Does nutrition have a place in agricultural research?

Robert Tripp

There are very few examples where nutritional objectives have made an effective contribution to planning agricultural research for developing countries. The complex nature of nutrition and the limitations of formal planning procedures help explain the failure. But most commentators ignore the personal, political and ideological factors that seriously limit the effectiveness of nutrition as a parameter for research planning. Three cases are discussed where nutrition has played a role in setting agricultural research directions, without evident nutritional impact. Conclusions are proposed for making agricultural research planning more relevant to nutritional concerns.

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[1]M. Lipton and R. Longhurst, *New Seeds and Poor People*, Unwin Hyman, London, 1989, p 233.
[2]N.S. Scrimshaw and M. Behar, eds, *Nutrition and Agricultural Development*, Plenum, New York, NY, 1976; A. Pacey and P. Payne, *Agricultural Development and Nutrition*, Hutchinson, London, 1985; P. Pinstrup-Andersen, A. Berg and M. Forman, eds, *International Agricultural Research and Human Nutrition*, IFPRI, Washington, DC, 1984.
[3]Barbara Harriss, 'Nutrition and international agricultural research', *Food Policy*, Vol 12, No 1, 1987, pp 29–34.
[4]J.O. Field and F.J. Levinson, *Nutrition and Development: the Dynamics of Commit-*
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Directing agricultural research and development towards the improvement of human nutrition has proven to be an elusive goal. There are certainly many cases where human nutritional status has improved as a result of agricultural research,[1] but there is little evidence of agricultural research having been specifically planned to resolve particular nutritional problems. There is no shortage of ideas regarding how agricultural research can be made more relevant to nutritional concerns.[2] Harriss, on the other hand, has recently called into question the feasibility of strategies for making international agricultural research more responsive to nutritional interests, suggesting instead that research institutions take a more directly political approach to addressing malnutrition.[3] But one of the reasons nutrition came to the fore in development planning in the 1970s was precisely because attempts to focus on equity had failed to elicit effective political response;[4] thus the debate on nutrition and agricultural research seems to have come full circle.

One problem with both sides of this debate is a lack of attention to the way that agricultural research is actually planned and conducted. The following discussion seeks to remedy that deficiency. It begins with a description of the problems that have been encountered in accommodating nutritional goals to a variety of formal planning procedures in agricultural research. The next section provides a review of some of the less frequently acknowledged aspects of research planning, where a variety of subjective factors take precedence. This is followed by brief descriptions of three cases where nutritional criteria have had an influence on the direction of agricultural research. The common features of these cases, and their failure to produce any nutritional impact, are emphasized. Finally, some practical conclusions are drawn for addressing nutritional concerns through agricultural research.

Nutrition and formal research planning

Nutritional status has been seen as an excellent summary indicator of human welfare, but continuing difficulties in defining malnutrition and assessing its incidence[5] make it problematic as a parameter for research planning or as a useful measure for judging progress. In addition, the aetiology of malnutrition is so complex that it is difficult to trace precise relationships between technological change and nutritional outcomes.

Factors such as the dynamics of intrahousehold food distribution,[6] the synergisms between health and nutrition[7] and recent questions regarding the responsiveness of nutrition to income change[8] all contribute to the challenge.

These problems of definition and measurement detract from the efficiency of nutrition as a criterion for agricultural research planning. One common approach is to include poverty and nutritional concerns in various models for research resource allocation.[9] In the majority of these cases attention is given to crops that the poor produce or consume, to regions with high concentrations of rural poverty or to technologies whose labour demands, input requirements or yield-stabilizing qualities make them appropriate for resource-poor producers. The result of such analysis is usually a ranking of research endeavours where priorities reflect a balancing of the poverty and nutrition concerns against factors such as economic efficiency and research capacity. But even if nutrition is accorded high priority in considering these trade-offs, the actual nutritional impact of particular technologies is determined by so many intervening factors that decisions taken at this level in no way guarantee that the final research product will actually address nutritional concerns.

One attempt to increase precision in planning for nutritional impact involves more attention to the resource and labour correlates of proposed technologies. For instance, researchers may be asked to address the conflict between seasonal income opportunities for landless female labourers and their childcare demands during the same season.[10] But such proposals are often technically intractable[11] and may divert resources into overspecifying research directions. Such concerns also tend to treat the malnourished in a mechanistic fashion, by assuming for example that women are unable to understand or control the factors influencing their child-feeding practice.[12] There are certainly situations where research designed to protect women's traditional sources of income rather than develop new alternatives,[13] or promote labour-intensive crops rather than address land reform, are cases of 'moving the piano to the piano stool'.[14]

Local-level planning procedures have also tried to include nutrition in setting priorities for agricultural research. Extensive checklists have been developed for including nutrition in agricultural and rural development projects,[15] and farming systems research has been seen as a mechanism for making agricultural technology more relevant to farmers' nutritional circumstances.[16] Location-specific research offers the opportunity to target resource-poor farmers and to consider technologies that are in accord with their dietary preferences, food supply requirements and production systems. But much of this involves the commonsense (although often overlooked) necessity of assuring that new technologies are compatible with farmers' own priorities, so as to maximize the chances of acceptance. This should not be confused with the more difficult task of using information on nutritional deficiencies in particular populations to influence technology design. There are only a few examples of organizing agricultural research to accommodate specific nutritional information generated at the local level and to use it to set research priorities.[17] Detailed nutritional information from a few locations is not sufficient for making decisions regarding major investments in a plant breeding programme, for instance. Much more work is needed on incorporating adaptive agricultural research programmes into overall research efforts.

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ment, Plenum, New York, NY, 1976.
[5]T. Poleman, 'Quantifying the nutrition situation in developing countries', *Food Research Institute Studies*, Vol 18, 1984, pp 1–58.
[6]John G. Haaga and John B. Mason, 'Food distribution within the family', *Food Policy*, Vol 12, No 2, 1987, pp 146–160.
[7]L.J. Mata, *The Children of Santa Maria Cauque*, MIT Press, Cambridge, MA, 1978.
[8]C.H. Shah, 'Food preference, poverty and the nutrition gap', *Economic Development and Cultural Change*, Vol 32, 1984, pp 121–148.
[9]H.P. Binswanger and J.G. Ryan, 'Efficiency and equity issues in *ex ante* allocation of research resources', *Indian Journal of Agricultural Economics*, Vol 32, No 3, 1977, pp 217–231; G.W. Norton and P.G. Pardey, *Priority-Setting Mechanisms for National Agricultural Research Systems: Present Experience and Future Needs*, Working Paper No 7, ISNAR, The Hague, 1987.
[10]Pacey and Payne, *op cit*, Ref 2, p 31; J.G. Ryan, 'Efficiency and equity considerations in the design of agricultural technology in developing countries', *Australian Journal of Agricultural Economics*, Vol 28, Nos 2 and 3, 1984, p 128.
[11]For example see the suggestions of Lipton and Longhurst, *op cit*, Ref 1, pp 242–243.
[12]For evidence to the contrary, see J. Leslie, 'Women's work and child nutrition in the Third World', *World Development*, Vol 16, 1988, p 1357.
[13]D. Kandiyoti, *Women and Rural Development Policies: the Changing Agenda*, IDS Discussion Paper 244, Institute of Development Studies at the University of Sussex, UK, 1988.
[14]J.M. Mellor, 'Relating research resource allocation to multiple goals', in T.M. Arndt, D.G. Dalrymple and V.W. Ruttan, eds, *Resource Allocation and Productivity in National and International Agricultural Research*, University of Minnesota Press, Minneapolis, MN, 1977, p 482.
[15]FAO, *Integrating Nutrition into Agricultural and Rural Development Projects*, FAO, Rome, 1982.
[16]T.R. Frankenberger, 'Adding a food consumption perspective to farming systems research', report prepared for Nutrition Economics Group, Technical Assistance Division, Office of International Cooperation and Development, United States Department of Agriculture, Washington, DC, 1985.
[17]For one example see S.C.S. Tsou and J. Gershon, 'Nutritional goals and activities of the AVRDC research program', in Pinstrup-Andersen, Berg and Forman, *op cit*, Ref 2.

Beyond formal planning

The preceding discussion has emphasized some of the technical and organizational factors that limit formal planning procedures in contributing to the nutritional relevance of agricultural technology generation. But beyond these constraints it is worth asking to what degree agricultural research actually proceeds on the basis of rational planning. Studies of the US agricultural research system show a range of personal preferences, professional motivations, political expediency and administrative exigencies that give little evidence of being amenable to any formal planning procedure.[18] At the very least, the subjective side of planning in both applied nutrition and agricultural research must be acknowledged.[19]

In any development planning, stated project goals need to be balanced against the demands of particular groups of participants or beneficiaries.[20] The influence of political power on the direction of public-sector agricultural research is no exception.[21] In addition, an ethical element is often introduced in the planning process,[22] and this is certainly relevant to the case of nutrition, which carries strong moral connotations. The political and the ethical often become mixed, however, and the result is a considerable ideological influence in setting research directions. Adherence to different values affects the conduct and interpretation of research efforts. The current debate over low-input agriculture in the USA provides one example. Conflicting ideologies yield individual visions of the future of the family farm, and these in turn lead to research projects that give cause to wonder how 'presumably capable, well-trained scientists . . . come up with such diametrically opposed results'.[23]

Although personal values may help determine research directions, the existence of particular research opportunities may in turn help shape values.[24] For example, the challenge of breeding crops for nutritional qualities may induce more of a concern for nutrition than would otherwise be the case. The values and beliefs of individual scientists thus interact with personal career choices and the availability of research opportunities. These factors are in turn conditioned by political and administrative pressures, and it is little wonder that formal planning procedures may have limited relevance to final choices for research priorities. Nutrition is often presented as an ethical criterion, but with considerable uncertainty regarding measurement and interpretation. It is thus particularly susceptible to abuse in the planning process.

The interactions of the technical and logistical limitations of research planning, on the one hand, with the political factors inherent in research organizations, on the other, are illustrated in the following three cases. In each one, nutritional concerns have helped to shape agricultural research directions. And in each case a lack of impact can be attributed in part to the difficulties described above.

Quality protein maize

For many years it was believed that a shortage of protein in the diets of the world's poor constituted one of the principal challenges for applied nutrition and agriculture. The discovery of maize genotypes with significantly higher proportions of the amino acids lysine and tryptophan in the endosperm protein, and hence much higher quality grain

[18] L. Busch and W.B. Lacy, *Science, Agriculture, and the Politics of Research*, Westview Press, Boulder, CO, 1983; J. Lipman-Blumen, 'Priority setting in agricultural research', in V.W. Ruttan and C.E. Pray, eds, *Policy for Agricultural Research*, Westview Press, Boulder, CO, 1987.
[19] J.O. Field, 'The soft underbelly of applied knowledge', *Food Policy*, Vol 2, 1977, pp 228–239; C.R. Shumway, 'Subjectivity in *ex ante* research evaluation', *American Journal of Agricultural Economics*, Vol 63, 1981, pp 169–173.
[20] D. Hulme, 'Project planning and project identification: rational, political or somewhere in between?', *Manchester Papers on Development*, Vol IV, 1988, pp 272–293.
[21] R. Grabowski, 'The implications of an induced innovation model', *Economic Development and Cultural Change*, Vol 30, No 1, 1981, pp 723–734.
[22] D. Goulet, 'Three rationalities in development decision-making', *World Development*, Vol 14, 1986, pp 301–317.
[23] F.H. Buttel, G.W. Gillespie, Jr, R. Janke, B. Caldwell and M. Sarrantorio, 'Reduced-input agricultural systems: a critique', *Rural Sociologist*, Vol 6, 1986, pp 350–370.
[24] E. Levy, 'The responsibility of the scientific and technological enterprise in technology transfer', in R.S. Anderson, P.R. Brass, E. Levy and B.M. Morrison, eds, *Science, Politics and the Agricultural Revolution in Asia*, Westview Press, Boulder, CO, 1982.

protein,[25] was received with great interest. The original discoveries soon grew into well funded and productive breeding programmes for quality protein maize (QPM).[26]

At about the time that acceptable QPM varieties began to appear, however, nutritionists intensified a debate over the degree to which energy, rather than protein, was the more limiting factor in the diets of the poor.[27] The issues are complex and continue to be debated today, although all would agree that the relative importance of protein has been permanently diminished. Beyond the technical arguments, ideological factors played a role in distinguishing the two sides. Protein advocates tended to take the view that adjusting the amino acids in people's food supply represented a technically feasible solution to nutrition problems, while the energy side took advantage of the grassroots appeal of promoting greater availability of local foods. It is interesting to note that while dietary protein had earlier been a symbol of concern for the complexities of poverty,[28] emerging nutritional results and the politics of research converted it to a symbol of technocratic aloofness.

Plant breeders were caught in the middle of the controversy. Debate within research institutions increased regarding the future of protein as a breeding objective[29] while nutrition research led to continual readjustments in official protein and energy requirements.[30] Joint projects between nutritionists and agriculturalists to test QPM led to field evaluations more remarkable for their advocacy than for their analysis.[31]

In the meantime it was becoming increasingly difficult to identify the potential beneficiaries of this research. Because the gene for the quality protein character is recessive, it is soon lost through cross-pollination. Possible solutions include farmers buying seed each year, or learning how to select seed in their fields, but neither is easy for resource-poor farmers. These drawbacks encouraged interest in the problems of urban malnutrition, and the possibility that large-scale producers could deliver QPM for processed foods or school lunches. When the value of extra protein in human diets became less tenable, the feed value of QPM for non-ruminant animals received more attention, and the hope was expressed that, somehow resolving the seed issue, the poor could grow QPM and sell it to the feed industry.

A number of QPM varieties are available today that are virtually indistinguishable from normal improved maize varieties. The conversion of a laboratory curiosity into a wide range of acceptable materials must rank as one of the major technical accomplishments in plant breeding in recent years. But there is little interest from farmers and no evidence that QPM is being utilized for improving human nutrition.

There are several lessons to be learned from the experience. First, a well intentioned research effort was frustrated by problems in delivering a product to the poor and by the shifting knowledge base in nutrition. Second, once such an effort was initiated it was very easy to lose sight of potential clients as commitments of funds and research programmes took precedence. And third, the polarization resulting from the protein–energy debate did little to further an understanding of the complexities of agricultural research and its relation to nutrition. Although it is now *de rigueur* to criticize the strategy of breeding for improved protein, the same critics are usually only too willing to present proposals for new breeding initiatives, aimed at vitamins, oil content or

[25]E.T. Mertz, L.S. Bates and O.E. Nelson, 'Mutant gene that changes protein composition and increases lysine content of maize endosperm', *Science*, Vol 145, 1964, pp 279–280.
[26]CIMMYT–Purdue, *High Quality Protein Maize*, Dowden, Hutchinson, Stroudsburg, PA, 1975.
[27]J.C. Waterlow and P.R. Payne, 'The protein gap', *Nature*, Vol 258, 1975, pp 113–117.
[28]G. Borgstrom, *The Hungry Planet*, Macmillan, New York, NY, 1965.
[29]J.G. Ryan, A.R. Sheldrake and S.P. Yadau, *Human Nutritional Needs and Crop Breeding Objectives in the Semi-arid Tropics*, Economics Program Occasional Paper No 4, Icrisat, Patancheru, India, 1974.
[30]UNU, *Protein-Energy Requirements Under Conditions Prevailing in Developing Countries: Current Knowledge and Research Needs*, United Nations University, Tokyo, Japan, 1979; FAO/WHO/UNU, *Energy and Protein Requirements*, report of a joint FAO/WHO/UNU expert consultation, WHO Technical Report Series 724, World Health Organization, Geneva, 1985.
[31]Indian Agricultural Research Institute, *Studies on Assessing the Nutritive Value of Opaque-2 Maize*, IARI, New Delhi, 1977; V. Valverde *et al*, *The Patalul Project; Production, Storage, Acceptance, and Nutritional Impact of Opaque-2 Corns in Guatemala*, Incap Working Document, Institute of Nutrition of Central America and Panama, Guatemala, 1983.

energy, that make the technical and logistic challenges of QPM look simple by comparison.

Native crops

There are a large number of minor crops that have been a source of interest to agriculturalists and nutritionists for some time.[32] Arguments for promoting these crops include a concern for maintaining dietary diversity and a respect for the quality of traditional diets. The challenge to agricultural research is an attractive one, and the prestige associated with becoming a 'crop champion'[33] helps explain the effort that goes into developing lists of such crops as candidates for research.[34] However, nutrition is often used as a justification without reference to the potential of the crop or its place in the diet; for instance, an obscure legume can be presented as having 'a calorific value equal to that of a high quality grain'[35] without asking if it could actually compete with other crops as a calorie source.

An example from the Ecuadorian Andes will illustrate some of the problems. Quinoa (*Chenopodium quinoa*), an Andean grain of the goosefoot family, and lupins (*Lupinus* spp), a leguminous species also native to the Andes, have both been the subject of several projects in Ecuador and form the basis for a recently established native crops programme in the national agricultural research institute.[36] Both crops are promoted on nutritional grounds. Quinoa offers excellent protein quality and a protein content higher than most cereals, and is high in calcium and riboflavin. Lupin varieties commonly contain above 40% protein and are high in oil. Both crops are well suited to Andean growing conditions.

But efforts to increase the small quantities of these two crops currently grown in northern Ecuador are based more on the emotional appeal of revitalizing native crops than on an understanding of their place in local production and diets.[37] Lupins are never given to children (because it is believed that they upset the stomach), are rarely consumed in the home and are sold instead as a market snack. Quinoa production and consumption is also modest, and farmers' lack of interest in the crop is reflected in its low market price. Utilization of the two crops is also limited by difficulties in preparation. Both crops have seed coats containing saponins that require extensive soaking and washing before use. This characteristic has given rise to breeding programmes aimed at 'sweet' varieties, as well as numerous proposals for improved preparation methods at both village and industrial levels.[38]

Indeed, when farm-level utilization of these crops appears questionable it is easy to shift attention to industrial applications, such as the use of lupins in oil production or quinoa as a wheat flour substitute.[39] Once again, research initiated to address nutritional needs ends up in a search for clients to justify a research product. The particular results from Ecuador should not discourage research on quinoa or lupins in other parts of the Andes, nor should they close off debate on the potential of native crops. But the experience offers an example of how vague reference to nutritional data combined with development ideologies that emphasize self-sufficiency or traditional diets provide a justification for pursuing research interests that are unlikely to have a nutritional impact. Once budgets and research programmes are committed the acceptability and appropriateness of native crops for specific groups of people receive only superficial attention.

[32]National Academy of Sciences, *Under-exploited Tropical Plants with Promising Economic Value*, NAS, Washington, DC, 1975; B.M. Koppel, 'Food policy options for secondary regions: a framework for applied research', *Food Policy*, Vol 6, No 1, 1981, pp 33–46.
[33]N.D. Vietmeyer, 'Lesser known plants of potential use in agriculture and forestry', *Science*, Vol 232, 1986, pp 1379–1384.
[34]B.N. Okigbo, 'Broadening the food base in Africa: the potential of traditional food plants', *Food and Nutrition*, Vol 12, No 1, 1986, pp 4–17.
[35]Vietmeyer, *op cit*, Ref 33.
[36]Norton and Pardey, *op cit*, Ref 9.
[37]R. Tripp, *Including Dietary Concerns in On-farm Research: an Example from Imbabura, Ecuador*, CIMMYT Economics Program Working Paper 02/84, CIMMYT, México, 1982.
[38]M. Tapia, H. Candarillas, S. Alandia, A. Cardozo and A. Mujica, *La Quinua y La Kañiwa*, CIID, Regional para la América Latina, Bogotá, 1979; R. Gross and E.W. Bunting, eds, *Agricultural and Nutritional Aspects of Lupines*, GTZ, Eschburn, FR Germany, 1982.
[39]B.J.F. Hudson, J.G. Fleetwood and A. Zand-Moghaddam, 'Lupin: an arable food crop for temperate climates', *Plant Foods for Man*, Vol 2, 1976, pp 81–90; E.J. Weber, 'New beginning for an ancient crop', *IDRC Reports*, Vol 7, No 1, 1978, pp 3–5.

Cash crops and 'food first'

In the previous two cases nutritional interests helped shape the direction of plant breeding research. The third case, which concerns the debate over the nutritional impact of commercial agriculture, is an example of a development ideology embracing nutrition and influencing the course of numerous agricultural projects. There is no doubt that agricultural research in developing countries has placed an excessive amount of emphasis on cash crops, prejudicing food crop research and the livelihoods of rural populations. Efforts to correct this imbalance are very important, but the opposite extreme sees an ideology of self-sufficiency linked to the view that all commercial agriculture is exploitative and a threat to nutritional welfare.[40] Some of the concerns raised by the 'food first' movement are legitimate ones, but just as in the cases of breeding crops for nutritional improvement, advocacy easily replaces the consideration of field-level realities.

The theme of 'food first' goes well beyond nutritional concerns to include issues related to self-provisioning agriculture, foreign exploitation and women's role in development. The nutritional perils of commercial agriculture are real enough and have been responsibly discussed.[41] The interesting point is that the potential problems have been so readily translated into accepted fact. The hypothesis that commercial agriculture is nutritionally detrimental to peasant farmers, independent of changes in income, has established itself in many standard works on rural development.[42]

The rush to associate malnutrition with commercial agriculture has at times failed to establish any plausible causality. In some cases the virtues of national self-reliance policies are discussed without examining the local market dynamics that make the policies work,[43] while in other cases the nutritional consequences of rural development projects that failed economically are presented to prove the case.[44] Once the thesis linking self-sufficiency to nutritional welfare is accepted, evidence of only the flimsiest sort is necessary for confirmation.[45]

The data that are beginning to emerge from empirical studies show that the negative nutritional effects of shifts into cash cropping are overstated, and that it is possible to identify those characteristics of commercial agriculture that increase the probability of nutritional benefit.[46] In addition, the varied concerns that constitute the 'food first' movement must be disaggregated, as in the case when an agricultural project jeopardizes women's control over technology and income, yet improves nutrition.[47] The ideology of self-reliance needs to be separated from the complicated realities of smallholder production. Although 'food first' is a populist initiative, it has been no more successful than any other approach at matching nutritional concerns with farmers' conditions.

Conclusions

If the three cases discussed above are at all representative, there is little evidence that nutritional concerns have been effectively addressed by agricultural research. The complex aetiology of malnutrition combined with limitations in the capacities of agricultural research institutions explain part of the failure. Beyond this, nutrition brings a strong moral and political element to research planning, but nutritional outcomes are

[40]F.M. Lappé and J. Collins, *Food First*, Houghton Mifflin, Boston, MA, 1977.
[41]P. Fleuret and A. Fleuret, 'Nutrition, consumption and agricultural change', *Human Organization*, Vol 39, 1980, pp 250–260.
[42]R. Cassen and associates, *Does Aid Work?*, Clarendon Press, Oxford, 1986, p 299; I. Tinker, 'New technologies for food-related activities: an equity strategy', in R. Dauber and M.L. Cain, eds, *Women and Technological Change in Developing Countries*, Westview Press, Boulder, CO, 1981, p 63.
[43]T. Marchione, 'Food and nutrition in self-reliant national development', *Medical Anthropology*, Vol 1, 1977, pp 57–79.
[44]K. Dewey, 'Nutritional consequences of the transformation from subsistence to commercial agriculture in Tabasco, Mexico', *Human Ecology*, Vol 9, 1981, pp 151–187.
[45]B. Suárez, D. Barkin, B. DeWalt, M. Hernández and R. Rosales, 'The nutritional impact of rural modernization: strategies for small-holder survival in Mexico', *Food and Nutrition Bulletin*, Vol 9, No 1, 1987, pp 30–35.
[46]J. von Braun, 'Production, income, and employment effects of commercialization: implications for household food security and lessons for agricultural policy', paper presented at IFPRI/INCAP workshop, 'Commercialization of agriculture and household food security: lessons for policies and programmes', Antigua, Guatemala, 9 March 1989; R. Longhurst, 'Cash crops, household food security and nutrition', *IDS Bulletin*, Vol 19, No 2, pp 28–36.
[47]J. von Braun, 'Effects of technological change in agriculture on food consumption and nutrition: rice in a West African setting', *World Development*, Vol 16, 1988, pp 1083–1098.

difficult to measure. This leaves much room for variable interpretations of research plans and priorities. In the meantime the clients of the research are increasingly ignored or subject to redefinition.

Nutrition is important and it should be used as one measure for judging the progress of agricultural change. But the inclusion of nutrition in agricultural research design has only infrequently moved agricultural research closer to addressing human needs or sharpened the focus of research. Based on experience to date, the answer to the question posed in the title of this paper must be quite pessimistic. The answer is given with disappointment and in the spirit of a challenge. It is certainly important to continue trying to make a connection between decision making in agricultural research and nutritional outcomes. But nutrition is poorly served by limiting it to formal planning procedures that are often irrelevant to local realities; using it as an excuse to promote particular ideologies; or insisting on attention to factors well beyond the capacity of agricultural research services. Continued reference to nutrition may at times be counterproductive in that it can divert resources from activities that may have a larger impact on human welfare.

Some qualifications to the negative answer regarding nutrition's role in agricultural research include several suggestions to make agricultural research more relevant to nutritional goals.

First, it should be acknowledged that there is only a limited role for agricultural research in applied nutrition. Agricultural technology is a rather blunt instrument for treating nutrition problems, and the seriously malnourished may or may not be directly accessible to agricultural interventions.[48] Research targets should be carefully selected.

Second, it is unreasonable to expect much progress until there is better collaboration between agricultural research organizations and institutes of applied nutrition. More formal mechanisms may be needed to allow nutritionists to participate in the work of agricultural research organizations. In many cases considerable change in the traditional behaviour of nutritionists and nutrition institutes will be required.[49] Nutritionists will need to base their participation on a problem-solving rather than a prescriptive approach. They will also have to be willing to enter into debate regarding the relative merits of nutritionally oriented technologies *versus* other alternatives.

Next, agricultural research should devote more attention to broad equity issues rather than to nutrition *per se*. Agricultural research institutes need to address basic food policy issues relating to the balance of demands from various classes of producers and consumers, in order to better define their clientele. The danger here is that a wave of the economist's wand may reduce nutrition to calories and calories to food consumption. This is not to deny the value of more specific nutritional analysis, but given the current capacities of agricultural research and the state of nutritional knowledge it would seem prudent to first deal with distributional concerns. In addition, agricultural scientists need to make better use of what is already known about the impact of technological change in agriculture. Enough information is available regarding the distributional effects of new technology to formulate some general rules of thumb to guide research.[50]

Location-specific research capabilities will make the setting of research priorities more responsive to the concerns of nutrition and equity, but this is not a panacea. In particular, it presumes a well

[48]M. Lipton, *The Poor and the Poorest: Some Interim Findings*, World Bank Discussion Paper 25, Washington, DC, 1988.
[49]Pacey and Payne, *op cit*, Ref 2; R. Tripp, 'On-farm research and applied nutrition: some suggestions for collaboration between national institutes of nutrition and agricultural research', *Food and Nutrition Bulletin*, Vol 6, No 3, pp 49–57.
[50]H. Binswanger, 'Agricultural mechanisation: a comparative historical perspective', *Research Observer*, Vol 1, No 1, 1986, pp 27–56; Longhurst, *op cit*, Ref 46.

organized research service. Location-specific research will only be effective at changing priorities if it can channel the range of local demands through the research organization so that a critical mass of research resources is directed at priority problems.

Finally, the cases discussed above show that a call for 'socially and politically responsible research'[51] neither substitutes for a nutritional agenda in research nor is it any less subject to variable interpretation than the nutritional issues themselves. Researchers may be able to personally justify their work as being socially responsible, but that judgment must ultimately be made by the clients of the research. Location-specific research that responds to local problems and concerns can help the cause, but political pressure from the countryside, from farmer groups or rural organizations, will do much more to encourage relevant research.

[51]Harriss, *op cit*, Ref 3.