AGRICULTURAL DEVELOPMENT SYSTEMS EGYPT PROJECT

UNIVERSITY OF CALIFORNIA, DAVIS

FIRST ECONOMICS POLICY WORKSHOP PAPER:
THE ECONOMICS OF AGRICULTURAL INTENSIFICATION

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WORKING PAPER

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This is the summary paper resulting from the ADS Economics Sub-Project First Economics Policy Workshop, March 27-31, 1981, Cairo, Egypt. It was written by a core group of economists that included Bruce Glassburner, M. Ragaa El-Amir, Osman El-Kholi, Afaf Abdel Aziz, Mohamed A. El-Shennawy, Will Rochin, and Wayne Dyer.

THE ECONOMICS OF AGRICULTURAL INTENSIFICATION: STRATEGIES FOR THE ATTAINMENT OF NATIONAL GOALS

1. INTRODUCTION

The following paper is an attempt by a "core group" of seven economists to capture the essential results of a four day workshop on the subject of agricultural intensification held in Cairo from March 28, through April 1, 1981. The workshop was attended by more than 100 persons, and 35 papers were presented. We, the core group, have therefore decided that our objective in this paper will not be to summarize in detail the presentations and discussion, nor to make an effort at a detailed description of the workshop. Copies of the program of the workshop and summaries of papers are to be made available to interested parties in any case; hence any such detailed summarization would be redundant. Instead, what we present here is an attempt at a distillation of the economic ideas presented. And inasmuch as we were all participants in that workshop, we have made no effort in this paper to avoid contributing toward formulation and interpretation of those ideas.

This is, therefore, a paper written by a committee. It contains not a single viewpoint of Egypt's difficult agricultural situation, but an amalgam of many views. Nonetheless, we believe we have attained a high degree of consensus. The following key points may be highlighted in advance: First, Egypt faces a developing "food gap" crisis, involving a very rapid increase in demand for agricultural produce at a time when production growth has slowed to virtual stagnation.[1/] Complacency is unacceptable; new strategies are urgently needed.

Second, Egypt has very little potential for expansion of her land and water resources; hence an expanded agricultural growth rate, if it is going to

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1/ We are aware of the relatively strong performance of the agricultural sector in the past two years. Few observers consider this to be more than a short term abberation, however. The decade growth rate of agricultural output, 1970-80 was a mere 2.1 percent; this represents a decline in agricultural output per capita, given a population growth rate over the decade of 2.4 percent.

be achieved, requires more intensive and more efficient use of these precious national assets.

Third, better use of these resources will require the full cooperation of Egyptian farmers, who must be presented with incentives which are consistent with intensification.

Fourth,the pattern of pricing and government controls utilized in the recent past, although they may have made a contribution toward rationalization at an earlier point in Egyptian history, are no longer capable of doing so. Indeed, steady progress toward dismantling of the worst of the market distortions imposed on the agricultural sector by government intervention will have to be achieved if successful intensification is to be accomplished.

Fifth, economic success for the nation as a whole is impossible without a strong performance by the agricultural sector. That sector contains nearly half of the nation's poeple, and even in a period of stagnation, produces one thrid of the nation's total output.

Sixth, although agricultural research has made great strides in Egypt in recent years, it must be intensified also -- so that farmers and planners may be availed of the knowledge required to make the thousands of decisions required to achieve rapid rates of output growth and increasingly rational use of technologies and resources.

Seventh, and last, we agree that a successful agricultural intensification effort is, and must be, attainable with social justice. It can be so, provided the strategy which is chosen releases the nation's farmers from the heavy burden of implicit taxation which has been placed upon them by prices and delivery quotas which are inconsistent with both the farmer's personal interests and with social values of both outputs and inputs. The agricultural sector comprises the largest part of the nation's poor. And if, as we feel it must, equity in the distribution of income is an essential national goal, then presenting the nation's farmers with the opportunity to reap benefit from their own production efforts, in a manner which is consistent with their social contribution, is the sine qua non of a just,

as well as of a prosperous society. To repeat, equity and prosperity can and should be complementary objectives, not competing objectives.

II. NATIONAL GOALS

While we have obvious consensus that critical problems exist in Egyptian agriculture, there is much less agreement as to what policies might improve future prospects. The recently held workshop aimed at throwing light on the possibilities as well as the limitations of agricultural intensification as a concept of relevance to the achievement of goals envisaged by policy makers in the Egyptian agricultural sector.

Conceptually, the phrase "agricultural intensification" may be perceived differently by different groups related to the agricultural industry. But whatever these perceptions are, they all reduce to a common notion of increasing agricultural production both per unit of inputs(i.e., through the adoption of better input combinations and new technologies), and through increased amounts of inputs.

Thus, even if we were to agree that agricultural intensification is a relevant and useful concept to apply in order to increase the technical and economic efficiency of the agricultural sector, we still have to answer three broad complex and closely related questions: (1) what combinations of inputs will serve the national purpose best ? (2) what technologies should be utilized ? and (3) what combination of outputs should be aimed for ?

Furthermore, we have to recognize the fact that the intensification process, when applied, will itself induce many changes. Some of these changes are purely technical in nature, but social and economic changes of great importance will also ensue. The implications of these changes and their agricultural production effects must be anticipated and taken into consideration, which is to say that the intensification process must be seen as a very complex package of social change, with many and widespread ramifications. The success of intensification in the achievement of desired goals depends, in large measure, on our ability to comprehend

these complex relationships and to create an atmosphere in which the different productive and social factors may work together and interact in such a way as to reach those desired goals.

In our view, national public policy should incorporate the twin objectives of (1) maximization of net social produce per capita and (2) optimal distribution of income. Agricultural intensification could be regarded as a set of measures directed in the first instance toward achievement of the first of these broad goals. But maximization of net social product per capita, in view of changing technology and fluctuating prices of both outputs and inputs, is of a dynamic nature, and therefore the pattern of intensification policies must also be flexible and of a dynamic nature.

Optimization of resource allocation is one of the requirements for maximizing net social product; hence intensification policy must be interpreted in that context, i.e., as a search for the best possible production combinations over time. However, this difficult search, as indicated above, is complicated by our need to bear in mind the social welfare implications of the production process, and in particular the distributional implications of the allocation patterns chosen, and, by inference, the employment implications of that pattern.

III. MEANING AND IMPLICATIONS OF INTENSIFICATION

In broad intuitional terms, the meaning of intensification is clear to all. It is evident to most observers, if not all, that Egypt's great effort to expand "horizontally" by creating new land resources through desert reclamation has yielded only the most modest of results, and that the potential benefits of further large efforts in that direction are likely to be meagre, as compared with what might be accomplished by a greater concentration of effort and resources on the "old lands" . Indeed, we, as a group, regard it as imperative that the nation's primary effort be toward raising output per feddan, rather than in attempting to raise aggregate output through extensification of land resources.

But beyond this clear intuitional meaning, there is little precision in the use of the concept of intensification. We feel that it is incumbent upon us to endeavor to clarify the concept. In particular, we regard it as

essential that it be understood that intensification is a technical concept, rather than an economic concept, and that economists support an intensification strategy for Egypt only because it is economically superior to the alternative.

The Technical Definition of Intensification:

The simplest and most widely used technical definition of intensification in current discussions of agricultural policy is the cropping ratio. This is merely the ratio of the number of crops planted and harvested on all cultivated area in a year's time divided by the total cultivated area. This ratio, for all of Egypt, for 1980, has been widely quoted as being 1.9, and it is frequently stated as a national goal that this ratio should be raised to 3.0 over some planning time horizon. This then leads to detailed discussion of possibilities for the shortening of the growing season for established crops, for increasing use of interplanting, and for shifting cropping patterns to concentrate greater effort on crops which are more amenable to multiple cropping. The obvious shortcoming of such a definition of intensification is that it provides no basis for choosing between alternative cropping strategies which might yield the same or similar ratios of crops to area; and indeed, it could lead to an entirely irrational concentration on quick-yielding crops of low social value. A similar shortcoming inheres in all purely technical definitions of intensification. Tonnage of produce per feddan , for example, which would concentrate effort on goods of high yield in weight, or which are particularly amenable to close planting, regardless of relative social value, is clearly an inadequate definition in that it provides no meaningful planning criterion.

III. 1. ECONOMIC ANALYSIS AND INTENSIFICATION

The essential distinction between a purely physical criterion of production performance and an economic one lies in the use of values, as opposed to physical quantities. The economist seeks to maximize the value of benefit derived from a production process, expressed in relation to the value of the resources required to obtain that benefit. In short, an economic criterion must be a benefit-to-cost relationship. Thus, in a priori terms, the economist does not give preference to an intensive, or "vertical" strategy of agricultural development over an extensive, or "horizontal" strategy. In economic terms, intensification is seen as desirable for Egypt because the net benefit from intensified effort on the old lands appears to be, prima facie higher than continued investment of scarce complementary resources in the development of new lands. This distinction is by no means new in the economics profession. It was first enunciated with clarity by the English economist David Ricardo in 1817 in his classic work, The Principles of Political Economy and Taxation, wherein he defined the distinction between the "intensive margin of cultivation" and the "extensive margin of cultivation". The essence of the Ricardo argument is that extensification should be pursued if and only if the cultivation of new land yields net benefits at the margin in excess of those which are obtainable by more intensive cultivation; and by intensive cultivation, he clearly meant, as we mean here, the increasing of the ratio of complementary input factors per unit of land. In Ricardo's simplified case, this meant only labor inputs, but by inference, it extends to all complementary inputs, including human and physical capital, fertilizer, and "technological inputs" as well. In Egypt, one vital complementary input, water, is limited to nearly the same degree that land is limited; hence intensification implies a careful calculus of its allocation as well.

It should be clear from the above discussion that Ricardo's distinction between the intensive and extensive margins, although an important part of the economic literature for 164 years, is a technical concept, and not, strictly speaking, an economic concept at all. The economist's objective, to reiterate, is the optimal allocation of resources, using the optimal available technology, with optimality defined in terms of the relationship between social values of benefit

and cost. Thus the economist is as much concerned with the quality of the output pattern, as gauged by social values, as with the physical quantities of inputs and outputs. Hence, the basis for judging a production strategy which raises the level of cropping intensity on existing lands, is, as it must be, based on an evaluation of the resources used in Egyptian agriculture and of the products of Egyptian agriculture.

III.2. VALUES, PRICES AND INTENSIFICATION

It must be admitted that any such evaluation under present circumstances in Egypt must of necessity be very approximate. Market prices of agricultural inputs and outputs fail to measure social product and social costs. It would be possible, as a point of departure, to estimate the marginal contributions of various types of production activity using such a conventional basis for evaluation as net contribution to National Income or Gross National Product per unit of investment. However, we immediately run into the fact that final product prices and values of inputs utilized in the Egyptian agricultural sector are badly distorted by governmental intervention, both in determining prices and in controlling the acreage allocations in crop production. Cotton, for example, is undervalued at the prices paid by the Ministry of Supply, and land use patterns (and presumably land values) have been distorted by the use of quotas. Moreover, cotton is an export crop which brings more on world markets than it does on domestic markets; the difference accrues to the Egyptian government in the form of a very heavy implicit tax. One possible approach for evaluating the use of resources in cotton production would be to substitute the international price of cotton for the controlled domestic price. To do so in the case of cotton (and of tradeable goods generally) would be a substantial improvement over the use of value added measured in domestic market prices. It has been seriously considered that, for export crops, net foreign exchange earned per unit value of domestic resources in production be utilized in assessing resource allocation to such production; and, although it is an improvement over the use of domestically measured value added (and an approach seriously worth considering for generalization to the entire traded goods sector) it must be recognized as being, at best, a crude approximation of a social benefit-cost approach.

III.3. COMPARATIVE ADVANTAGE AND THE USE OF FOREIGN PRICES

In the opening session of the workshop, Dr. Mohamed K. Hindy argued that the intensification effort should be guided by the principle of comparative advantage, and that comparative advantage be judged using prices determined on international markets. This proposal is, in essence, an extension of the argument of the previous section. The principle of comparative advantage, derived from the economics of international trade, states that, with optimal allocation of resources, using optimal technology, a nation will (and should specialize in the pattern of production which allows it to maximize gains from international trade. Indeed, in theory at least, an economy exposed fully to international competitive pressures will be led to such a pattern of specialization without governmental intervention. A of this argument is that if for any reason the market system fails to guide the pattern of resource allocation and production in that direction, it is the responsibility of the government to intervene in order to allow that pattern to be utilized.

In the case of Egypt's recent history the situation is that government internvention has been so extreme and domestic prices and allocation patterns so far removed from those consistent with comparative advantage that it is now being suggested that international prices be used as a guide for moving in the general direction of optimal allocation as determined by the nation's comparative advantage. This suggestion has considerable appeal, and, as a step strongly in the right direction, we approve. However, we wish to add that the approach, though useful, has limitation which will require eventual tailoring and refinement.

The essential difficulty with such an approach is that not all outputs and inputs in agricultural activity in Egypt are traded on international markets, and therefore, the question must quickly emerge as to how to price such non-traded products as berseem and such non-traded inputs as water and land. It will be necessary in making allocation decisions for purposes to use other criteria for determining social values, because in these domestic markets, also, market prices surely deviate by substantial margins from social values. This is because government intervention has led to either under- or over-valuation of these products and

and resources either directly (as in the case of land and water) or indirectly (as in the case of berseem). The latter point, with reference to indirect influence of government intervention on market prices ,is worth pursuing briefly. Agricultural markets are inter-related to such an extent that a distortion in any one market will induce distortions in others, even though the government may have taken no overt action. In the case of berseem, the undervaluation of cotton and rice and the absence of price controls on meat and dairy products have combined to make berseem production so attractive as animal feed that some farmers have been willing to pay fines for failure to meet cotton quotas in order to maintain or expand acreage planted to berseem. And this example illustrates a much larger point, namely, that the economic system is a system of inter-related markets of such a nature that no serious alteration of its performance anywhere can fail to have repercussive effects throughout the system.

To return to the issue of the use of international prices for the purpose of approaching a pattern of allocation consistent with comparative advantage, the question arises as to how these international price signals are to be transmitted to the producers -- i.e., to farmers. The most simple approach would be for the govenment agencies involved in price fixing for agriculture to simply set prices for cotton and rice, and all other traded products at the internal equivalent of the international price. This would involve, in the first instance, a decision with reference to the rate of exchange which would be used to convert the international price of,say , rice, at $500 per metric ton. At the parallel rate of exchange of L.E. 1 = $1.4, that translates into a price of L.E. 357. But insofar as the parallel rate of exchange reflects overvaluation of the Egyptian pound, a correction should be made which would raise the domestic price proportionately to that degree of overvaluation. Moreover, adjustments have to be made in the domestic price at the farm gate to cover the costs of transportation and handling between the farm gate and the international market. In short, the government price setters would be asked to perform the function of the marketplace itself, as it would have been performed in the absence of government intervention.

The same principle of pricing would, if Dr. Hindy's principle were to be adopted, apply to agricultural inputs traded on world markets as well. For example, fertilizer, which is actively traded on international markets, would be traded domestically at prices reflecting international prices, again corrected for any exchange rate distortion and for any special domestic costs, such as transportation and marketing costs.

The two examples chosen above were deliberately chosen to indicate that price rationalization according to the comparative advantage principle would apply to both prices which farmers receive and the prices farmers pay. Farmers would, of course, applaud the one, and object to the other. But, on balance, it is important for them to understand that they would gain; and it is important for the planners and the public at large to understand that the entire community would gain from such an approach. Farmers would unquestionably gain because it is abundantly clear from the best research evidence that the system of controlled prices takes far more from the farmer than it replaces with subsidies. And, more seriously, from the point of view of the national interest the gross departures of prices which farmers face at the farm gate create gross incentives for the farmer to misallocate, even if quotas do not impose the misallocation on him.

III.4. THE CONCEPT OF FOOD SECURITY

As recently as 1974, Egypt was able to earn enough foreign exchange from agricultural exports to defray the total foreign exchange costs of agricultural imports. This is no longer the case. The agricultural sector and the community's demands for agricultural goods have become a heavy net drain on the balance of payments. As things stand currently, the combination of oil revenues and vast quantities of food aid, largely in the form of P.L.480 aid from the U.S.A., make it possible for Egyptians to meet food and fiber requirements, despite the rapid rate of growth of the urban population and despite heavy subsidies to consumers of basic food commodities. This situation is viewed with alarm by many Egyptians and has led to a demand for greater security of food supplies than the present situation affords.

Unfortunately, this demand for security remains somewhat inchoate, in that the precise nature of food security goals has not been carefully articulated, It is generally conceded that food self-sufficiency is out of the question as a goal for the simple and sufficient reason that it is considered to be entirely unattainable in the foreseable future. But in some sense food security is taken to mean that Egypt must be in a position to rely on her own resources to find the means of feeding herself, through augmentation of supplies from increased domestic production; from increased export potential, to provide the means for the purchase of food shortfalls on international markets without dependence on food aid; and from curtailment of the rate of growth of demand, through the slowing of the population growth rate, slowing of the rate of rural to urban migration, and the reduction of the degree of subsidization of food consumption. In short, the campaign for food security consists of all possible means for the curbing of the rate of growth of the food gap.

Agricultural intensification is essential to the achievement of greater food security. As an initial goal, expansion of the rate of growth of food production equal to or in excess of the rate of growth of food demand needs to be established. Not only is such a goal feasible, given the appropriate pattern of economic policy in agriculture, but its achievement will, in itself, stem the growth of the food gap. The other supply side and demand side efforts mentioned above would then be relied on to contribute to the reduction of the degree of food dependence. Increased export capability (for example from expanded sales of fruits and vegetables on international markets) would contribute in some small way, at least, to alleviation of dependence on aid and other sources of foreign exchange; and curtailment of the rate of demand growth towards more manageable levels would alleviate the sense of panic associated with the rapidly expanding gap and help to defer the day of reckoning when oil revenues cease to provide an easy form of relief of the balance of payments.

V. SUBSECTORS IN THE CONTEXT OF INTENSIFICATION

The workshop with which this paper is concerned was divided into seven sessions,the first of which, held on the first day, was primarily concerned with the conceptual issues which we have been discussing in this paper thus far. Thereafter, as the program for the workshop shows, followed, in succession, sessions on the implications of intensification for Field Crops; Horticultural Crops; Land, Water, and Human Resources; Animal Production; Agricultural Industry and Processing; and finally, Technology and Mechanization.

We do not propose to summarize in detail the papers and discussion of each of these sessions. Summaries of the papers are to be made available to interested parties. We give reference to particular presentations only when a specific set of points are integrated into our general overview; we apologize to all the authors whose valuable contributions did not receive special mention in the text that follows. Our objective, instead, is to attempt to capture the essential issues of each of these sessions and to relate these issues to the conceptual discussion above.

V.1 FIELD CROPS

The session on field crops focussed heavily on technial issues, such as interplanting of crops, the planting of shorter duration varieties (so as to provide more latitude for multiple cropping), and increasing plant densities. The crops explicitly discussed in this connection were cotton, rice, sugar cane, and soybeans; along with several relatively minor crops which might serve for interplanting, such as summer onions, beans, or garlic (with cotton); chickpeas, lentils,or junugrek(with sugar cane). The chief putative advantages of intercropping involve the sharing of inputs of land, water, fertilizer, and labor. But these gains are not without their costs. The sharing ofinputs means yield reductions in each individual crop, even though the increased intensity of cropping may lead to higher overall net returns. Hence, if cotton, the chief crop, is undervalued by farmers because of artificially depressed delivery prices, the overall social gains from intercropping will be overstated at market prices(or in physical output terms), while net returns could even be negative in terms of social benefits. Here again, it is essential for farmers and planners to use values (prices) which reflect the best estimate of social value of output and inputs -- as opposed to physical intensity criteria -- in evaluating this sort of intensification effort. This issue is of greatest importance, clearly, in the cases of cotton and rice, which are major crops whose prices

and production levels are government controlled.

One of the most favorably received papers, by Drs. H.A. Kheir El-Din, H.A. Khedr, and M.H. El-Adawy explained that intercropping with cotton has declined in recent years for a variety of reasons. First, the interplanting of summer onions with cotton may preclude the planting and harvesting of a catch crop of clover prior to the cotton planting. Given the high market value of berseem, it is rational for the farmer to opt for the catch crop rather than for the intercrop of onions. Moreover, the berseem planting is advantegous in that is enhances soil fertility, particularly by nitrogen fixations, and thereby reduces the need of cotton for chemical fertilizers. In addition, cotton and summer onion fertilizer requirements are conflicting, in that cotton needs much nitrogen beyond the time when onions are in need of it; nevertheless, the onions continue to absorb nitrogen beyond their peak need, at the expense of the cotton plants. There are also incompatibilities with respect to the timing of water requirements as between the two crops; and finally, the rise in real agricultural wages of hired labor in recent years has made intercropping relatively unattractive to farmers because of the greater intensity of use of hired labor which it requires, particularly at planting and harvesting time.

The above example, however discouraging it may seem from the point of view of promotion of intensification, is an object lesson in agricultural economics, in that it illustrates that physical output maximization alone is not a rational goal for a farmer, nor one that he will strive for, unless it is consistent with his own view of <u>economic</u> rationality. If berseem prices rise relative to those of onions, intercropping will be diminished, and changes in the relative price of hired labor will cause farmers to diminish labor intensification, insofar as it is possible for them to do so.

A similar moral may be drawn with reference to the planting of short duration cotton varieties. The shorter growing season of shorter staple American varieties of cotton would allow farmers to plant a full winter crop of berweem prior to the cotton planting, as opposed to the short berseem catch crop before the early cotton planting (which is necessary in planting traditional cotton). However, at this juncture, Egypt does

not have the means of producing short staple cotton seed in quantity; hence any significant increase in short duration cotton planting would require, at least in the interim, increased foreign exchange cost and, presumably, a relatively high seed cost to farmers (unless the seed were to be provided at subsidized prices by government). Further, although the American cotton is well suited for spinning here, there is some question as to the capability of Egyptian ginning equipment to handle significant quantities of shorter staple cotton. In view of this complex set of issues, it would clearly be mistaken policy to force plantings of American short staple cotton on Egyptian farmers. It might be worth making seeds available in limited quantities at prices which reflect international prices and foreign exchange scarcity, and with cotton prices comparably determined, to find out by observing the farmers' revealed reaction whether this form of intensification is economical at the farm level.

The Ministry of Agriculture has under consideration a wide variety of practices which it hopes to promote in the interest of intensifying physical returns per feddan. These include intercropping, shorter duration varieties, and increased density of planting, along with improved crop management practices, such as more meticulous planting methods, optimal timing of sowing and transplanting, more precise and improved use of pesticides, increased mechanization, and improved crop rotations. All of these practices have potential for increasing physial yields per feddan, and may well have potential for increasing economic welfare for the farmer and for the nation, provided their actual benefits and costs can be reasonably well evaluated by both planners and farmers. All involve complexities of such a nature that in all likelihood only the cultivator, with the help of good research and extension, will be able to make an effective decision as to how far each technique should be pushed.

V. 2. HORTICULTURE CROPS

Egypt is well suited for year around horticulture production and in recent years the pattern of cultivation has gone well beyond traditional gardening for home use. Because farm prices of vegetables, in particular, are not controlled, farmers find that growing vegetables is more profitable than growing traditional crops such as wheat and cotton.

In the decade 1970-80, the area planted to vegetables expanded from 700,000 feddans to 1,169,707 feddans, an annual increase of 5.3 percent. The most important vegetable crops involved in this rapid increase were tomatoes, potatoes, onions, and garlic.

It was argued during the session on horticulture that a shift of cropping patterns from the more traditional field crops to horticulture will not only contribute to a closing of the food gap, by increasing domestic food output, but it can also contribute foreign exchange earnings. According to figures offered by Dr. Mahmoud Mansour, a more 200,000 feddans devoted to horticulture could earn as much foreign exchange as 6 million feddans planted to field crops, a 30:1 ratio. The chief constraints to expansion in this direction were said to be mainly technical and political. Foreign demand is not a constraint. Demand has shown great strength in both European and Middle Eastern markets. On the technical side, Egypt needs to educate and train farmers and marketing middlemen in ways to improve standards of quality handling of perishable crops. The marketing infrastructure also needs investment in order to assist in the preservation of quality of produce being stored and handled in the market place. Furthermore, farmers need training in improved varieties of plants and in ways to increase plant populations through interplanting.

More attention was paid to marketing problems in connection with horticulture than in any other session at the workshop. A detailed comparison was drawn between Egypt's position as a supplier of tomatoes to the European market (by Dr. Waheed Magahid), indicating that, although Egypt has considerable natural advantages as a tomato producer vis-a-vis such important competitors as Morocco, Spain, and the Canary Islands, Egypt's shortcomings in marketing practices and infrastructure have prevented Egypt from entering the European tomato market effectively. At the same time, tomatoes are a crop that lends itself to high intensity cultivation; hence it behooves the Egyptian Government and research scientists at the agricultural colleges to seek means of overcoming these bottlenecks.

A more technical aspect of tomato culture was examined in this same session (by Dr. Farouk El-Aidy) in his discussion of the use of plastic tunnels for production of vegetables. Trials in Egypt and commercial experience elsewhere indicate that plastic tunnel cultivation techniques have great promise, but they have yet to be adopted on a commercial scale in Egypt.

Attention was also given during this session to the vital issue of the dissemination of innovation (by Dr. Will Rochin). Acceptability of an innovation on the part of farmers is crucially dependent on its suitability to local conditions (soil, climate, water), its relative profitability, its riskiness, its simplicity, its visibility, its congruence with the current interests and cropping patterns of farmers, and its ready availability as needed by farmers. The vital role which must be played by extension agents in the context of diffusion of innovation is obvious. There is general agreement that a greater effort needs to be made by the Government and the universities to promote adaptive research and the dissemination of research results.

V. 3. LAND, WATER, AND LABOR RESOURCES

The bulk of this session was devoted to irrigation issues, a vital issue, but in a sense, this is unfortunate, inasmuch as land use and labor issues are of great moment in the context of any discussion of agricultural strategy. Cultivable land area is considered to be the most important and limiting factor of production under present conditions in Egyptian agriculture. Optimum allocation and conservation of this resouce is considered of prime importance to Egyptian society. Intensification, implying, as it does, concentrated usage of the old

lands, also requires attention to the problems of maintaining productivity and conserving fertility. Productivity is believed by competent observers to be deteriorating, particularly in the period following the completion of the High Dam at Aswan and the elimination of regular siltation from flooding. For this reason, such projects as those which raise soil fertility, improvement of the field irrigation system, and the spread of tile drainage must be carefully researched technically and economically evaluated. A further concern is the shift of cultivable land to non-farm uses. In many locations, economic return in non-farm uses greatly exceed those from cultivation, hence land is being shifted to residential, industrial, and commercial uses. The annual rate of such shifting is estimated to be ten to twenty thousand feddans. However, despite its evident importance to the nation, this problem has not yet been scientifically investigated. In particular, it would be desirable to investigate the feasibility and economic desirability of inducing non-farm activities to move or (for new activities) to establish themselves in desert areas. Egypt is a vast nation in terms of area, but areas of cultivability are small. If market prices of building sites fail to reflect the full social costs of their being used for non-agricultural purposes, an appropriate means of shadow-pricing high fertility lands should be considered. A closely related problem is the mining of the soil for the making of bricks for construction purposes. The question of whether the market is appropriately pricing building materials when precious fertility is being permanently destroyed in brick-making is, again, a difficult and perhaps vital issue in welfare economics.

The recently arisen enthusiasm for intensification should not obliterate all concern for recalamtion, despite the relatively disappointing agricultural performance of the nearly one million feddans already reclaimed. It is essential that these projects be subjected to careful post hoc evaluation, again using appropriate social values for prices, exchange rate, and interest rate. Nearly fifty percent of the reclaimed land has not been brought under cultivation at all,possibly because of failure to complete the necessary infrastructure.

Much more attention was given during this session to irrigation and drainage issues, albeit almost entirely in technical terms, such as the possibility of conserving water by using techniques other than traditional flooding (sprinklers, drip devices, central pivot devices, etc.). The specific type of tile drainage techniques for dealing with problems of rising water tables was also discussed in most interesting detail. This, unfortunately, is typical of the approach which Government in Egypt has taken to water problems. This is in part a matter of tradition, in that the society is assumed to hold responsibility for providing free irrigation supplies for agricultural production. A by-product of this practice - of provision of water without cost, and, in many areas without specific limit -- has been rising water tables and increased salinity. It has clearly contributed to the need for the very large scale investment program in drainage systems now being undertaken; and it may also have serious implications for water quality in the lower Nile either now or in the near future.

The water problem, from the social point of view, implies the possibility of misallocation of investments in two dimensions, namely, huge investment for storage and water conveyance, and subsequent large outlays for drainage. Moreover, the society is seeking to execute vast irrigation projects outside the borders of Egypt --in Sudan, Ethiopia, and Uganda —in order to expand water supplies further. The extent to which these outlays are being evaluated according to considerations of social benefit and social cost is uncertain; but there appears to be clear danger of diversion of excessive amounts of scarce capital in that direction without any clear rationale. A well set up policy for water management is urgently needed. The question of the pricing of water for irrigation was raised during the session, but, in view of the heavy implicit taxation of farm production through pricing policy and government marketing of crops produced under quota, proponents of a water pricing policy can make little headway. Perhaps, given the traditional strength of a free water policy, it is more realistic to hope for water conservation through the adoption of more technically efficient techniques. However, here again, careful economic analysis is required if even a "second best" economic optimum in water use is to be approached.

It is worth noting that such considerations as cropping patterns, soil conditions, and topographical characteristics will affect the choice of optimal irrigation technique. Therefore, no unique irrigation technology can be generalized for all of Egyptian agriculture. Irrigation supplies, notably in the newly reclaimed lands, are pumped to varying elevations. Irrigation water in West Nubaria , is pumped to irrigate an area of nearly 300 thousand feddans. Six huge pumping stations are established for this purpose, each for a head of 10 meters, i.e., water for some parts of the area is pumped 60 meters ! Irrigation in this situation might well imply excessive waste of both water and energy from a social point of view. Indeed, reference was made to a study which indicated that pumping in excess of 20 feet could not be justified in economic terms under present economic conditions. Here again, the need for careful examination of social cost and benefit is clearly called for.

Issues pertaining to utilization of labor resources were discussed in one paper during this session. However, the matter emerged again in conenction with choice of technology, hence our comments will be reserved for that section.

V. 4. ANIMAL PRODUCTION

The various papers presented during the session on the Intensification of Animal Production highlighted the wide range of policy choices available in this field. The papers on fisheries development and poultry production were both adamant in declaring their respective fields to be more efficient than livestock production and calling for increases in investment in animal production other than livestock. In defense, the two papers on livestock production both emphasized that livestock activities used feed and labor that have a low opportunity cost and that improvements in the genetic potential and feed situation could lead to significant intensification.

Dr. Yehia Hassan's paper, "Intensification and Fisheries Development", calls for the use of modern technology in fish production in order to expand the amount of high-quality protein in the Egyptian diet. Fish farms are able to achieve very high yields. Fish farms using Hungarian technology are producing one metric ton of meat per feddan

and those using Chinese technology are producing three to four metric tons per feddan. Each type of fish farm could also include the raising of ducks to diversify meat production. Dr. Hassan also gave examples of farms in Europe capable of producing up to 100 metric tons per feddan and of a French proposal that could achieve 350 metric tons on one feddan. Other important contributions that could be made included establishing hatcheries and the construction of artificial reefs in coastal waters to provide protected places for small fish, making the undersea environment more productive.

Policies to increase poultry production were outlined in Dr. Mahmoud Kher-Din's paper, "The Intensification of Poultry Production". Poultry production lends itself to intensification. Local birds produce 50 to 70 eggs annually, but production of 240 to 260 eggs can be achieved. Dr. Kher El-Din stated that the average Egyptian gets 10 to 12 grams of animal protein per day, while the recommended minimal levels are 33 to 36 grams. He calls for poultry and fishery development to bridge this gap. The government is now promoting production of poultry as a more efficient means of increasing supply of animal protein. The government farms sell day-old chicks to private farms to help meet the shortage of chicks on these farms and to improve the genetic endowment within private industry. An encouraging sign is that last year there were 2800 poultry farms while this year there is demand for 1500 additional farms. This has been fostered by lowering the interest rate for loans on animal and livestock production.

The paper, "The Intensification of Animal Production in Egypt", by Dr. Khalid El-Shazley and Dr. Mostafa Abdou El-Naga focused on the crucial aspect of improving the feed situation in livestock production. They estimate that the requirements for cattle and buffalo are 8.52 million tons of total digestible nutrients (TDN) while the availability is only 6.67 million tons of TDN. The problem is further exacerbated by the seasonality of feed availability that concentrates the shortage during the summer season when the animal is doing the most farm work and when cows are pregnant. Offspring are often delivered underweight and without an adeqaute milk supply. A precondition for any livestock intensification program is the solution of this serious feed problem which prevents animals from fulfulling their genetic potential. Drs. El-Shazley and El-Naga outline a program to introduce new feeds in the livestock diet and to build feed mills that will aid in distributing the feed more evenly over the year. This program, along with adding urea

to low-nitrogen feeds and combining low quality feeds with concentrates, would fully meet the feed requirement of the present cattle and buffalo population. As a complement, the paper stresses the need for policies that improve veterinary care and achieve a reasonable price policy for feeds, animals and animal products.

The final paper was" The Role of Livestock in Agricultural Intensification: Economic Aspects" by Dr. Ibrahim Soliman. As background,this paper emphasizes the importance of livestock on the farm. Animal work and manure are an integral part of the farm; livestock utilize family labor with low opportunity cost, and crop by-products are utilized efficiently. Livestock are important to small farmers with family labor surpluses, and a high percentage of livestock products are consumed at home. In the final section of the paper, Dr. Soliman outlined four possible scenarios for the future of livestock production. Each depended on the introduction of productive foreign animals as a source of intensification and the analysis varied the area under berseem.

The problems that received the most attention, being mentioned in each paper and being the focus of discussion, were marketing constraints and price policy. In fishery development, the marketing of fish is critical because it is a perishable item and because the sources of supply may be quite distant from the sources of demand. Dr. Hassan also made the point that present price policy hinders the expansion of fish production. In poultry production, marketing is controlled by just a few people who can force farms to accept given prices. This is especially critical because poultry farmers cannot afford to keep broilers beyond the optimal selling date without incurring high feed costs. Poultry production is also hampered by a shortage of veterinary care, the low nutrition level of the scavenging type of local production and the shortage of day-old chicks.

The major problem in increasing livestock efficiency is the feed situation, which was the focus of the joint paper by Drs. El-Shazely and El-Naga. Any work on livestock production must first overcome this problem because it prevents the animals from producing near their potential. Milk and meat production suffer, while mortality and morbidity increase from the poor nutrition levels. Dr. Soliman's scenarios for possible future

production build on the assumption that the feed situation can be solved to allow for increases in production through breed selection. Marketing is also a constraint to livestock production, especially in the marketing of milk. There are not adeqaute markets that allow small farmers to sell the milk for the price consumers are willing to pay. Again, price policy is a problem as evidenced by the severe meat shortage last year and the present enforced prices for meat.

All of the papers called for studies of price policy. Government intervention in prices affect livestock, poultry and fish production decisions. But insofar as agricultural intensification implies the use of shadow prices of goods, price policy studies must include international prices and analysis of the trade situation. For example, should the present "meat shortage" be solved by increasing imports of high-quality beef with a dampening effect on livestock prices ? Imports could be the best solution to the increasing area of berseem, which Dr. Goueli termed the most disturbing factor in the cropping pattern. A critical analysis must be done to determine if Egypt has any comparative advantage in livestock production. If not, controls on imports are damaging to the entire agricultural sector by making livestock products highly profitable. The result is that important resources are being siphoned into livestock activities that might be better utilized in alternative activities. Labor utilization is concentrated heavily in livestock production. Dr. Alan Richards stated that on all farms under 10 feddans in size more than 75% of female labor and 33% of male labor is devoted to livestock.

The role that the expansion of international trade has in animal production is entirely dependent on marketing facilities. Marketing studies are essential for fish, poultry, meat and milk products. The limited infrastructure prevents domestic markets from operating efficiently and each speaker emphasized this point. But the ability to market imported animal products at proper prices is just as critical to the agricultural sector. Some critical areas where marketing studies need to be done are the follwoing: concentrates for livestock marketed through cooperatives at low prices but which are not widely available; milk collection centers and the prices they offer for milk; facilities to handle high-quality beef imports and the ability to distribute fish and poultry.

The papers presented indicate that much research on animal production has alrady been completed. Therefore, each area could benefit from carefully selecting and implementing pilot projects to study further plans for intensfification in each. Dr. Hassan's examples of the high productivity of fish farms indicate that pilot projects should be undertaken for intensive fish production. Poultry production could be studied by actively encouraging private production with an integrated package of breeding, feed supply, veterinary care and marketing support. The solution to the livestock feed situation and improved breeds that were suggested in the livestock papers could be jointly implemented for an informative pilot project.

It seems time that economists go beyond the normal research areas and now contribute to the design of pilot projects to increase animal production. Dr. Tim Wallace made the point that successful programs in California agriculture began with small pilot projects that took the full attention and time of the planners to make sure it was a success. After one area succeeds, it becomes easier to transplant that success to ther areas. The tone of the papers presented was that investment is now needed to increase the production of animal products in Egypt.

V.5. AGRICULTURAL INDUSTRIES AND PROCESSING

This session brought to light the increasing significance of agriculture related industry, and food processing emerges as an important factor in preparing agricultural products for storage, urban use, and for export. One of the largest of food processing industries is that of baking, reflecting the huge subsidies to consumers of bread, and the virtual abandonment of home baking that has accompanied subsidization. Unfortunately, this policy is now locked into the Egyptian food situation politically, because of the violent reaction to reduction of bread subsidies in 1977. At present, bakeries cannot meet demand, but at the same time it is alleged that bread is being used as poultry feed. It will require careful socio-political engineering if anything like economic equilibrium is ever to be restored to this market and this industry.

But rapid change is not confined to the bread subsidy problem. Rising incomes and changes in tastes associated with rapid urbanization is increasing the demand for processed foods, either domestically produced or imported. Domestic industry is responding, in some cases quite rapidly, as in the case of canning of fruits and vegetables.

The session included a discussion of facilities planning, particularly as it is practised in the United States (by Dr. Eric Thor). Ideas generated through basic technical and economic research in universities may be promoted toward adoption by careful cultivation and education of the key persons in selected production and processing areas. In a number of cases, in the U.S., resistance to new processing organization or technique was met primarily on the part of established business enterprises, and successful implementation of the improved set of techniques or organizational arrangements was achieved because of the receptivity of the farming community, whose interests would be clearly served. This object lesson, although it was derived from experience in a production and business context far removed from that of present day Egypt, suggests again the extreme importance in a dynamic agriculture of devotion of resources to adaptive research and careful dissemination of information to those who stand to benefit from the knowledge most.

V.6. TECHNOLOGY AND MECHANIZATION

The final session of the workshop was dedicated to the very complex issue of technological choice in Egyptian agriculture, and its relationship to the intensification effort. The rationale and tone of the session was set by the session's moderators, Dr. Goueli and Dr. Child.

The underlying argument is neo-classical. If by intensification we mean the optimal use of agricultural resources in the face of scarcities, then choice of technology is <u>crucial</u> to the objective of intensification. It is a matter of combining labor with land, capital, and enterpreneurship in such a way as to elicit the highest level of output possible. Achievement of this objective requires a great deal of information and a careful balancing of benefits and costs as they are associated with a wide variety

of alternative uses of resources.

Those responsible for making technological decisions must be provided, first, with as much knowledge as can be made available about the technological atlernatives which exist. For example, a farmer needs to be advised (and perhaps convinced) as to the relative physical yield advantages which are associated with a choice between use of high dosages of chemical fertilizer, as opposed to, say, lighter dosages supplemented with manuring with dung or harvest by-products. And, of course, he needs to know what the costs of each fertilizationtechnique are likely to be to him -- not only monetary costs, but such costs as the relative intensity of labor inputs for the two approaches as well as animal power and other inputs in kind .

Farmers, of course, provide themselves with the largest part of this sort of information themselves, as the result of their own experience, that of their fathers and grandfathers, as well as that of their neighbors and friends. Nevertheless, it is unquestionable that the generation and dissemination of technical information by both private and public institutions other than the farm itself is the sine qua non of successful rapid agricultural growth. It would seem, therefore, to go almost without saying, that a fundamental role of government in any predominantly agricultural society, should be to provide for a major effort in adaptive agricultural research, and to establish an extension network to make certain that farmers are informed of their alternatives. It was mentioned during this session that the sixteen agricultural colleges in Egypt need considerable strengthening, that the extension service is much weaker as an organization and is much less influential. Granting that the creation and dissemination of information is by no means costless and that the high level manpower requirements associated with research and development in agriculture will not emerge without great effort and cost, nonetheless, it would seem to be virtually self-evident that a major effort to upgrade agricultural research and extension is an absolute necessity if Egypt is to avoid agricultural crisis during the period of the lifetime of the next generation.

Adequate technological knowledge, however, important as it is, is only the beginning. Before meaningful technical choices can be made by farmers (or by planners, for that matter, insofar as they are to substitute their decisions for those of farmers), it is necessary for them to know what values to place on the results of these choices. As we have argued above, a pure, technical choice can be nonsensical in terms of community welfare. For example (as one discussant at this session pointed out) a technical index of intensification, such as the ratio of crops per annum to land area, could be readily raised by simply converting planting to crops with very short growing seasons, e.g., the cropping ratio in Egypt could be raised to 5.0 if cultivators would plant nothing but radishes. By the same token, the goal of total displacement of animal power by introducing as many tractors as can be sold to farmers at subsidized prices is not a meaningful social goal.

Tractors, it appears, have become almost synonymous with mechanization in Egypt, and the Government of Egypt has seen fit to provide tractors to farmers at prices well below those established on world markets. Credit for tractor purchases is provided at a negative real rate of interest and tractor fuel is heavily subsidized. Farmers are not in a position to make socially rational decisions with reference to the use of mechanical power as opposed to animal power given these circumstances. The discussions held during this workshop indicate that it is highly unlikely if not impossible that this policy of tractor subsidization can lead to the optimal pattern of intensification. Indeed, it is conceivable that it could lead to the opposite, i.e., to extensification, insofar as the effective use of the types of tractors provided demands increasing the scale of farming.

It may be recalled that in the initial paper presented at the workshop Dr. Hindy indicated that the guiding principle of agricultural intensification should be comparative advantage, and that the principle indicator of comparative advantage should be the pattern of international prices. This implies that farmers should be expected to make decisions on resource use(including capital inputs) in terms of costs and benefits as measured by prices which reflect relative scarcities as they are experienced in the international marketplace. As it happens, Egyptian farmers are being asked to make decisions related to tractor use in the face of a badly distorted pattern

of agricultural prices. They are required to devote considerable acreage to cotton production and to deliver that cotton to government buyers at prices well below the world market level. Similar underpricing is practised in the case of various other agricultural commodities. Partial compensation for this implicit taxation is provided for in the form of subsidization of inputs -- of water, fertilizers, pesticides, and mechanical equipment. Thus, from the farmer's point of view, cotton is a crop to be avoided if possible, water is a free good and need not be economized, and a tractor is worth 1/3 to 1/2 what it is thought to be worth by buyers and sellers on the international machinery market. The result is certain to be a cropping pattern, and a tractor use pattern which is at considerable variance with that which comparative advantage, as determined by international prices, would call for. A strategy guided by this latter principle would call for an eventual elimination of subsidies to buyers of tractors, and other inputs, and the payment to cultivators of prices for products which are the domestic equivalents of international prices, converted at a realistic rate of exchange, and adjusted for internal transportation and handling costs.

Mechanization, in itself, is not opposed by this line of argument. The introduction of modern mechanical devices when and as, they are "appropriate" is to be encouraged. Of course the term "appropriate" begs the question. We must have a value basis for determinating what is appropriate at a given time, and what is not. Unfortunately, in the face of a badly distorted pattern of pricing of agricultural inputs and outputs, it is all but impossible to determine what sorts of innovations in agricultural technology will yield net benefits and which will not. It was suggested during the final session that implements designed for use in agriculture in Asia, such as those emerging from the research efforts of the International Rice Research Institute in Los Banos, the Philippines, might be usefully adapted to use in Egypt. Low horsepower hand tractors, for example, or low-lift diesel water pumps, might well yield substantial net returns to Egyptian farmers, allowing them to reduce the donkey and buffalo populations and ease the demand for fodder in the process. Such modest innovations might well be adopted quite spontaneously, without subsidization, by Egyptian farmers -- particularly if improvements in the rural credit system could be made. However, even in the case of such relatively modest sorts of mecha-

nization, it is necessary for the farmer to be able to calculate his potential benefits using price signals which reflect social scarcities, if he is to make decisions which conforms to the comparative advantage principle as enunciated by Dr. Hindy.

No discussion of mechanization can ignore the implications of introduction of mechanical devices into agriculture without the issue of employment emerging. In the case of Egyptian agriculture, this issue is particularly complex, because rapid migration has led to a situation in which labor shortages at times of peak labor demand, such as in harvest season, have emerged. The attractiveness of employment abroad, and of residence in the rapidly growing cities, has led to a relative reduction in the size of the agricultural labor force and to a rise in real agricultural wages. It is felt by many that this situation creates a prima facie case for the rapid introduction of labor-saving machinery. But this case is not so clear nor so simple. The rate of growth of the Egyptian labor force is very high by international standards-- on the order of 3 percent per annum. A crisis in rural unemployment has apparently been avoided in Egypt by virtue of the fact that employment opportunities in neighboring countries in the Middle East have been very good, at wages high enough to allow for generous remittances to rural families left behind by migrant workers. At the same time rapid economic growth in the urbanized sector of the Egyptian economy has made the cities relatively attractive to rural workers.

However, this situation is not to be contemplated without concern. It is very liekly that the demand for Egyptian workers in other Middle Eastern nations has already peaked--particularly for unskilled labor of the type most readily available in the agricultural sector. Furthermore, it is probably socially undesirable to sustain such a rapid rate of urbanization as Egypt has experienced over the past decade. In short, there is a case for making the countryside a more effective absorber of labor as a means of slowing down the rate of migration or perhaps even for preparing to repatriate workers who have migrated abroad, once their construction jobs have been completed. If this argument is valid, effort should be given to finding modernization techniques which are at once labor absorbing and which raise the productivity of workers. There exists a susbtantial literature on alternative technologies in agriculture in developing countries, the broad thrust of which is to emphasize the biological aspects of modernization as opposed

to the mechanical aspects. Concentration should perhaps focus on such innovations as higher yielding varieties of crops, many of which require sustained attention in the form of more careful irrigation techniques, more meticulous weeding practices, and more careful planting techniques, all of which call for more time spent in the field, and which may call for only very modest increases in mechanical inputs. It may be inviting disaster for Egypt to expend large quantities of capital on the introduction of elaborate cultivating and harvesting equipment now before the full implications of her farm labor supply dynamics are well understood. To cite Dr. Hindy's paper once again, comparative advantage must be seen as a dynamic, not a static concept.

The issue of scale of operations in agriculture as it pertains to mechanization was also discussed at various points in the session. It is difficult to think of mdoern mechanization without becoming concerned with land fragmentation and scale efficiency. The world's view of agricultural efficiency is overly colored by the impressive performance of the agricultural economy of the United States, which manages to produce enough to feed a population in excess of 200 million persons, and at the same time to export $40 billion worth of agricultural commodities annually. This is achieved with the use of a vast amount of mechanical power, a very small agricultural labor force, and the use of a vast land acreage. But the very description of that performance indicates how little relevance the choice of techniques in America has for the agricultural economies of the developing world. The ratio of cultivated acreage to agricultural labor force in the USA, or for that matter, of cultivated acreage to total population, is vastly higher in the USA than it is in any but the very best endowed of developing countries (Argentina, perhaps). In the Third World, generally, cultivable land is extremely scarce, and so is capital, while labor is relatively plentiful, and (unfortunately from the point of view of peasant welfare) extremely cheap. Under such circumstances, it is both uneconomic and antisocial to utilize tehcniques using large relative inputs of mechanical power. Moreover, the concentration of population on the land has inevitably led to reduction of the average size of land parcels to such an extent that the type of equipment used to harvest wheat in the State of Kansas, would scarcely fit on such a parcel even if stationary. To use a combine with any degree of efficiency would require that the minimal planted area be some large multiple of the average sized Egyptian farm.

Under such circumstances as these, the question arises as to whether to alter the techniques in the direction of the "best practice" in the State of Kansas which would require that, by some means, the average size of parcel be greatly enlarged, or to find a technique which will raise productivity on the given sized parcel. This is, of course, an extremely complex issue, but it seems intuitively obvious that Egypt must accept, at least for several decades, that her agricultural population will remain too large to allow much consolidation to take place without displacing vast numbers of people, whose absorption into non rural residence areas and to non-agricultural form of employment would create immense adjustment problems. On the other hand, experience has shown that, given the appropriate price signals, access to adequate input supplies, and credit at realistic rates of interest, peasants, operating on very small plots are able to raise productivity steadily at good rates of growth, which is to say that a strategy of intensification, given the right circumstances, is not only feasible, but, in such circumstances, is likely to be preferable, both economically and socially to consolidation and rapid mechanization.

The workshop did not engender a great deal in the way of specific discussion of technique. The only significant exception to this was an extremely interesting presentation by Dr. Nabil Alaa El-Din on the role of Bio-gas production. Present techniques for the use of bio-mass on Egyptian farms are extremely inefficient. The largest part of straw, bran, and dung is stored and used within the household for cooking, lighting, and space heating. For the most part this is accomplished using open fires, which waste much of the energy potential and destroy virtually all of the solids usable for manuring and for animal feeding. Moreover, stored bio-mass harbours and nurtures rodents and other pests. Small scale biogas generation, using small digesters of the type utilized in China and India in recent years, has been demonstrated to be much more efficient and more effective for cooking, lighting, and heating. The process retains virtually all of the solids, and their nutritive potential, for use as feed and manure. Considerable research has already been undertaken in Egypt and a number of pilot of projects are being operated under Egyptian circumstances. These small generation devices

would appear to have considerable potential for use in the Egyptian agricultural household. The primary obstacle to widespread adoption of such devices appears to be their capital cost -- on the order of L.E. 600.-- which would be beyond the means of the majority of rural Egyptian households. However, given access to credit, it is at least conceivable that the savings in fuel, feed, and manure costs would provide the wherewithal for the service of that amount of initial indebtness.

To summarize, in order to make the Egyptian farmer an effective and efficient planner of his own pattern of technological choices in connection with intensification of agricultural production, he must be faced with prices of inputs and outputs which are consistent with Egypt's comparative advantage. This involves movement toward rationalization of agricultural product prices, as well as agricultural input prices, including those for agricultural machinery. Wholesale tractorization of Egyptian agriculture is not consistent with comparative advantage, whereas a modernization strategy which emphasizes output growth generated by breeding of plant varieties suitable for higher intensification, and the development of culture techniques which will absorb rather than displace labor will serve Egypt's national interests better in the long run. Attempts to expand the scale of operation of the typical agricultural unit at an accelerated pace in order to accommodate high technology mechanization would create adjustment and labor absorption problems beyond the capacity of the economic and social system. Bio-mass utilization in Egyptian agriculture, given present technologies, is extremely inefficient, and serious consideration should be given to the promotion of the use of small scale biogas generators which can conserve energy as well as solids for feed and manuring.

The above discussion highlights the obvious and imminent need for research into thecnological alternatives specific to the problems of Egyptian agriculture. What mechanization alternatives are there, as compared with widespread tractorization under heavy subsidy. It is possible that low horsepower hand tractors or other intermediate techniques would be adopted at world market prices, provided their incomes were measured in world market prices as well.

There also appears to be urgent need for more secure knowledge of the impact of mechanization in particular, of the extent to which the experimental evidence indicating that cropping intensities are improved upon by mechanization are in fact carried out in practise; and similarly for the putative improvements in yields. It would be unfortunate if the drive for intensification were to reinforce the mechanization drive on the strength of little if any evidence derived from actual field experience. Mechanization has now been carried far enough in Egypt so that quite accurate survey data ought to be obtainable.

It would also be well to generate some evidence of the likely effect on cropping patterns of allowing farm gate prices to reflect world market prices -- the price of cotton in particular. If cotton prices were to rise markedly relative to those of meat and milk, would the tendency for cotton acreage to be shifted to berseem and other alternative crops be stemmed, and would the drive for wholesale tractorization directed toward reducing the demand for fodder then appear to be less urgently needed ?

VI. CONCLUSION

The members of the core committee agree that the initial workshop in this series has been successful, not so much as a forum in which many great issues were solved, but rather that the workshop provided a forum in which a re-thinking of agricultural strategy could be stimuated. We feel that it is vital that intensification be viewed by the policy makers as an economic process, not a technical process, purely and simply. We support intensification as a broad strategy, because it appears to conform to economic realities, i.e., that the net social benefits of such a strategy will exceed those of a strategy which continues to give investment priority to investment in reclamation of new lands. Nevertheless, we urge that the new lands effort be given a careful economic post hoc evaluation and that projects half finished not be written off merely because of a shift of policy orientation. At this juncture, earlier investment must be counted as "sunk costs", and any further investment of resources must be evaluated only in

terms of any marginal costs and benefits associated with their further development.

Intensification involving new technologies of whatever sort -- biological, chemical, or mechanical -- should be carefully evaluated using appropriate economic criteria. A partial solution, ready at hand, is the use of international market prices, appropriately adjusted, for the evaluation of both inputs and outputs, if they are tradable on international markets. Other guides to appropriate pricing in evaluation of project proposals must be sought for non-traded goods.

Serious thought should be given to the extent to which price signals, whether they be internationally determined or otherwise, are to be communicated directly to farmers, thereby leading to at least a gradual dismantling of the control system in agriculture and to a reduction in the heavy implicit taxation which that system imposes on the agricultural sector.

We feel that there is a prima facie case for greater use of government's resources in research and extension. This workshop clearly revealed that, although knowledge of agricultural technique is improving rapidly in Egypt, it is not growing fast enough given the dimensions of the impending food crisis. Moreover, the extension system, which is now largely preoccupied with implementation of the control system, is not (as it must be) an effective instrument for the diffusion of newly created knowledge; and finally, we are firmly convinced that economic knowledge of all sorts is sorely needed, both from the point of view of orienting planners to their task of policy making and implementation and from the point of view of orienting the Egyptian agricultural producer, including the smallest scale cultivator.

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USAID/EGYPT

ECONOMICS POLICY WORKSHOP

"The Economics of Agricultural Intensification"

March 28-31, 1981

Foreign Relations Building
Ministry of Agriculture
Nadi El-Said Street
Dokki, Egypt

ADS EGYPT - CALIFORNIA PROJECT

ECONOMICS POLICY WORKSHOP

"The Economics of Agricultural Intensification"

The ADS Egypt-California Project is a joint effort of the University of California and the ARE Ministry of Agriculture promoting policy-relevant research on problems of the agricultural development of Egypt. The Economics Sub-Project of the ADS Egypt-California Project has organized this Economics Policy Workshop on "The Economics of Agricultural Intensification" to clarify the policy significance of intensification, to identify policy alternatives for Egyptian policy-makers, and to specify problems and areas of research required to improve the intensification policies. Following four days of presentations by policy-makers, economists, and agriculturalists a core group of economists will produce a policy workshop paper summarizing the conclusions from the workshop.

PROGRAM

March 28
10am-1pm — Agricultural Policy and the Economics of Agricultural Intensification

Moderators: Dr. Ahmed Goueli and Dr. John Rowntree

Welcome: Dean Pierre Loiseaux

Speakers:
H.E. Minister Mahmoud Dawood, "The Importance of the Policy of Agricultural Intensification for Egyptian Agriculture."
Dr. Mohamed K. Hindy, "Egyptian Agricultural Development and the Role of Agricultural Intensification."
Dr. Mahmoud Abdel-Akhar, "A New Policy of Agricultural Intensification in Egypt."
Dr. Frank Child, "Mechanization: Is There a Tradeoff Between Technological Progress and Employment."
Dr. Said Dessouki, "The Role of Research in the Intensification of Agriculture in Egypt."
Dr. James Ross, "A U.S. Perspective on Egyptian Agricultural Intensification."
Dr. Morris Makramalla, "The Role of Agriculture in the General Economy."

March 29 First Session Intensification in Field Crops
9:00-11:30am

Moderators: Dr. Said Dessouki and Dr. David Hansen

Presentations: Dr. M. El-Shennawy, Dr. M.S. Moustafa, Dr. A. Abdel Aziz, and Dr. Wasima Afifi, "Agricultural Intensification As One of the Main Strategies for Future Food Security."
Dr. Hanaa Kher El-Din, "The Role of Short Staple Cotton in Agricultural Intensification."
Dr. M. S. Balal, "The National Strategy for Intensification in Field Crops with Special Emphasis on Rice."
Dr. David Hansen, "Targeting Plant Breeding Research for Traditional Farmer Intensification Needs--Triticale Experiences in Mexico."
Dr. Ali Abdel Aziz, "Soy Beans and Intensification."

March 29 Second Session Intensification in Horticulture Crops
12:00-2:30pm

Moderators: Dr. M.M. Azzouni and Dr. Eric Thor

Presentations: Dr. Mahmoud Mansour, "Horticulture Crops Situation in Perspective."
Dr. Sayed Nassar, "The National Strategy for Agricultural Intensification in Horticulture Crops."
Dr. Waheed Magahid, "The Role of Marketing in Intensification."
Dr. Farouk El-Aidy, "An Economic Evaluation of Producing Vegetable Crops under Plastic Tunnels in Egypt."
Dr. Ali Abo-Gazia, "The Role of Cooperatives and Unions in the Intensification of Horticulture Crops."
Dr. Will Rochin, "The Role of Cooperatives in Agricultural Production."

March 30 First Session Land, Water, and Labor Resources
9:00-11:30am

Moderators: Dr. G. Abdel Samie and Dr. Tim Wallace

Presentations: Dr. M. Abou Zeid, "Water Resource Development."
Dr. Tim Wallace, "Irrigation and Agricultural Farm Production Intensification."
Dr. Hassan Amer, "Tile Drainage Policies in Egypt."
Dr. Baligh Shendi, "Land Development Strategy."
Dr. Salah Kandil, "Intensification in the New Lands."
Dr. Alan Richards, "Rural Labor Utilization and the Impact of Mechanization."
Dr. Bahgat Maksoud, "The Role of Extension in Intensification."

March 30 Second Session — Intensification in Animal Production
12:00-2:30pm

Moderators: Dr. Mahmoud Kher El-Din and Dr. Carl Gotsch

Presentations:
- Dr. Mahmoud Kher El-Din, "The Intensification of Poultry Production."
- Dr. Khalid El-Shazley, "Livestock Development in Egypt: the Role of Nutrition and Health."
- Dr. Ibrahim Soliman, "The Role of Livestock in Agricultural Intensification: Economic Aspects."
- Dr. Yehia Hassan, "Intensification and Fisheries Development."
- Dr. Carl Gotsch, "Programming Models as a Tool for Evaluating Intensification Projects."

March 31 First Session — Agricultural Industries and Processing
9:00-11:30am

Moderators: Dr. Mahmoud Abdel-Akhar and Dr. James Wylen

Presentations:
- Dr. Abdel Aziz Housein, "A New Approach to Intensification Through Food Industries."
- Dr. Fatahala El-Wakiel, "Food Processing Aspects."
- Dr. Ali Zein El-Abedin, "Food Policies and Food Security."
- Dr. Nagla Wally, "Economic Performance of the Processing Industries in Egypt."
- Dr. Eric Thor, "Facilities Planning."

March 31 Second Session — Technology and Mechanization in Intensification
12:00-2:30pm

Moderators: Dr. Ahmed Goueli and Dr. Frank Child

Presentations:
- Dr. Nabil Alaa El-Din, "An Important Role for Bio-gas Production in the Intensification of Agriculture."
- Dr. Jim Wylen, "Energy Policy and Agricultural Production."
- Dr. Kamal Nasser, "The Role of Credit in Mechanization and Technology Transfer."
- Dr. Shawky Imam and Dr. Wayne Dyer, "Agricultural Mechanization: Economic Aspects."
- Dr. Frank Child, "Appropriate Technology and the Factor Proportions Problem in Agricultural Development."

March 31 Evening Reception
6:00-8:00pm

Reception Garden
Foreign Relations Building
Ministry of Agriculture
Nadi El-Said Street
Dokki, Egypt

The Economics Policy Workshop core group responsible for writing the policy workshop paper includes:

Egypt: Dr. Osman El-Kholi
Dr. M. Ragaa El-Amir
Dr. Mohamed A. El-Shennawy
Dr. Afaf Abdel Aziz

California: Dr. Bruce Glassburner
Dr. Will Rochin
Dr. Wayne Dyer