of regions represented at the Conference.

Problems of developing countries

Employment policy and land reform will remain major problems in developing countries. The consequences which result from the priority of the employment problem can be derived from Ruttan's paper. The promotion of the labour-intensive development path with the extension of high yielding crop varieties, the increase in the use of means of production which increases land productivity rather than labour productivity and the extension of irrigation will have to be particularly emphasized. However Nurul Islam has shown that there are strong arguments for limited mechanization also even if one gives priority to labour-intensive development.

The distribution of development capital between 'labour-intensive' investments and 'labour-saving' investments will probably remain in the discussion for many years and very likely economists will have to be careful to avoid the exchange of problems of income distribution with problems of employment.

Islam has shown also that the employment problem is closely related to the problems of land reform and he has underlined the preconditions for a successful land reform with respect to employment as well as to productivity. This part of his paper deserves special attention since the discussion has shown that we are far away from a generally accepted economic theory of the land reform. Land reform is considered mainly a social and political problem. Islam has indicated the economic implications and maybe this is the beginning of an attempt to include the land reform in the 'theory of induced institutional change' instead of taking it as an exogenous variable in economic considerations.

Problems between developing and developed countries

Trade policy was the major subject treated at this Conference in the field of relations between developing and developed countries and the major requests were: the decrease of protection of production in the developed countries or as Britton has formulated it, 'fair share or international trade' in order to promote development in the 'poor' countries. However, it seems that these requests apply to certain industrial goods rather than to agricultural products. For only little advantage remains for the developing countries if one 'disaggregates' the consideration by analysing product by product and country by country. The production potential in most of the developing countries—probably with the exception of some countries in Latin America and in South-East Europe—is too small to provide a substantial export surplus in basic products, like grain, meat and plant protein. If protection will decrease the redistribution of production is likely to occur mainly between developed countries.

This might be considered a valuable objective, too, taking into account the possible welfare effects of distribution of production according to the law of comparative costs within a world-wide horizon. However it will almost certainly have to face the objective of 'national security' established by politicians in the countries with relatively high production costs and high level of protection at present.

We have observed a distortion of the international moral of free trade with agricultural products in order to protect agricultural income in the last decade in which supply tended to exceed demand. Maybe we will enter a period of short or at least uncertain supply in the next decade. It might be hard to believe that countries will follow the moral of a fair share of international trade if this is against the vital interest of their consumers. The problem of expansion of free trade in a period of uncertain supply, at least in the long run, is not only an economic problem, it is a moral and political problem, too. It needs some optimism to believe that this problem will be solved more satisfactorily than the moral problem which is involved if one country or a group of countries transfers its farm adjustment problem partly to the world market.

Considering the world as it is, we will have to solve the problem of the agricultural sectors of our countries in an atmosphere of regulated and manipulated trade and it might be a step forward if we can establish a code of 'good behaviour' rules. The task of the economists is probably not to establish such rules but to point out the economic implications of certain patterns of international behaviour.

Problems of developed countries

The search for a new agricultural policy was the major subject of the discussion and the agricultural price policy was the major subject of criticism among the problems of the developed country.

Only the representatives of the Soviet Union[5] seem still to believe that prices are a suitable instrument of agricultural income policy, if one looks

into the papers presented. Miller's forthright statement[6] may stand as an example of the opinions expressed.

The following major arguments have been presented against the price policy as an instrument of income policy.

(*a*) Price policy supports only the income of the big farms. The differential rent resulting from farm size and different natural conditions will be increased if one uses price policy as an instrument of income policy.

(*b*) Price policy used as instrument of income policy has a negative welfare effect:

(i) since only a small percentage of the expenses of consumers and public households spent for the support of prices contributes to the income of farmers,
(ii) since price policy used as an instrument of income policy results in an inefficient allocation of production factors,
(iii) since price policy increases the inflationary trend in the economy.

However, nobody has tried to determine what an optimal price policy would be, according to what criteria one could measure the degree of optimality and how to implement a price policy with a maximum welfare effect. Probably Breimeyer was right in stating during the discussion, that the search for a new agricultural policy in the developed country must not be mistaken for a condemnation of one instrument but has to be considered as the search for a new and more efficient combination of well-known policy instruments. Searching for a new combination of policy instruments one has probably to take into account:

(*a*) The possibilities of increasing public expenses beyond a certain level are limited in market economies for political and economic reasons. However, the requests for public means increase permanently and tend to exceed the tax-paying capacity of the society. Public expenses and private expenses are not 'equally scanty' and it might well be that the marginal welfare effect of additional expenses is higher than the additional private effects or might become higher if the present development continues.

(*b*) If one accuses the prices policy of supporting only big farms, one has to determine what is meant by a big farm. The size of a big farm today frequently corresponds to the size which equals the objective of agricultural policy for tomorrow. To reach this objective at least some small farms must keep profitable investment opportunities and must be in the position to finance them. Therefore not only the support of income by direct payments for social reasons results from decreasing prices but also the support of investments if one aims at a continuation of the structural change.

Support of investments by public households has become a familiar policy instrument in many countries which worked satisfactorily as long as public support was restricted either to certain bottle-neck investments or to certain farm groups covering only a small part of the total sectoral investments. However, the guidance of investments by public

administration might result in a even more inefficient allocation of production factors than the misallocation caused by a price policy 'misused' for income purposes, if the proportion of investment subsidized by public means exceeds a certain level. In other words, the use of price policy as an instrument of income policy requires intervention at the product markets, direct income payments and investment subsidies mean intervention at the factor markets. It is by no means clear that the latter is more efficient if the substitution of price policy by direct payments goes beyond a certain level. Probably there exists a minimum cost combination of different measures which depends on the relevant circumstances and which has to be determined in a trial and error process in each case by implementation of a flexible policy following careful and objective observation. Economists might find it useful to complete and refine their instruments for measurement and comparison of the income of the sector and of farm groups and for the determination of the effects of policy measures.

Change of the structure of relevant problems?

The present structure of problems in the fields of international trade and national agricultural policy in developed countries results from the tendency to increase supply faster than demand. Practically none of the industrialized countries has succeeded in the adjustment of factor mobility to technical progress and changes of demand. If the world market situation changes, the nature of these problems will naturally change also. The allocation of the factors of production according to the law of comparative cost advantage is not a major problem if practically all natural resources are used for the satisfaction of demand which are available at the stage of technology at any given time. If supply falls short of demand on a world-wide scale, the distribution of the production to meet the demand as far as possible might become the major trade problem and the question might arise if the distribution shall be left exclusively to the market, thus following mainly the distribution of purchase power, or if other objectives which would require intervention by administrative measures would gain priority.

The promotion of biological technical progress and the effective allocation of capital for more intensive land use would become major problems in the field of production. The farm income problem would lose importance, agriculture would enter a new 'golden age'. To keep agricultural prices from rising and to keep the increase of agricultural income, especially of land rent, within socially acceptable limits will become major problems. The crucial question is, does the increase of the population and the increase of per capita income enforce a 'labour-intensive development path' not only in the countries with a narrow land/man ratio but in the whole world and if so, how would the labour-intensive path look in the industrialized countries with high wages. The Conference did not answer these questions. We have discussed them but nobody dared to answer them, thus revealing the poor state of the arts in

which forecasting still is, in spite of all the efforts economists have made. Methods—like the Delphi method—which have been fairly recently developed for long-run forecasting emphasize the role of expert judgment and the 'seminar' on the prospects of the world-market situation which has been spontaneously organized has also shown that at least long-run forecasting has to be based to a great extent on judgment.

That means long-run forecasting which will become extremely important for the design of long-run agricultural policy, has to make use of national and regional judgment and can be improved only by international co-operation. The seminar has shown that a considerable amount of national and regional judgment can be accumulated in this association. Maybe the improvement of long-run forecasting which requires close international co-operation of individual experts could be organized in the framework of this association certainly to the benefit of the reputation of our profession.

REFERENCES

1. Aereboe, F. (1917) Allgemeine landwirtschaftliche Betriebslehre, Berlin, 4. Auflage, S. 656 f.; Brinkmann, Th. (1922) Die Ökonomik des landwirtschaftlichen Betriebes, in *Grundriss der Sozialökonomik*, Tübingen; Herlemann, H. und Stamer, H. (1958) Produktionsgestaltung und Betriebsgrösse in der Landwirtschaft unter dem Einfluss der wirtschaftlich-technischen Entwicklung. In: *Kieler Studien*, 44, Kiel.
2. Throsby, C. D. (1973) New methodologies in agricultural production economics: a Review. XV International Congress of Agricultural Economists, São Paulo.
3. Heidhues, T. (1973) Sectoral and regional analysis objectives and methods. XV International Congress of Agricultural Economists, São Paulo.
4. Weinschenck, G. (1965) Recent applications of quantitative research in agricultural economics, in *Proceedings of the International Conference of Agricultural Economists*, Lyon.
   —— (1971) Recent developments in quantitative analysis at the micro level, in E. O. Heady, *Economic models and quantitative methods for decision and planning in agriculture*, AMES.
5. Boyev, V. (1973) Pricing as a tool for the stimulation and regional distribution of farm production. XV International Congress of Agricultural Economists, São Paulo.
6. Miller, G. (1973) Agricultural prices: their role in market economies (discussion). XV International Congress of Agricultural Economists, São Paulo.