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**NUTRITION-RELATED DIMENSIONS OF
AGRICULTURAL RESEARCH AT ICARDA**

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(ICARDA)**

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Introduction

The International Center for Agricultural Research for the Dry Areas (ICARDA) is located in Syria. Its headquarters are in Tel Hadya, a 948 ha farm 30 km south of Aleppo.

ICARDA was founded in 1977 and had its administrative headquarters in Beirut until all offices were moved to Tel Hadya in 1981. Aleppo province was chosen as the center of research activities because it is possible to observe different environmental conditions within the limits of an area covered by a 100 km radius. For example, rainfall (long term averages) reduces from 477 mm in the northwest at Jindiress near the Turkish border to 219 mm at Khanasser, 100 km to the southeast. Tel Hadya, more or less in the middle averages 389 mm. Similar variation can be observed in soils, social conditions, etc. but, for rainfed agricultural production in the Middle East and North Africa, climatic variability is considered to be a crucial constraint. Hence, Aleppo province provides quite a suitable environment in which agricultural research for diverse rainfed conditions can be conducted.

Within the Consultative Group for International Agricultural Research (CGIAR), ICARDA currently has a regional mandate covering the Middle East and North Africa (MENA). This region extends from Pakistan to Morocco and from Turkey to the Sudan. Cropwise, it has the world mandate to coordinate research on barley, lentils and faba beans. On a regional basis it conducts

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research on chickpeas in collaboration with the International Center for Research in the Semi-Arid Tropics (ICRISAT) and in wheat (bread and durum) in collaboration with the International Wheat and Maize Improvement Center (CIMMYT). ICARDA also conducts research in pasture and forage improvement as well as livestock management.¹

The salient characteristic of ICARDA is the adoption of the farming systems perspective in agricultural research. The Farming Systems Program (FSP) is quite active in research in Syria and internationally. FSP is involved in interdisciplinary research and within the multidisciplinary team of scientists diverse fields as economics, agronomy, soil physics, soil chemistry, weed science, agro-climatology, microbiology, sociology, livestock science and plant physiology are represented.

These research activities at ICARDA are organized along four programs:

1. Farming Systems Program (FSP)
2. Cereals Improvement Program (CIP)
3. Food Legume Improvement Program (FLIP)
4. Pasture and Forage Improvement Program (PFIP).²

In addition to these, there is a Genetic Resources Unit (GRU), a computer center, a training center, a communications unit and various laboratories and workshops.

¹/ Livestock research activities are primarily oriented towards management with the local fat-tail Awassi sheep and does not involve breeding activities.

²/ PFIP and livestock research in FSP have had many cooperative activities. It was planned and also suggested by the first Quinquennial Review (QQR) of ICARDA to integrate livestock research into PFIP yet maintain its ties with FSP. This will be implemented in 1984.

ICARDA is a production oriented research center. It views the rural population primarily as producers. It seeks to improve the welfare of the rural populations as well as populations in general by contributing to increases in agricultural production.

As such, ICARDA emphasizes crops that are important in its mandate region:

- a. Wheat is the basic staple crop in MENA. It is consumed primarily in the form of various bread types (flat, sheet, leavened, etc.). Durum wheat is an important source of nutrition in typical regional dishes as burghul and couscous but it is also widely used in making the local flat breads.
- b. Barley is the basic feed crop of the region. It is adapted to the drier zones, hence it is an important crop for the farmers of these poorer areas. These farmers exploit the limited potential of these areas to the full (and not unusually, to excess) by integrating barley production with livestock production on the farming unit.
Grazing - or rather, overgrazing - of the pastures in the steppe areas is another dimension of these livestock driven activities typical of the drier zones of the region. ICARDA's research in the PFIP involve efforts to rehabilitate pastures and to develop and promote forage crops which may slow the degradation of the steppe if current stocking rates are maintained.
- c. Food legumes nutritionally are quite important in the region. The traditional food legumes are lentils, chickpeas and faba beans. They figure as important sources of protein in the traditional dishes of the region such as lentils soup, hommos bi-tahine (a chickpea paste containing sesame oil) and ful (a faba bean dish). Labour intensive production and especially harvesting processes, mainly for lentils and chickpeas pose problems in the face of scarce agricultural labour and associated high labour costs. There are efforts at ICARDA to develop mechanized harvesting for these crops, along with other (breeding, etc.) efforts so that their roles in production and nutrition are maintained.

ICARDA operates in a region in which, with the exception of one country, there are chronic food deficits which are partially closed by imports.¹ It would not be too difficult to imagine that the poor have more than their fair share of these deficits. However, the existence of global food deficits appear to cause policy makers to give priority to assuring adequate food supplies in the aggregate; the problems of the poor, the malnourished, nutritionally vulnerable, etc. appear to have lower priority. For example, food security through increased food production is a common policy theme in the region. However, it is not clear whether on a national basis or on the basis of groups of countries such as the Islamic Conference, the problem has been adequately analysed especially with respect to comparative advantage.

ICARDA does not appear to have clearly identified target groups whose nutritional needs are specifically considered and incorporated in its research activities. However, its efforts are concentrated on staple commodities that are consumed widely and at least theoretically, more by the poor.² Hence, we can easily claim to be addressing the nutritional problem of the poor in general.

1/ Invariably these imports are directed to the urban areas while rural consumers are expected to make do with their own production. These producers, when they have deficits in food, may not be able to benefit from subsidized food sales directed to urban consumers. Hence, they are doubly penalized, first as producers by inadequate incentives due to subsidized food prices when food is mainly imported, and secondly as consumers when they bear the full costs of the food they have produced. Evidence in this respect from Jordan is presented further below.

2/ This characteristic is not unique to ICARDA: all the production oriented centers within CGIAR are essentially involved in staple commodities.

Some may feel that a caveat and a qualification are necessary due to ICARDA's research on livestock, barley and forage crops. These activities are ultimately directed at improving livestock production. Allocating research resources to livestock production, usually viewed as meat production, may be considered as addressing the needs of those who can afford meat. It is clear that these groups, will probably have nutritional problems, if they have any at all, arising from affluence and hence may not be considered a priority group. Add to this considerations of livestock being inefficient converters of energy into protein, we can have quite strong grounds for casting a critical eye on livestock research and research on feed crops.

However, we need to consider several other dimensions of livestock production. First, from the point of view of the producers, barley and livestock production is an efficient and time-tested way of exploiting the limited resources of the drier regions. Second, in MENA, livestock production, especially sheep production is not a purely specialized meat production activity. It is a multiproduct activity, producing e.g. dairy products and wool as well.¹ In some cases, dairy products may even be more important than others. Then livestock sales (for meat) will be more dependent on the adequacy of feed supplies. Our emphasis on dairy products is not without reason.

^{1/} It is not difficult to also hypothesize a "banking" function in livestock production: herds are thinned in times of financial need but rebuilt when finances improve.

In MENA in general but more in rural areas two dairy products are almost staples.¹ These are yogurt (lebneh) and white cheese. These items are widely consumed and can be considered to constitute the primary source of high quality animal protein, especially for the rural populations. For example, according to the results of a rural expenditure survey conducted in 1973-1974 in Turkey, real and imputed expenditures on dairy products were 3 to 4 times as much as expenditures on meat. In conclusion then, it can be claimed that research on livestock, barley and forages, apart from the potential increases in incomes generated, will cause increases in dairy production, which will have positive nutritional effect.

Nutrition Related Research at ICARDA

The fact that with its production orientation, ICARDA does not have tangible target groups with respect to nutritional objectives does not mean that we are not involved in nutrition related activities. Even at this early stage of its development, ICARDA has exhibited consciousness of nutritional issues.

In this respect three sets of activities can be discussed:

1. Product Quality Research

These research activities are an integral part of the commodity improvement programs. Although there are routine analyses of nutrient content (especially protein) the emphasis on product quality research is on "acceptability". The quality laboratories use quite advanced equipment and process large numbers of samples. Acceptability tests, however, involve different approaches depending on the nature of the product. Some examples may illustrate this point:

¹/ Butter can also be included in this list.

- a. Major quality factors for chickpeas and faba beans are taste and cooking time. Quite simple tests like 90% cooking time and manual checks for softness are conducted along with such tests as the crude fibre digestion system. Panels are used to evaluate taste factors. Protein contents are tested routinely. In addition, serious problems like favism for faba beans are given special attention.
- b. In cereals, routine quality tests involve protein content, 1000 kernel weight, vitreous kernel percentage, hardness and wheat meal fermentation time. However, two other activities are worth noting. The first is the Cereal Quality Nursery (CQN). This is a series of advanced lines of cereals grown in several locations in the ICARDA region under rainfed and irrigated conditions. The objectives of CQN are to determine the stability of quality parameter ranks under different environmental conditions and to determine the extent to which environment rather than genotype determines individual quality factors. Preliminary results appear to indicate that genotype has more effect on quality than environment.

The second activity involves testing of flour from different cultivars and genotypes in breadmaking quality. For this a traditional local flat bread (khobz) oven was built at Tel Hadya along with a small milling facility. Even though this oven is quite typical of local ovens, selected flours are also tested in commercial traditional and modern ovens. In this manner, an effort is made to conform quality tests to local taste patterns as much as possible. As a consequence it was determined that:

- i. Weaker wheats make the best khobz.
 - ii. Flours with 10-11.5% protein are most satisfactory.
 - iii. Pure durum flours are unsuitable for khobz and need to be blended with at least 50% breadwheat flour.
- c. In addition to routine tests for such factors as protein, fibre content, etc., barley and other forage crops are subjected to digestibility studies with sheep in the livestock unit. Plans are being developed to subject barley straw, which is important as feed, to similar tests.

2. The ICARDA/UNU Workshop on Interfaces between Agriculture, Food Science and Human Nutrition in the Middle East.

This international workshop was organized and funded by the United Nations University and ICARDA and held in Aleppo on February 21-25, 1982. The workshop increased the sensitivity of both ICARDA and regional scientists to nutritional issues. Participation of scientists of diverse disciplines from many national and international research organizations provided for a most fruitful exchange of ideas. The proceedings of the workshop have been edited by D. Nygaard and P. Pellett and will soon be published.

One of the recommendations of the workshop was to hold similar workshops at the regional and national levels. As a consequence, the workshop in the Sudan, discussed below, was organized.

3. The Workshop on Interfaces between Agriculture, Food Science and Nutrition in the Sudan, Khartoum, 10-15 December, 1983.

This workshop was sponsored by ICARDA and jointly supported by the Ford Foundation and UNICEF. The primary objective was to bring together national scientists conducting disciplinary research on agricultural and nutritional problems. The workshop was held at the Food Research Center, Shambat. Thirty national scientists participated in the workshop, representing diverse disciplines such as food science and technology, nutrition, medicine, agronomy, agricultural economics, community health care, etc. Planners and policy makers from the Sudanese ministries of health, commerce, industry and agriculture also participated in the workshop.

During the workshop, ongoing research was reviewed and the current food and nutrition situation in the Sudan was assessed. Subsequently, areas that needed further research, multidisciplinary approaches and constraints to research were discussed.

The workshop concluded with several recommendations that had implications for policies, research and action for increasing food production and improving food consumption and nutrition status. The principal recommendations are summarized below:

- a. To organize a National Food and Nutrition Council to coordinate the activities of agencies involved in food production, food science and nutrition.
- b. In order to increase food production, more financial resources should be allocated to agriculture, mainly production of food crops and in rainfed areas; improvement of marketing and storage facilities.
- c. Taking into consideration consumer demand and national interest, protection of the local food industry and developing adequate export and import policies.
- d. Evaluation and development of current nutrition education programs with emphasis on mass media and community involvement.
- e. Support of infant nutrition, encouraging breast feeding and development of weaning foods from locally available ingredients.
- g. Early detection of protein energy malnutrition by simple anthropometric criteria and development of simple rehabilitation activities to be conducted by the existing health services.

- h. Dietary fortification, especially vitamin A, iron and iodine.
 - i. Cooperation with international agencies which can provide technical and financial assistance.
4. Two specific nutrition related activities have been supported by ICARDA/FSP.
- a. A nutrition survey of rural and urban Irbid, a major wheat production province of Jordan was carried out as part of a collaborative research activity with the University of Jordan. Preliminary results from this survey were presented and conveyed to regional scientists at the First ICARDA Regional FSR Workshop held in Aleppo, May 24-26, 1983.

The purpose of the survey was to assess nutritional status with respect to age, sex (as well as separately for pregnant and lactating women), family size, income and rural vs urban residences and to determine the role of wheat in nutrition. Preliminary results indicate the following:

- i. Differences with respect to family size, residence and three income groups do not appear to be discernible.
- ii. In general, nutritional conditions appear to be below average RDA but well within the range of RDA.
- iii. Only children (grouped as <1, 1-3, 4-6, 7-9) appear to be deficient in energy requirements. Average protein intake in the same groups exceeds requirements by as much as 100% (except for infants <1 in the low and moderate income groups). Due to the relative calorie deficit, protein use may not be as excessive as it appears.

- iv. Bread is the dominant element in rural and urban areas. However, most rural families produce their own wheat and in case of deficits purchase wheat from rural markets. As such, they cannot benefit from the subsidized flour and bread sales in urban areas. For Jordan, this result has interesting policy implications.

The results from the survey need further analysis and refinement.

- b. With similar objectives but also with the objective of identifying the problems of vulnerable groups, a small scale survey will be held in the villages of Aleppo province by a Ph.D. student from the University of Massachusetts at Amherst. ICARDA is involved in scientific and logistical support.

It is expected that results from these studies will familiarize scientists with nutritional issues and gradually increase considerations for incorporating nutrition related dimensions into agricultural research. It must, however, be admitted that we are in the very early stages of such efforts.

Production Oriented Agricultural
Research and Nutrition Issues

A general perspective needs to be initially provided. It would not be too much of a simplification to state that nutritional problems emanate from the following causes:¹

- a. Inadequate food production/availability
- b. Inadequate food distribution systems
- c. Inequalities in income distribution and inadequate income
- d. Inadequate nutritional information - education
- e. General health problems.

The solutions similarly lie on many planes:

- a. Research on production
- b. Improving health conditions and education
- c. Food, product and input subsidy policies
- d. Investment in storage and distribution
- e. Macroeconomic policies to alleviate income distribution problems.

These lists are by no means exhaustive but cover the dominant aspects of nutritional problems.

Within such a frame, production oriented International Agricultural Research Centers (IARC) can partially contribute to the solution of nutrition problems. It is clear that their contribution will disproportionately be on the plane of research on production. It is a matter of comparative advantage.

^{1/} A more thorough discussion of these issues can be found in: E.T. Kennedy and P. Pinstrup-Andersen, Nutrition-Related Policies and Programs: Past Performance and Research Needs, IFPRI, February 1983, pp 7-20.

Let us now discuss the issues that production research faces in contributing to the solutions of nutritional problems.

1. First of all, IARC do not have an adequate picture of the demand and increases therein for the products they are working on. We are working primarily on staples and with the conception of limitless increases in demand.¹ Hence, the basic philosophy is to increase yields and production.

We can gauge our production targets more realistically if we have adequate demand projections. This would also allow us to give adequate consideration to trade-offs between yield and production targets and other objectives, nutrition being one.

2. Production research can contribute to improving the nutritional condition of the poorer sections of populations involved in production activities. It must be indicated here that concepts like "resource-poor farmers", "poor agricultural labourers", etc. are relative concepts. Relative poverty need not always be associated with nutritional problems. Hence it is necessary to identify target groups and their needs. This can best be done at the national research organization level and IARC can be most effective in collaborative activities with such organizations.
3. The claim that production oriented IARC can increase production and hence improve the welfare² of producers is based on an assumption which may not hold under all circumstances. This assumption is that producers can capture most or all the benefits

1/ There are projections on food demand as an aggregate. However, if one considers possibilities of substitution between food items, more disaggregated commodity based demand projections are necessary. They are very few of those.

2/ In a specific dimension, the word "welfare" can be replaced by "nutrition".

of increased production. It is neither inconceivable nor unexpected that producers share the benefits of increased production with landlords, intermediaries, tax officials and consumers. The effectiveness of production research efforts will be diluted by this distributional dimension. Some of the sharing of benefits, e.g. with consumers may be desirable while others probably will not. This distributional issue can only be resolved at the national policy level. Hence, it should not prevent IARC from maintaining their research perspectives provided the distributional issues do not completely prevent the effective implementation and adoption of production research results.¹

4. It is claimed that one way of assuring the poorer farmers to benefit from agricultural research is to develop technologies that reduce unit costs of production. This puts undue burden on agricultural research for the following reasons:
 - a. The general approach in IARC is to develop technologies appropriate to farmer conditions that do not increase risks and those that provide adequate net benefits to justify adoption. The additional target of reducing unit production costs imposes the extra burden of ensuring that yields grow faster than costs.²
 - b. Unless significant untapped indigenous resources are discovered and utilized, improved technologies invariably require increases in costs. As research moves from high production pay-off areas to lower ones, the potential of yields growing faster than costs decreases. Unfortunately, resource-poor farmers usually operate in such low production pay-off areas.

1/ A more rational approach would be to be conscious of these issues and adjust research accordingly. This is easier said than done.

2/ This argument also assumes stable (or even decreasing) output prices, a point of importance to consumers. In practice it is possible, through implementing both consumer and producer subsidies, to have increasing farm gate prices. This does not imply that we are advocating such distortions.

- c. Policies related to water management favour the high pay-off areas in terms of costs. Areas that are irrigated through large irrigation networks run by state agencies usually have water charges that do not reflect costs. In other words, farmers of these advantaged areas are subsidized in their water costs.

When we move to drier areas, we observe that if there is irrigation, it is done by simpler schemes like tubewells, pumps, etc. that are also generally privately owned. Hence the farmers of these relatively disadvantaged areas usually have to pay actual costs that more accurately reflect opportunity costs.

We have then the possibility that lower yield potential areas may face higher costs due to discriminatory policies.

- d. One way of achieving lower growth of costs as compared to yields is to have input price subsidies. This is a policy matter. However, economists are generally not in favour of using input subsidies as production incentives.¹ Inputs like fertilizer can be used on many crops and a targeted staple crop may not totally benefit from the input subsidy. An output price subsidy is a more efficient policy instrument in providing production incentives.

In conclusion, to reduce unit production costs is not an easy task and more so in poorer areas.

5. One of the targets of nutritional research is agricultural labour. It is clearly possible for this group, especially female and children agricultural workers, to have serious nutritional problems. However, we believe that the concern with this group is conditioned by a preoccupation with labour intensive agricultural production processes and labour surplus areas. ICARDA operates in a region characterized by labour scarcity and high labour costs. Hence, the identification of target groups or vulnerable groups need to be based on location specific or national level research rather than being based on general preconceptions.

^{1/} Except maybe for a transitional period for promotional purposes.

6. Intra-household decisions on the allocation of resources like labour are of interest to production oriented IARC. The connections with expenditures in general and food specifically can give us a better understanding of the farm-household-enterprise.

For long periods the myth of the ignorant and inefficient peasant was perpetuated. Evidence has reversed these beliefs. Yet, there are now doubts that the farm-household-enterprise which is capable of allocating resources efficiently on the farm is not capable of a similar allocation process for food and income among its members. This may or may not be true. We need first to improve our analytical tools for looking at intra-household decision making processes and we need considerable concrete evidence.

Conclusions

The contribution of production oriented IARC to the solutions of nutritional problems is limited to the plane of increasing food production. It is, of course, necessary to be conscious of the issues and incorporate nutritional dimensions into agricultural research.

It would however be realistic to expect that the success of the IARC in influencing nutrition through production will be tempered by other factors (see p.10) which operate primarily on the policy level, This indicates that nutrition related problems are best approached at the national level. The multiplicity of factors that impinge on nutritional problems require an integrated approach in order to be effective. The contributions of IARC in collaborative research will enhance the effectiveness of such national level research. IARC can assist national organizations by offering their expertise, through analysing and interpreting results in terms of policy implications.

The continuation of present work in IARC on quality tests, workshops, etc. would enable the scientists of IARC to maintain a high degree of awareness of nutrition related issues.