

Original Article

# Contributions and constraints from agriculture in achieving a nutrition strategy to prevent chronic diseases

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Improved nutrition has potential to stem the growth in chronic diseases seen in developed and developing countries alike. The ability of the agricultural sector to feed a country's population is an important factor in achieving better nutrition, particularly among populations that cannot buy imported food. How to address chronic disease must be considered in the very different contexts of both developed and developing countries, as well as among wealthy and poor sub-populations. The limitations of agriculture in most developing countries to satisfy the nutritional needs of the population are revealed in the persistently high rates of under-nutrition in the developing world, and increases in over-nutrition. This paper develops the argument that agriculture must change dramatically in many countries to be able to provide the needed opportunities for improving nutrition for reduction of chronic disease risk.

**Keywords:** agriculture, chronic disease, nutrition.

"With the wrong descriptions, people will not find solutions..." Professor Mark Wahlqvist, Vienna, 2001

Agriculture is fundamental to human nutrition across the globe, but especially in developing countries. Most people get all of their nutrition from the foods they eat, and this is especially true for the less-wealthy who have little access to non-food nutritional supplements and who could not afford them even if they had access. Further, the poor people of the developing world are not only consumers of food, but rely on agricultural production for their income and livelihoods. In spite of urbanization and industrialization throughout the latter 20th century, more than half the people in developing countries remain in rural areas, subsisting primarily on their own food producing abilities. Thus, agriculture is a linchpin of survival for developing country poor populations, both economically and nutritionally. Typically, the rural poor eat what they grow, and the urban poor eat what they can afford.

The limitations of agriculture in most developing countries to satisfy the nutritional needs of the population are revealed in the persistently high rates of malnutrition in the developing world. Five years after the Rome World Food Summit at which 185 countries and the European Union declared a goal of cutting malnutrition in half by 2015, this goal seems more elusive than ever. According to the FAO, 842 million people still are food-insecure, 23% of them children under 10 years of age.<sup>1</sup> Rural poverty is more severe than urban poverty in most countries, agricultural productivity is rising slowly or not at all in many countries, and most rural poor are largely dependent on a few staple crops that do not provide a nutritious diet.

Malnutrition is manifested in both acute and chronic conditions and has a major influence on individuals' susceptibility to other diseases, including chronic diseases. Chronic diseases, such as cardiovascular disease and cancers, have long been considered afflictions of developed countries. These conditions are often attributable to lifestyle choices, environmental exposures, or genetic factors and have long latency periods, often beyond the life expectancy of people in many developing countries. However, government officials, researchers, and medical professionals have recently noted a ballooning incidence of chronic diseases among developing country populations.

For example, between 1970 and 1995, death rates from coronary heart disease among men aged 35-74 years declined dramatically in developed countries while rising in developing countries. For countries with statistics during the period, Argentina is the only developing country with declining coronary heart disease, whereas every country with declining rates of coronary heart disease is developed. Other apparent trends are rising incidence of diabetes and quickly rising overweight and obesity proportions.<sup>2</sup> The burden of chronic diseases may soon become more important to sustainable development than under-nutrition.

In China, it is estimated that 2.4% of GDP will be lost due to diet-related non-communicable disease compared to

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0.5% of GDP lost due to under-nutrition.<sup>3</sup> It is indisputable that the presence of malnutrition in developing countries is one factor that contributes to chronic disease prevalence, but not solely in ways that mirror the relationship in developed countries.

Thus, questions of how to address chronic disease must be considered in the very different contexts of both developed and developing countries, as well as among wealthier and poor sub-populations. Moreover dealing with chronic diseases as part of a nutrition strategy means dealing with simultaneous under-nutrition and over-nutrition in developing countries, along with the severe limitations imposed by agricultural, economic and cultural realities in those countries.

### **Focus on developing-country poor**

This paper discusses the potential of diet to prevent chronic disease among food-insecure populations in developing countries by addressing the dietary recommendations issued by the World Cancer Research Fund issued in 1997. These recommendations are based on an extensive scientific review of the evidence on diet and cancer and the collective judgement of an illustrious committee of experts. They are currently under-going revision and so the time is ripe to examine their strengths and weaknesses through various lenses. The focus of this paper is the agricultural sector's ability to meet the needs of food-insecure people in the manner suggested by the guidelines. The guidelines are intended to have global relevance. The reason for focusing on food-insecure populations in this paper is that they represent the largest group of malnourished, including both problems of under-nutrition and over-nutrition, and face the greatest constraints on their dietary choices. Therefore, both the greatest nutritional risks and the greatest challenges lie with this group.

For rural populations in developing countries, potential changes in both consumption and production of food should be examined. Urban populations are less dependent on own-production for survival, but the poor among them still have little latitude in their dietary choices. This paper will first present an overview of the major agricultural production and consumption trends affecting developing countries, and then compare those trends to the dietary recommendations for chronic disease prevention. If the trends foretell that the agricultural sectors and consumption patterns in most developing countries are not providing the dietary choices recommended by the WCRF – as they do – then interventions will be needed to assist populations in following those recommendations. Further, this analysis of trends makes clear that a food-based nutrition strategy to prevent chronic disease must be adapted to local conditions and means, and supplemented with other efforts to improve long-term health prospects. This would include a strong education and behaviour change component. It is likely that a combination of interventions to improve diets through feasible adjustments in agricultural production and incentives to change consumption behaviour will be needed.

### **Issues affecting food consumption in developing countries**

The primary factors affecting the per capita consumption of food among poor developing country populations are income, population growth, and culturally and socially determined dietary habits. Food insecurity arises when people have insufficient income to purchase an adequate diet when they face food shortages because of natural or human-made disasters, or both. Malnutrition can also exist in situations where people are food-secure, but make dietary choices that lead to poor health.

According to the UN FAO, consumption trends show improvements in food security in most regions of the world except sub-Saharan African countries where per capita food availability has stagnated.<sup>4</sup> The share of developing country populations that is food insecure has dropped by half over 30 years, but the number of food-insecure has not declined as quickly. Per capita consumption trends are now being helped by slower population growth in most developing countries (with the notable exceptions being parts of South Asia and Middle East/Northern Africa.)

Due to a combination of lower population growth and healthy income growth, many developing countries in Asia and Latin America have seen improvements in per capita food supplies. This includes China and India. By 2015, FAO projects that 82% of the world population will live in countries with moderate availability of food. However, other factors, such as ageing populations, declining inequality, and slowed income growth, are expected to make the World Food Summit goal unattainable until 2030. Globally, income growth is projected to exceed 1990s levels, but will be concentrated in the developed world.<sup>4</sup>

### **Issues affecting food production in the developing world**

Agricultural production is determined by a combination of technology, climate, policy and market forces. These factors change often, seasonally if not daily, and can quickly turn a prosperous village into a destitute one. Food insecurity is often brought on by changes in these factors that poor people cannot guard against because they have no insurance, few assets, and lack diversification of their income sources.

Agricultural trends are increasingly driven by global economic forces: new markets, price fluctuations, and greatly expanded trade in food. Even rural farmers in developing countries are forced to find ways to cope with these changes, and some of them will be better off through new market opportunities, but they also face new sources of vulnerability. The most important trends affecting food production in developing countries are increases in livestock production, horticulture, and fisheries. Some of these trends are driven by agricultural interventions designed to improve household nutrition, such as home gardens.<sup>5</sup> These trends bode well for dietary improvements in the countries whose populations can afford the new food choices.

Farmers are diversifying into livestock as consumers acquire the purchasing power to demand more meat. This trend is apparent in China, parts of south-east Asia, and

wealthier Latin American countries. By now, production levels in some of these countries have satisfied their middle-class and wealthier populations and the demand for meat is rising more slowly. Oil is also more widely used in developing countries where people can afford it, improving caloric intake for large numbers of people. This trend is expected to continue. Some unintended consequences of the production changes are also evident. Pulse production in parts of Africa has declined as feed grains for livestock have been substituted for that food staple. The livestock produced is not affordable nor adequate to feed as many people as the pulses and iron deficiency is rising in areas where this is occurring.

Green revolution technologies greatly increased availability of cereals to large developing country populations in India, parts of Asia and Latin America. However, the varieties of staple crops cultivated in marginal areas and under difficult conditions were not included in the search for paths to increase production. The staples of the very poor – cassava, sweet potato, taro, sorghum, millet – need research aimed at improving nutritional value and tolerance to poor climatic conditions. Experiments involving plant breeding for trace mineral augmentation are underway and may eventually offer increases in vitamins and minerals, along with greater bio-availability.<sup>5</sup> Yields of the main staple crops rose only 1% during the 1990s which is not enough to improve food security in poor populations.<sup>4</sup>

Another major trend affecting agricultural production in developing countries is international trade. In regions that are open and have good trading opportunities, farmers are trying to diversify into cash crops such as cotton, palm oil, coffee, rubber, and so on. In some cases, this raises cash income of farmers, but it can also lead to a nutrition crisis as cash crops substitute for staple food crops. Populations can be left without either food or the means to purchase it when prices fall, or their productivity levels or quality cannot compete with crops on the global market.

However, the globalization tale does not have to end badly for nutritional outcomes. In some areas, poor farmers are increasing diversification by planting seasonal cash crops combined with fisheries, long-term fruit and coffee plantations, or both. The potential for improved income, along with diversification of food sources and types, depends on the technology available to the farmer, the climate, and the government policies that affect trade flows and prices. A mixed cropping or crop/livestock system can provide dietary diversity and reduce vulnerability to shocks, even in a resource-poor region.

#### **Environmental constraints affecting agriculture production**

For poor farmers with low technology the environment poses one of the greatest hazards to their livelihood. Some of the environmental threats are natural – floods, landslides, earthquakes – and cannot easily be avoided. Others are created by human intervention, often the farming practices themselves,

and can over time erode the productivity of the resource base relied upon for food. The most damaging is environmental pressure associated with intensification of land use in the form of chemical applications of fertilizers and pesticides. In some areas, water systems are contaminated, soil has become acidified or waterlogged from poor irrigation systems, and soil nutrients have been destroyed.

The trend of increased production intensification and chemical use is expected to continue in farming. Rising incomes in developing countries will fuel greater use of chemicals, and will worsen associated health problems from improper application. Climate change is expected to harm developing countries disproportionately, especially sub-Saharan Africa and coastal areas. This will affect horticultural activity, aquaculture and coastal fisheries in many developing countries, posing food security risks especially to major urban areas.

#### **Dynamic issues**

Several trends beyond the agricultural sector will greatly affect nutritional choices and food availability to poor populations in developing countries. The increasing urbanization underway in developing country regions, especially Africa, will continue to change people's diets. Food insecurity is rising among urban populations in a number of developing countries, although still lower than in rural areas. Over-nutrition is also becoming a significant concern in the developing world, and is concentrated in cities. Concomitantly, incidences of heart disease, cancers, diabetes, and other chronic disorders is growing.

Another demographic trend of importance to nutrition prospects is the ageing of developing country populations. While far less advanced than the ageing of populations in developed countries, this transition is reflected in large numbers of children reaching working age, falling fertility rates, and still relatively few old people needing to be supported. The concomitant surge in productivity that could ensue is sometimes termed the 'demographic dividend.' The result can be great opportunities for investment and savings and higher economic productivity if jobs are available for the young workers. Channelled properly, the result will be higher incomes and improved nutrition.

#### **The recommendations for a food-based strategy to prevent chronic disease**

The WCRF has presented a comprehensive and evidence-based set of recommendations to guide dietary choices to prevent chronic disease. How well do those recommendations fit the reality of the agricultural sector as described above? In some respects, the recommendations are quite compatible with on-going and projected production and consumption changes and will be relatively easy to implement.<sup>4</sup> In other cases, it will be very difficult, either because of economic or socio-cultural preferences, to achieve modifications in people's diets to comply with the food-based strategy. The easy cases first.

*WCRF Recommendation: Less than 10% of energy needs from red meat.*

Comment: This condition is met in most of the developing world already. Maintaining it as incomes rise will depend on reducing subsidies to industry to produce meat, incorporating the full cost of production including environmental damage into the price of meat, and consumer education.

*WCRF Recommendation: Fats to provide no more than 15–30% of total energy, with limits on animal-derived oil.*

Comment: Oil consumption currently provides 6–11% of energy intake in most developing countries (with some extreme exceptions such as Pacific Islands) and is rising. There is no reason to expect this proportion to exceed recommended intake given current trends.

Not so easy, but feasible, changes are possible in developing countries in order to meet some of the other dietary recommendations.

*WCRF Recommendation: A variety of starchy and protein-rich foods of plant origin should provide 45–60% of energy, with sugars comprising less than 10% of the total.*

Comment: Many developing countries fall within these guidelines currently and are expected to maintain reliance on foods of plant origin. However, 22 developing countries are heavily reliant on consumption of starchy staples with resulting micronutrient deficiencies and other problems. These include countries with limited resources and harsh agro-climatic conditions that make it difficult for farmers to diversify. It will be necessary to change agricultural practices, perhaps ultimately through drought-resistant varieties and other new technologies, to improve dietary intake of most people in these conditions.

Alternative interventions may be more cost-effective. Research in Bangladesh on iron deficiencies in diarrheal children shows that de-worming is likely to be more cost-effective as a means of protecting iron nutritive in poor children than providing iron-rich foods.<sup>5</sup>

*WCRF Recommendation: Encourage fish consumption.*

Comment: While some developing country populations consume large amounts of fish per capita due to cultural tradition and proximity to productive fisheries, environmental threats to ocean fisheries and aquaculture may reduce these amounts. For adequate amounts of fish to be available to developing country populations, significant investment will be needed in technological improvements in aquaculture along with resolutions of disputes relating to territorial waters. The latter would not ordinarily be expected to fall in favour of developing countries in cases where developed countries are party to the disputes. Nonetheless, establishment of fish ponds has demonstrated benefits in micronutrient intake in a number of experimental interventions.<sup>5</sup>

Among the most difficult challenges for populations in developing countries to comply with are:

*WCRF Recommendation: Conversion of cereal output to human consumption rather than animal feed.*

Comment: 20% of the world's wheat production and 70% of maize production is intended for animal use, although a significant share is grown in developed countries. Most rice production is intended for human consumption. The difficulty of even maintaining current levels of cereal consumption for humans,

let alone increasing the proportion of overall production that is consumed directly by humans, is that consumers demand greater quantities of meat as incomes grow, increasing the amount of feed grain needed. This pattern is expected to spread to more developing countries, albeit slowly.

*WCRF Recommendation: Vegetables and fruits to provide 7% or more of energy intake.*

Comment: The feasibility of meeting this target depends greatly on agro-climate, soil and water conditions, and technical knowledge, such as integrated pest management. There are many food-insecure developing countries with limitations on growing horticultural products except in greenhouses or other artificial environments, which are unaffordable to many poor people. This recommendation cannot be fulfilled until substantial income changes occur that allow food importation or development of artificial environments.

*WCRF Recommendation: Little or no alcohol consumption*

Comment: This recommendation is antithetical to cultural practice and traditions in many developing (and developed) countries. In fact, increased alcohol consumption is more likely as per capita incomes rise in some developing country regions. A massive educational campaign or strictly enforced prohibitions would be needed to limit alcohol consumption in some countries, and neither is politically feasible.

*WCRF Recommendation: Store foods in ways to minimize fungal contamination. Refrigerate perishables or use preservation methods. Do not salt or cure meats for preservation.*

Comment: The recommendation flies in the face of economic reality in most developing country households, where refrigeration is nonexistent and storage of foods is a necessity of survival between harvests. Poor households often do not have the opportunity to keep much food in storage, but when they do, methods used are primitive and stockpiles are vulnerable to infestations and other exposures. Interventions such as solar drying and other introduced preservation technologies show mixed results.<sup>5</sup>

*WCRF Recommendation: Enforce food safety standards regarding pesticide applications and avoid contamination to the consumer by washing foods, filtering water and avoiding polluted food products.*

Comment: As discussed above, chemicals are often over- and misused in developing countries. At the household level, lack of access to water, already-contaminated water, and lack of technology for filtration would make compliance with these recommendations unfeasible for large numbers of people in developing countries. These conditions could be changed with extensive efforts to install safer water storage facilities with covers and taps. Training on chemical use can also be increased, although research has shown mixed results in some populations.<sup>6</sup>

*WCRF Recommendation: Encourage low temperature meat cooking and avoid cooking over wood.*

Comment: The vast majority of food cooking in the developing world takes place over open fires in the home. This exposes people to indoor air pollution, the major cause of respiratory disease among women and children. Fuel alternatives are too expensive for most people in developing countries. Cookstove hoods and stove replacements are a more feasible intervention than radical changes in cooking practices.

### Conclusions on a dietary policy for prevention of chronic disease in developing countries

Several important issues must be considered in formulating a policy to address nutrition issues in the developing world. Among them is the recognition that people face limitations on dietary choices from their economic and agro-system conditions. The most constrained populations in the world are poor rural dwellers in resource-poor countries, followed closely by their poor urban counterparts. Consisting of about 800 million people, the food-insecure in developing and transitional countries are struggling with a variety of challenges, adequate diets being just one of them.

Thus, one of the issues for governments and private organizations and individuals to consider is the priority of chronic disease prevention among all the needs they face. The WCRF report suggests that 30–40% of cancer incidences and mortality worldwide could be eliminated if the dietary guidelines are followed. This would account for 3–4 million fewer cases of cancer and 2–2.5 million lives saved, compared to the 6.6 million children's deaths from malnutrition that occur every year, and 60 million people facing food emergencies at any given time. Beyond cancer, poor diets are risk factors for other chronic diseases and the global burden of disease is now 60% attributable to these conditions. Further, chronic diseases can be expected to rise with ageing populations, rising incomes, and increased urbanization. Choices must be made about which problems deserve priority consideration in both policy and interventions. Priority-setting should be informed by data about burden of disease and costs of intervention.

When decisions are made to address dietary deficiencies as part of a strategy to prevent chronic disease, there will be a need to design cost-effective prevention programs that are culturally specific and proven. Rather than a global approach, care must be given to understand the potential for any given recommendation in a specific context. Further, lessons cannot be simply transferred from the scientific understanding in the developed world to a human intervention in the developing world. Research is needed to better understand the links between nutrition and chronic diseases in developing country settings and should be associated with realistic assumptions about the agricultural context, or sustainable agriculture or food-based interventions. Resources spent in developing countries on dietary improvements should have returns commensurate with those for other health interventions. The benefits of colo-rectal cancer screening may not be seen for 10–20 years, and breast cancer prevention for even longer. The policy relevance and economic relevance of those efforts will be difficult to justify in countries that still face communicable disease epidemics and lack of basic health care.

As mentioned earlier, globalization, urbanization, and changing consumer habits are all factors that present increased challenges to preventing chronic diseases through diet. Globalization encourages consumption of more processed and less fresh foods. Urbanization in developing countries leads to a nutrition transition, reducing reliance on traditional diets and increasing consumption of packaged foods. Higher incomes induce greater tobacco consumption and a dietary transition to increased meat and fat intake. Managing the challenge of existing food insecurity with the dietary needs of chronic disease prevention means the necessity to scrutinize country policies, rather than plans, and to encourage real modernization of the agricultural sector. Incentives will have to be created for farmers to grow the food called for in the dietary guidelines, and these incentives will need to be backed up with access to modern technology and know-how for developing country farmers to survive all the other trends affecting their livelihoods.

In support of the needed changes, globalization also brings mass communication systems and consumer awareness. Communication and information systems can be used more effectively than ever to spread awareness of appropriate dietary habits, agricultural best practices, food safety and other needs to keep consumers safe. Urbanization can be accompanied by appropriate cross-sectoral planning to incorporate green spaces for local horticulture in proximity to the population. Fresh fruits and vegetables can sometimes be provided by local farmers safely and reliably with appropriate infrastructure support and planning.

A new policy approach to nutrition security is needed that incorporates new knowledge, new problems, and recognition of the interactions among diet, disease, and other health outcomes. The approach must combine understanding of trends and constraints in agriculture, health, nutrition and the environment. Changes in diet and activity are needed for almost all populations and the challenge of scientists and policy-makers is to determine how those can be made compatible with the other changes occurring in the developing world.

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