

# Fruit and Vegetables for Health

Report of a Joint FAO/WHO Workshop



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Report of a Joint FAO/WHO Workshop,  
1–3 September 2004, Kobe, Japan



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## 1 Background

Noncommunicable diseases (NCDs), especially cardiovascular diseases (CVDs), cancer, obesity and type 2 diabetes mellitus, currently kill more people every year than any other cause of death. Four factors in the epidemiology of these diseases – poor diet, physical inactivity, tobacco and alcohol use – are of overwhelming importance to public health.

Fruit and vegetables are an important component of a healthy diet and, if consumed daily in sufficient amounts, could help prevent major diseases such as CVDs and certain cancers. According to *The World Health Report 2002*, low fruit and vegetable intake is estimated to cause about 31% of ischaemic heart disease and 11% of stroke worldwide.<sup>1</sup> Overall it is estimated that up to 2.7 million lives could potentially be saved each year if fruit and vegetable consumption was sufficiently increased. Recommendations in this direction tend to complement and reinforce other valid messages based on the long-known health benefits of consuming vegetables and fruit as dietary sources of fibre, vegetable proteins and protective micronutrients. The recent Joint FAO/WHO Expert Consultation on diet, nutrition and the prevention of chronic diseases, recommended the intake of a minimum of 400g of fruit and vegetables per day (excluding potatoes and other starchy tubers) for the prevention of chronic diseases such as heart disease, cancer, diabetes and obesity, as well as for the prevention and alleviation of several micronutrient deficiencies, especially in less developed countries.<sup>2</sup> The recommendation thus adds to the already strong case for the health benefits to be gained from the consumption of fruit and vegetables and paves the way for concrete action advocating increased consumption of these commodities.

WHO has responded to the global rise in NCDs by giving increasing attention to their prevention and control, most recently through the Global Strategy on Diet, Physical Activity and Health endorsed at the Fifty-seventh World Health Assembly on 22 May 2004.<sup>3</sup> Within the framework of this Global Strategy, WHO aims to actively promote an increase in fruit and vegetable intake worldwide. To reach this goal, WHO and FAO have formed a partnership around the theme of fruit and vegetables for health.

WHO and FAO announced their joint effort at the Third Global Forum on NCD Prevention and Control held in Rio de Janeiro, Brazil, in November 2003, emphasizing that worldwide awareness of the health benefits of fruit and vegetable consumption needs to be increased. In addition, accelerated national initiatives are required to produce and efficiently market more affordable horticultural products, while ensuring that they are safe and that fewer losses occur along the post-harvest handling chain.

WHO and FAO held their first joint workshop – Fruit and Vegetables for Health – at the WHO Centre for Health Development in Kobe, Japan, on 1-3 September 2004. Participants included nutrition, health and agricultural scientists, representatives from ministries of health and agriculture, advisers on nutrition from WHO Regional Offices, experts from the World Food Programme, the United Nations Economic Commission for Europe, the Secretariat of the Pacific Community, the International Food Policy Research Institute, and the global "5 A Day" community, which promotes fruit and vegetable consumption (see Annex 1 for the list of participants and Annex 2 for the workshop programme).

The overall goal of the workshop was to develop a draft framework to guide the development of cost-efficient and effective interventions to promote adequate consumption of fruit and vegetables in Member States. The expected outcomes of the workshop were a series of background papers prepared by experts (and published in separate documents, available under: [www.who.int/dietphysicalactivity/fruit/en/](http://www.who.int/dietphysicalactivity/fruit/en/), and the elaboration and endorsement by participants of a draft framework to guide effective fruit and vegetable promotion interventions at national level, taking the whole chain from production to consumption into account (i.e. production, trade, post-harvest handling, processing, distribution, marketing, procurement, preparation and consumption of fruit and vegetables).

Presentations of the background papers and case studies from selected countries are summarized in section 3 of this report. The points and arguments raised by participants

<sup>1</sup> *The World Health Report, Reducing risks, promoting health*. Geneva, World Health Organization, 2002.

<sup>2</sup> *Diet, nutrition and the prevention of chronic diseases. Report of a Joint FAO/WHO Expert Consultation*. Geneva, World Health Organization, 2003 (WHO Technical Report Series, No. 916).

<sup>3</sup> Available from: <http://www.who.int/dietphysicalactivity/en/>





during the discussion are included in text boxes in Section 3. While these do not reflect the opinion of WHO or FAO, nor the workshop participants overall, they are included to reflect the rich discussion and different points of view raised during the workshop. The conclusions of the workshop are summarized in Section 4 and Section 5 contains the draft framework.

The workshop was financially supported by the WHO Kobe Centre for Health Development. FAO's support for the participation of a number of agriculture and horticulture experts from Africa, Asia and Latin America was supplemented by contributions from ongoing national programmes - Special Programme on Food Security and others - in Ghana, Nigeria, Thailand, and Venezuela, from the P.N. Agricultural Science Foundation, India and also from programmes funded by Belgium, DANIDA (Denmark) and Norway.

## ② Welcome address

The Director of the WHO Centre for Health Development (WKC), Dr Wilfried Kreisel opened the workshop. He stressed that the workshop was an excellent opportunity for the two UN agencies to join hands and consequently to have a stronger impact on the health outcomes of corresponding policies, programmes and activities of the Member States. He reminded the participants that WHO had identified low fruit and vegetable intake as one of the top 10 risk factors contributing to mortality, and that adequate fruit and vegetable consumption could help prevent major chronic NCDs. In addition, low consumption of fruit and vegetables also contributes to hunger and to malnutrition through micronutrient deficiencies, which increase the risk of mortality and morbidity throughout the life course.

Dr Kreisel explained that WKC forms an integral part of the Secretariat of WHO. Established in 1996, it is one of the newest WHO research-oriented centres. Its mandate is to carry out innovative, interdisciplinary research into the health consequences of social, economic, environmental and technological change at global and local levels. He acknowledged this joint workshop as an important opportunity for both WHO and FAO to share scientific knowledge and experience in both health and agriculture and called on participants to consider how to incorporate fruit and vegetable promotion initiatives into their countries' existing programmes and policies.

After Dr Kreisel had concluded his opening remarks, Professor Hester H Vorster (South Africa) was elected as chairperson and Mr Chavalvut Chainuvati (Thailand) as co-chair. Rapporteurs were Dr Prem Nath (India) and Ms Christine Quested (Samoa).

## ③ Presentations

### >>> 3.1 Overview of health effects of fruit and vegetables- regarding cancer, CVD, obesity and diabetes

*Dr Lydia Bazzano*<sup>4</sup>, Beth Israel Deaconess Hospital, Boston, USA, *Dr Anna Ferro-Luzzi*, WHO Collaborating Centre for Nutrition, National Institute of Research on Food and Nutrition, Rome, Italy, *Dr Beth Tobill*<sup>5</sup>, Nutrition and Physical Activity Division, Centers for Disease Control, Atlanta, USA

NCDs are the main cause of death in most regions of the world. Research findings reviewed for this paper are strongly suggestive of a potential for fruit and vegetables to reduce the risk of type 2 diabetes mellitus. Several short-term, carefully-conducted clinical trials show that the consumption of fruit and vegetables can help achieve or maintain a healthy body weight. However, longer-term intervention studies and epidemiological studies have given inconsistent results. The findings show that diets rich in fruit and vegetables significantly reduce the risks of ischaemic heart disease and stroke.

The following recommendations can be made: for weight management, longer-term and carefully-designed clinical studies are still needed to determine whether the consumption of fruit and vegetables can help with weight management. With regard to type 2 diabetes mellitus and CVDs, further research is needed to evaluate separately specific fruits and vegetables. Also, research needs to be conducted in developing countries, since most of the evidence to date comes from industrialized countries.

<sup>4</sup> <sup>5</sup> Fuller details can be found in the related background papers at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)

### Points raised in the discussion

- There is a need for policies to promote/support fruit and vegetable consumption.
- Adding fruit and vegetables to the diet does not necessarily decrease the energy density of the diet. There is a need to consider how people are preparing and eating them. Fruit and vegetables need to replace other high energy foods in the diet to effectively decrease its energy density.
- With regard to health benefits, it is better to consider fruit and vegetables as a broad food group rather than splitting them into individual fruits or vegetables. This is more useful because it is not known which components in fruit and vegetables are beneficial. There is a need to increase consumption of fruit and vegetables in general and also increase variety to ensure the best possible benefits.
- There is a need to look at the total diet and different dietary components, not just consider fruit and vegetables on their own.



### >>> 3.2 Trends in fruit and vegetable consumption and effects as part of the nutrition transition

*Dr Carlos Monteiro, University of Sao Paulo, Brazil*

In the last four decades the relative availability of staple foods (cereals, pulses and starchy roots) has decreased in almost all geographic regions. There are indications of partial shifts from staple foods towards vegetable oils and sugar in low and lower-middle income countries; towards vegetable oils, sugar and meat in upper-middle income countries, and towards vegetable oils and meat in higher-income countries. The relative availability of fruit and vegetables has only increased slightly in most countries and is still well below the recommended level in both developed and the developing countries.

The impact of food availability changes on nutritional parameters of the diet are shown in the following table:

Likely impacts
<ul style="list-style-type: none"><li>• increase in total fat content and decrease in total carbohydrate content everywhere</li><li>• increase in energy density everywhere</li><li>• decrease in fibre content everywhere</li><li>• decrease in protein content in less developed countries</li></ul>
Possible impacts
<ul style="list-style-type: none"><li>• increase in saturated fats</li><li>• decrease in some vitamins and minerals</li><li>• increase in the glycaemic index</li><li>• decrease in bioactive compounds (flavonoids, etc)</li></ul>

The food availability changes in the last four decades are therefore consistent with the transition of human diets particularly in relation to the incidence of obesity, CVD, diabetes, certain types of cancer, and other nutrition-related NCDs. A higher replacement of staple foods by fruit and vegetables, instead of meats, fats and sugar, would have avoided most of this deterioration. An increase in the availability (and consumption) of fruit and vegetables, particularly if these replace meats, fats and sugar where these are being consumed to excess, has the potential to revert the deterioration seen over the last decades.

### >>> 3.3 Worldwide production of fruit and vegetables

*Ms Alison Hodder<sup>6</sup>, Horticultural Crops Group, Food and Agriculture Organization, Rome, Italy*

The fruits and vegetables most widely produced and consumed in the world have been examined using FAOSTAT data from 1980 to the present. Current production of the 15 vegetables studied has risen above 1980 levels e.g. by 74% for green (sweet) corn (maize) to 259% for spinach and eggplant. For 11 of the 15, production has risen over 100%. The rise in production has been relatively steady for almost all the vegetables studied.



Between 1980 and 2001, consumption rose substantially for all 15 vegetables. On a per capita basis worldwide, consumption of all 15 categories rose by double digits, with cabbage the lowest (21%), and eggplant the highest (148%).

Of the 15 vegetables, 12 had export growth since 1980 of over 100% in volume and five exceeded 200%. Garlic enjoyed the highest absolute rate of export growth; 11.4% per year (much of the growth has been in the most recent years). The export values of garlic and frozen vegetables have had very strong growth. Vegetable imports were valued at US\$ 7.3 billion in 1980 and reached US\$ 21.6 billion in 2002.

Only five of the 15 fruits studied showed production increases greater than 100% between 1980 and 2003. These include watermelons, cantaloupes and other melons, lemons and limes, and other fresh fruit not otherwise specified (which covers a wide range of minor fruits). Annual growth rates in production of some fruits have been substantial.

Solid consumption growth was revealed for all 15 fruits between 1980 and 2001. On a per capita basis, growth has been somewhat more restrained; only two fruits, watermelons and cantaloupes/melons, have experienced triple digit growth. However, all 15 categories of fruit had double digit consumption growth, apart from plantains (0.66%) and pineapples (-21%).

Fruit export volumes have grown enormously in the 24-year period. For example, increases on 1980 figures have been 310% for cantaloupes/melons, 357% for orange juice, and 280% for pineapples. Orange juice exports have expanded at a rate of 7.2% per year, while melons/cantaloupes, pineapples and lemons and limes have enjoyed rates above 6% per year. In many instances trade





has been from developing country exporters, adding to their purchasing power and capacity to import other foods. The value was substantial for all fruits, but greatest for grapes, orange juice, cantaloupes/melons, pineapples and watermelons.

Imports of a few categories of fruits have surged. In the past few years import volumes of concentrated apple juice have increased by 1944%, with a yearly growth of 14.7%. Pineapple import growth has been 399%, or 7.6% per year.

While this study analysed trends in the 15 major fruits and vegetables, it omitted many other horticultural products for which there is a lack of data due to the small volumes traded. However, some of these products are very important for the local economy and food security of some developing countries and further research is needed to quantify their significance in this respect.

As several fruits and vegetables are in oversupply, many developing countries have diversified into the production and export of organically-grown fruit and vegetables. Sales of these products have expanded considerably in the last decade, with growth rates estimated at 25% per year in some instances. Consumer concerns for the safety and healthiness of foods, and perceptions that organic foods are better for health, have fuelled this growth. Retail sales of organic fruit and vegetables were estimated at US\$ 1.7 billion in the European Union in 2002.

### >>> 3.4 Measuring intake of fruit and vegetables

*Dr Antonio Agudo<sup>7</sup>, Catalan Institute of Oncology, Barcelona, Spain*

The accurate measurement of fruit and vegetable intake is essential to provide valid messages about fruit and vegetables and health. When defining or grouping fruit and vegetables, botanical and culinary classifications, as well as nutritional properties and potential health effects, should be taken into account. The inclusion of composite foods in fruit and vegetable assessment may be important depending on dietary patterns in each country. The error of omitting such foods seems to affect measurements of intake of vegetables more than fruit.

In dietary assessment methods, the completeness, structure and wording of the questionnaire must be considered. A short list of fruit and vegetables has less validity than a longer one and validity is improved when questions on portion size are included.

In dietary guidelines it should be emphasized that the frequently-recommended five servings-per-day should be considered as a minimum. Separate advice should be given for fruit and for vegetables.

### Points raised in the discussion

- There is a need to collect additional data to reflect appropriately the consumption of fruit and vegetables in the context of health.
- To increase the usefulness of data on production, consumption, and trade, consideration needs to be given to the type of data needed: fruit and vegetables are not all equally good for health, there is variability among vegetable types in health benefits (not all of which are fully understood), and macro-pictures of production and consumption do not reveal localized deficits or patterns within the informal sector.

<sup>6</sup> A statistical overview prepared by the Horticultural Products Group, FAO Commodities and Trade Division : full text available under : [www.who.int/dietphysicalactivity/fruit](http://www.who.int/dietphysicalactivity/fruit).

<sup>7</sup> Fuller details can be found in the related background paper at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)

A standard portion size is assumed to be 80g and the studies reviewed showed that, on average, this is appropriate. However, actual portions tend to be lower for vegetables and higher for fruit. It is advisable to provide the consumer with detailed lists of the usual portion sizes of fruit and vegetables commonly eaten, together with overall broad recommendations for fruit and vegetable intake.

All public health recommendations on fruit and vegetable intake should be flexible and adapted to local circumstances because of the wide variability of dietary patterns, food availability, food preferences and cultural considerations of food.

### Points raised in the discussion

- There is a need to decide which data should be collected to measure fruit and vegetable production, supply, and consumption. Appropriate indicators are needed to ensure that what is measured provides the necessary information.
- There is a need to decide on the definition of fruit and vegetables to avoid confusion.
- There is a need to take into account inter alia cultural and socioeconomic differences between countries when considering the promotion of fruit and vegetables.
- The amount of fruit and vegetables required by an individual per day is at least 400g; this is a minimum, not the target.
- It was suggested that some countries have such a low intake at present that 400g may not be an appropriate minimum target; they may never reach this goal. However, the consensus of the meeting was that the 400g minimum should be the ultimate goal for all countries, but that each country could set intermediate objectives to reach the 400g goal according to their own situation.
- Along with the 400g minimum goal the ideas that “variety is important” and “fresh is better” should be incorporated into promotional messages.

### >>> 3.5 Effectiveness of interventions and programmes promoting fruit and vegetable intake

*Dr Karen Lock<sup>8</sup>, London School of Hygiene and Tropical Medicine, London, United Kingdom*

In some developed countries, including Australia, the United Kingdom of Great Britain and Northern Ireland and the United States of America, fruit and vegetable promotion initiatives have been established for several years. Various groups of researchers have also performed food-based intervention studies for primary and secondary prevention of chronic conditions. An up-to-date systematic review of the literature on promotion programmes and interventions promoting fruit and vegetable consumption was carried out to examine the effectiveness of such interventions in promoting fruit and/or vegetable intake.

In April 2004, the following databases were searched from the earliest record: PUBMED, CAB Abstracts (including nutritional abstracts and reviews), The Cochrane Library (including DARE: Database of Abstracts and Reviews of Effects), Web of Knowledge (including Web of Science and ISI database), IBSS (International Bibliography of the Social Sciences), Psychinfo (BIDS), EMBASE, AGRICOLA, LILACS, ID21, ERIC, SIGLE and INGENTA.

The search strategy was designed to be used in PUBMED and adapted to the other databases. Papers published in Danish, English, French, Norwegian, Portuguese, Russian, Spanish and Swedish were considered. The reference lists of articles found were also examined and experts in the field in all regions of the world contacted. All individual- and population-based interventions and promotion programmes which encouraged consumption of a diet rich in fruit and/or vegetables in unsupervised (i.e. free-living) children and adults of both sexes who were not acutely ill were included, providing individuals were followed for at least three months and changes in fruit and/or vegetable intake were estimated.

The results of this review showed that a wide range of interventions and programmes promoting fruit and vegetable intake in children and adults around the world have already been performed and assessed. Interventions aimed at children achieved an increased intake of 0.14–0.9 servings of fruit and vegetables per day, and in adults intake increased by up to 1.2 servings per day. None of the studies showed a detrimental effect of the interventions on fruit and vegetable consumption.

<sup>8</sup> Fuller details can be found in the related background paper at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)

## Points raised in the discussion

- Initiatives to promote intake of fruit and vegetables must be based on scientific evidence. Evaluating projects is essential to learn what works and what does not. Without evaluation, much time and money may be wasted repeating things that do not work. Simple acceptable evaluation tools need to be developed so that projects can be evaluated easily.
- Messages concerning fruit and vegetables need to be integrated into guidelines with other healthy-diet messages and into different healthy-diet programmes, e.g. cancer prevention.
- Messages need to be country-specific and culturally-relevant. For example, bananas can be classified as a fruit, but where they are eaten as a staple in a country, they should be classified differently to ensure sufficient diversity of fruit and vegetables in the diet.
- There is a lack of data from developing countries; a lot of the current information is from Europe and the United States.



### >>> 3.6 Production interventions to improve the availability of and access to fruit and vegetables for all

*Mr Wilfried Baudoin<sup>9</sup>, Horticultural Crops Group, Food and Agriculture Organization, Rome, Italy*

A variety of strategies can be employed to improve the long term productivity, diversity and quality of fruit and vegetable production. In order to direct these strategies more precisely, the various target groups should be differentiated, i.e:

- the rural poor, through the promotion of homestead gardens and small-scale commercial production;
- the urban poor, through the promotion of urban and peri-urban intensified horticulture for home consumption and neighbourhood marketing;
- commercial farmers, through market-oriented fruit and vegetable production responding to national, intra-regional and international market opportunities.

In general, production interventions are planned and implemented with the growers' community in cooperation with national horticultural research and development centres under the ministries of agriculture. The sustainability and further expansion of pilot production interventions depend on a series of key elements of the supply chain that need to be addressed. These include micro-credit facilities, input of items that meet local requirements (e.g. tools), marketing to reduce transport costs and post-harvest losses, and storage and small-scale food processing to improve prices for perishable produce (e.g. onions) or to add value for selected markets (e.g. street food).

Increasingly, in addition to ministries of agriculture, other actors and stakeholders are involved, including civil society and decentralized authorities, in order to ensure effective linkages with the market as well as integration with social, educational and economic development programmes. Examples include school gardens, promoting the adoption of Good Agricultural Practices (GAP) for product quality and safety, and monitoring and impact assessment.

## Points raised in the discussion

For the implementation of production interventions, it is important to:

- provide clear messages and guidelines with regard to quality and safety of fruits and vegetables;
- pay special attention to fruit and vegetable species and cultivars that have a comparative advantage for their nutrient density or market value;
- adapt the intervention strategy to focus on the target beneficiaries;
- consider South-South cooperations to gain benefit from other countries' experience.

<sup>9</sup> Fuller details can be found in the related background paper at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)



>>> **3.7 A global initiative on fruit and vegetables: FAO's interdisciplinary approach to the promotion of fruit and vegetables and elements of a framework for action**

*Ms Alison Hodder<sup>10</sup>, Horticultural Crops Group, Food and Agriculture Organization, Rome, Italy*

FAO's work related to fruit and vegetables spans four departments within the Organization. A review of the work has been made to see where and how new activities linked to the Joint WHO/FAO Fruit and Vegetable Initiative will find a supportive environment. FAO has included the WHO/FAO Fruit and Vegetable Promotion Initiative in the Programme of Work and Budget and Medium Term Plan and will contribute to it through its Special Programme for Food Security which provides a field-oriented umbrella programme for improving production efficiency of fruit and vegetables.

Promoting the consumption of fruit and vegetables for health reasons implies a need to improve fruit and vegetable supply and distribution systems and, above all, to ensure their safety and quality. Increasing supplies of fruits and vegetables to enable all people, everywhere in the world, to have access to them is a major challenge. Thus, FAO's efforts to promote a viable and sustainable fruit and vegetable sector are shaped by the following basic considerations:

- The production and consumption of fruit and vegetables should be seen in a holistic supply chain approach i.e. from seed to table.
- The multiple roles of fruit and vegetable production should be considered in addition to ensuring nutritional and overall well-being, i.e. their vital role in income and employment generation and diversification of agricultural production systems.
- Policy and other implications related to increasing fruit and vegetable production and consumption should be considered, i.e. provision of inputs, production incentives, capacity building, marketing infrastructure and trade.
- Focus should be on less-developed sectors i.e. rural, urban and peri-urban areas, and more specifically in the low-income and food-deficit countries, and should be country and location specific, i.e. assisting countries to define their own action plans.
- Coordination and synergy should be enhanced by involvement of many stakeholders and partners in the commercial and informal sectors in the areas of production, processing, safety, quality control and marketing, as well as harmonization of efforts and collaboration among relevant UN and other international organizations.

The approach to promote sustainable production and increased consumption of fruit and vegetables relates to three broad categories of production systems: the formal commercial sector; the rural household; and the urban and peri-urban agriculture sector. Elements which could be included in a framework for action include:

- advocacy, information and decision support
- supporting urban/peri-urban horticulture
- promoting sustainable production and enhancing efficiency of production factors
- preventing post-harvest losses and enhancing value of fresh produce
- ensuring food safety and quality
- strengthening trade intelligence, marketing, processing, and financial services
- promoting research and technology
- investing in nutrition education e.g. in rural home gardens, school feeding and gardens.

<sup>10</sup> Fuller details can be found in the related background paper at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)



### >>> 3.8 Meeting consumers' needs and preferences for fruit and vegetables

*Mr William Clay<sup>11</sup>, Nutrition Programmes Service, Food and Agriculture Organization, Italy, Rome*

Efforts to expand and diversify fruit and vegetable production and consumption require the development of country-specific, multi-sector policies and programmes that address issues of both supply and demand. Strategies need to address a number of sociocultural, economic, commercial, educational and technical challenges, and commonly include:

- Increasing consumer awareness of the benefits of a balanced diet and building the motivation and skills needed to expand fruit and vegetable intakes.
- Increasing and diversifying the production of fruit and vegetables.
- Optimizing post-harvest supply chains to ensure that adequate amounts of a variety of produce and products are available to consumers.
- Understanding consumer expectations in terms of product taste, texture, form, price, convenience, and quality and safety attributes.
- Developing new and improved fruit and vegetable-based food products that meet consumer expectations and lead to increased fruit and vegetable consumption.
- Identifying and establishing new settings and programmes whereby fruit and vegetables can be offered daily to consumers.
- Implementing and evaluating promotional campaigns and education programmes, alongside efforts to increase the availability of, and access to, fruit and vegetables.

Different types of consumers (i.e. socioeconomic groups) acquire and utilize fruit and vegetables in different ways. Some consumers produce their own fruit and vegetables (auto-consumers), some are totally dependent on markets to procure fruit and vegetables (market-dependent consumers) and still others both produce and purchase fruit and vegetables (mixed-consumers). Similarly, different types of suppliers produce and market fruit and vegetables in different ways and through different channels. Smallholders and subsistence farmers produce for themselves and maybe a local market, while small-scale commercial producers and large commercial firms produce mainly for markets both near and far.

The identification of these consumer and supplier domains is important; factors which affect one domain of consumer or producer may not affect others in the same way. Therefore, to design sound interventions to improve fruit and vegetable intake, it is essential that the under-consuming population groups are identified and efforts made to understand their consumption behaviours.

In visualizing how various fruits, vegetables and derived food products move from different producers to different consumers, it becomes clear that what is commonly thought of as a

<sup>11</sup> Fuller details can be found in the related background paper at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)

### Points raised in the discussion

- Information of all kinds is very important for increasing production and consumption of fruit and vegetables. The information needs are very broad including marketing information and price signals to help growers and producers decide what to market and when; and diet, nutrition and food preparation information to encourage consumers to purchase and eat fruit and vegetables.
- As supermarkets become more important for marketing fruit and vegetables there are concerns that small growers may be excluded. Two complementary responses would be to improve the capacity of small farmers to help them meet the quality and supply standards of supermarkets while also working to establish and strengthen other marketing opportunities, including niche markets for certain products.
- Small growers in some countries cannot market their produce due to lack of infrastructure. Transport systems and cold chains need to be developed.
- Adding value to a product will help farmers find a market for goods and encourage consumption.
- Public policy is very important for determining which fruit and vegetables are produced and consumed. Manipulating fruit and vegetable prices through variable taxes is one possibility although it may act slowly, be unsustainable and of variable acceptability. A broad range of policies and support are needed to increase production.

food-chain is, in fact, a complex food-web or network. Within this web, it is imperative to protect and preserve the quality (desirability, edibility, safety and nutritional content) of produce over time and distance, and to extend opportunities for moving food, profitably, from its place of production to its place of consumption. In addition to the use of GAP, appropriate post-harvest technologies must also be employed.

The reasons consumers frequently give for not eating more fruit and vegetables include traditional and individual indifference or disdain toward certain foods, high prices and variable availability of many fruit and vegetables, their taste, the inconvenience of preparing them, and concerns about quality and safety. Consumers want foods that are tasty, readily available, affordable, convenient to acquire and prepare, socioculturally appropriate, safe and healthy.

The key to improving intake almost always lies in increasing the effective demand of consumers for fruit and vegetables. This requires aligning the supply of, and demand for, specific foods by specific consumer domains. This in turn requires comprehensive efforts to raise incomes, lower prices, expand, diversify and stabilize fruit and vegetable supplies, ensure food safety and increase the desirability of fruit and vegetables to consumers.

### >>> 3.9 Food safety aspects in fruit and vegetables

*Dr Gerald Moy, Food Safety Department, World Health Organization, Geneva, Switzerland*

Fruit and vegetables can be contaminated with a range of microbial and chemical contaminants. Fruit and vegetables eaten raw, as well as food of animal origin, have long been known to serve as vehicles for transmission of infectious microorganisms in developing countries. In contrast, the number of confirmed cases of illness associated with consumption of raw fruit and vegetables in industrialized countries has been relatively low compared to the number due to foods of animal origin. However, the number of cases associated with fruit and vegetables is not insignificant and includes infections caused by some of the more serious pathogens associated for foods of animal origin. Outbreaks of human disease associated with the consumption of raw fruit and vegetables often occur in developing countries and have become more frequent in developed countries over the past decade. The rapid growth of international trade in fresh produce has also resulted in outbreaks due to imported food.

Factors thought to influence the occurrence and epidemiology of these diseases include the quality of irrigation water, and other agronomic practices such as the inappropriate use of manures and biosolids. Measures to avoid such contamination have been encouraged.<sup>12</sup> The general level of hygiene in handling fruit and vegetables is also a major problem contributing to cross-contamination from animal products as well as direct contamination from the food handler. General guidance on food hygiene is provided by the Codex Alimentarius.<sup>13</sup>

Prevention of contamination is the most efficient way to ensure food safety and prevent foodborne illness. Thus, every effort should be made to protect food from primary sources of contamination.

However, this is not always possible and raw foodstuffs, particularly fruit and vegetables grown close to the soil, may be contaminated with various pathogens. In such cases, efforts should be made to establish critical control points to reduce contamination to safe levels, for example, by applying the Hazard Analysis and Critical Control Point (HACCP) system.<sup>14</sup>

In some countries, in addition to washing with water, chemical disinfectants are used to decontaminate the surface of fruits and vegetables.<sup>15</sup> Fruit and vegetables may also be contaminated with toxic chemicals from a variety of sources. Some of these are used intentionally, such as pesticides. While adherence to GAP regarding their application and pre-harvest interval should assure the safety of produce, exposure to pesticides may pose unacceptable health risks. Industrial pollution from the environment can also result in the deposition of contaminants on the surface of produce, particularly in farm land near certain industrial sites and motorways. Natural contaminants, such as mycotoxins, may be present on fruit (apples, figs) and vegetables (sweet corn). Some plant produce may contain inherent toxicants, such as toxins (mushrooms), phytohaemagglutinin (red kidney beans), solanines (tomato and potato) and oxalates (spinach and rhubarb). Washing can be useful to remove chemical contaminants. However, governments need to conduct adequate monitoring programmes, including total diet studies, to assure that safe or tolerable levels of contaminants are not exceeded.

<sup>12</sup> *Guide to minimize microbial food safety hazards for fresh fruits and vegetables*. Center for Food Safety and Applied Nutrition, Food and Drug Administration, College Park, MD, USA, 1998.

<sup>13</sup> Recommended international code of practice: General principles for food hygiene, CAC/RCP 1-1969, Rev. 3 (1997), Amended 1999, Codex Alimentarius, Joint FAO/WHO Food Standards Programme, FAO, Rome.

<sup>14</sup> Hazard analysis and critical control point (HACCP) system and guidelines for its application, Annex to CAC/RCP 1-1969, Rev.3 (1997), Codex Alimentarius, Joint FAO/WHO Food Standards Programme, FAO, Rome.

<sup>15</sup> *Surface decontamination of fruits and vegetables eaten raw: a review*. Geneva, World Health Organization, 1998 (WHO/FSE/FOS/98.2).



## Points raised in the discussion

- Often the perception of a food safety risk is greater than the risk itself. Small food safety risks can lead to large concerns among consumers and stop them from eating what they should. The risks associated with not eating fruit and vegetables are much greater than the food safety risk associated with eating them.
- Pesticide levels on fruit and vegetables in developing countries are not monitored so the levels of contamination are not known. Reliance is therefore placed on farmers to use agricultural chemicals wisely and consumers to wash vegetables properly.
- High levels of systemic nitrates can be found in dark-green leafy vegetables, apparently exceeding the acceptable daily intake. In particular situations, nitrate poisoning can be a problem for infants, although the risk should not be overrated.

### >>> 3.10 Patterns and determinants of fruit and vegetable demand in developing countries: a multi-country comparison

*Dr Marie Ruel<sup>16</sup>, International Food Policy Research Institute, Washington DC, United States of America*

Low fruit and vegetable intake is a main contributor to micronutrient deficiencies in the developing world, especially in populations with low intakes of other nutrient-dense foods such as meat and dairy products. Nationally-representative household data sets from 10 sub-Saharan African countries were used to document fruit and vegetable consumption patterns in this region, examine their determinants, and compare income elasticities for fruit and vegetable consumption. Income elasticities are defined as the percentage change in budget allocated to fruit and vegetables as income rises. Descriptive data were collected and multivariate regression analyses were used to look at the determinants of consumption.

The main goal of the analysis was to provide information to help guide future policy initiatives to promote and facilitate greater consumption of fruit and vegetables in sub-Saharan Africa. Effective programmes and policies are urgently needed to influence consumption behaviour and foster fruit and vegetable intake. The success of such initiatives will depend on how effectively they address the main constraints to consumption among the poor.

The results of the research show that fruit and vegetable consumption is very low in sub-Saharan Africa (27–114 kg/capita per year), far below the WHO/FAO recommendation of 146 kg/capita per year. Vegetable consumption is almost universal in the countries studied, but fruit consumption is much less common and is more variable across countries. Overall, there is a general positive trend of increasing consumption of fruit and vegetables as gross domestic product per capita goes up, but the trend is not fully linear. Food budget shares decrease as incomes and gross domestic product per capita increase, but overall, the percentage of the food budget allocated to fruit and vegetables is generally low (4–16%).

The household-level demand for fruit and vegetables rises with increasing income (income elasticities range from 0.64 to 0.99). A female head of household spends a greater share of her budget on fruit and vegetables than male peers, particularly for vegetables. Fruit and vegetable consumption is higher in urban than in rural areas, but this finding seems to be related to differences in income levels rather than location per se. Secondary education is associated with a lower share of the budget allocated to fruit and vegetables, which may be related to women's employment status outside the home and may reflect a related move towards increased consumption of convenience and time-saving processed foods.

Several policy implications can be drawn from this analysis namely that economic factors are important constraints to fruit and vegetable consumption among the poor, and income growth will contribute to greater fruit and vegetable consumption, but at a slow pace. Other interventions are needed to promote increased consumption of fruit and vegetables, for example:

- programmes to reduce price and increase availability through extending the duration of harvest and reducing post-harvest losses;
- processing fruit and vegetables to prolong their availability;
- making fruit and vegetable marketing less risky for small farmers;
- reducing important tariffs;
- removing unnecessary sanitary and phytosanitary restrictions;
- offering effective education based on sound knowledge of consumption constraints.

<sup>16</sup> Fuller details can be found in the related background paper at [www.who.int/dietphysicalactivity/fruit/en](http://www.who.int/dietphysicalactivity/fruit/en)





### Points raised in the discussion

- Constraints on fruit and vegetable consumption appear to be different in different areas of the world. There are many determinants of consumption, they are complex and require further study.
- In rural areas of developing countries differences may be due to cultural practices, economics, the environment, and lack of knowledge and skills to prepare fruit and vegetables.
- In Thailand (and other parts of Asia) fruit is abundant and lack of income is not a constraint to consumption as it is in Africa. As income rises more imported fruit is consumed. In the Republic of Korea, income does have some effect on fruit consumption for those with the lowest income.
- Consumption is also affected by season, and where women are gainfully employed outside the home, consumption is lower.
- In the Middle East, in some of the richest countries in the world, it appears that fruit and vegetable consumption is insufficient; children eat a lot of fast food and there are high rates of NCDs.

## >>> 3.11 Country case study presentations

### 3.11.1 BRAZIL

*Ms Angela Peres, Ministry of Social Development and Fight Against Hunger, Brasilia, Brazil*

Last year Brazil started the "Zero Hunger" programme. It recognizes that access to food is an essential right of every citizen and that adequate production can ensure adequate access to food. A National Food and Nutrition Security Policy is being prepared. The programme is coordinated by the Ministry of Social Development and Fight against Hunger in collaboration with other Ministries, namely health, education, agriculture, agrarian development, employment, and science and technology.

The Zero Hunger programme carries out many activities such as school meals, promotion of urban and family agriculture, food banks, an emergency food basket programme, a family stipend programme and community restaurants. Several educational manuals and leaflets have been prepared, such as comics on food and nutrition security.

The Ministry of Health has elaborated a National Food and Nutrition Policy promoting healthy dietary practices to combat under-nutrition

as well as obesity and other diet-related NCDs. Food labelling has been introduced and dietary guidelines for various age groups have been published.

Brazil is now planning to carry out three key initiatives at a national level:

- An initiative to promote fruit and vegetable consumption;
- Activities in the school environment to promote healthy practices;
- A regulation of food advertising and food commercialization in school cafeterias.

The National Council of Food and Nutritional Security has already initiated discussions on a fruit and vegetable promotion initiative. The main issues are to harmonize fruit and vegetable promotion with the National Food and Nutrition Policy; to inform the public about the health benefits of fruit and vegetables; to ensure for everyone the availability of and access to these foods, especially focusing on lower-income segments of the population; to provide fruit and vegetables in institutional food programmes; and to monitor and evaluate all activities.

### 3.11.2 ETHIOPIA

*Mr Milaku Jirata, Ministry of Agriculture, Addis Ababa, Ethiopia*

Agriculture is the mainstay of the Ethiopian economy, contributing 43% of the gross domestic product, providing 85% of export revenue and employing over 86% of the population. Ethiopia has highly-diversified agro-ecological conditions which are suitable for the production of various types of fruit and vegetables. However, the contribution of horticultural crops both to the diet and income of Ethiopians is insignificant.

With the aim of enhancing agricultural development, the Government considers various projects, including small-scale irrigation mainly through rainfall harvesting and home gardening, to be of crucial importance. As a result, vegetable and fruit production is being more widely adopted, primarily to ensure food security and to promote production of high-value crops for the market to improve living conditions of smallholders.

With regard to horticultural production, 46% of the vegetable-producing area is planted with potato followed by pepper and sweet potato. Traditional varieties of vegetables such as taro, yam and enchote are also grown but their production and consumption is declining. Among fruits, avocado, banana, orange, papaya and guava are common.

Commercial horticultural crop production is carried out mainly in the central rift valley and eastern part of the country. Most of the vegetables and fruit produced in the eastern region are exported to Djibouti and small amounts of fruit and vegetables are also exported to Europe, Pakistan, Saudi Arabia and Yemen.

Ethiopians consume on average 97g of fruit and vegetables per day. Cereals contribute about 75% of the Ethiopian diet. Pulses are a source of protein and widely consumed. The main constraint with regard to fruit and vegetable production is that, because of market and food security concerns, rural farmers prefer to produce cereals and pulses. Other constraining factors include low production and productivity, lack of adequate pest control, poor soil fertility management practices, lack of attention to product quality and prevention of physical damage, as well as the lack of storage and packaging facilities.

The Government of Ethiopia has formulated a national programme designed in such a way as to bring about meaningful improvements in productivity and quality of horticultural crops of different species to enhance their competitiveness in the market.

### 3.11.3 IRAN

*Dr Roya Kelisbadi, University of Medical Sciences, Isfahan, Islamic Republic of Iran*

As a comprehensive public health response to the rising chronic disease burden in the Islamic Republic of Iran, an integrated, community-based national programme entitled “Isfahan Healthy Heart Programme” was launched in 1999. Its aim is to integrate programmes and policies that effectively impact the major determinants of CVD, mainly through lifestyle change. This programme

is conducted by Isfahan Cardiovascular Research Centre (a WHO Collaborating Centre for Research and Training in Cardiovascular Diseases Control, Prevention, and Rehabilitation for Cardiac Patients), and Isfahan Provincial Health Office, both affiliated to Isfahan University of Medical Sciences.

Two counties (Isfahan and Najaf-Abad) are considered for interventions and a third (Arak) as reference. The populations of the three counties are studied for major risk factors such as diabetes, hypertension, hyperlipidaemia and smoking, as well as behaviour, attitude, skills and knowledge. There is also continuous surveillance and data collection on morbidity and mortality. This Programme serves as a pilot to identify appropriate and feasible interventions to be implemented nationally at a later date. Its goals are:

- to improve population behaviour, prevent and control risk factors and chronic diseases, delay the onset of disease, postpone death, reduce disabilities and disparities in treatment;
- to move the "disease care" system approach to a "health care" one.

The interventions are targeted at the whole population in the intervention areas using population-based strategies targeted at high-risk individuals, delivered through nine intervention projects, one focusing on healthy food. The activities to increase fruit and vegetable consumption include organizing sessions for the following:

- members of the fruit and vegetables shopkeepers' union, to train them about ways of transportation and storage of fruit and vegetables, and to coordinate with them to offer hygienic packaged vegetables;
- workers in restaurants, pizza shops and sandwich stalls, to encourage them to serve healthy menus including fresh or cooked vegetables.



Television and radio programmes are broadcast to the public on the benefits of fruit and vegetables, their proper washing, storage, healthy preparation, and cooking methods. Educational activities are organized for pre-school children including puzzles, posters and songs. A series of information booklets and two books on healthy diets for adults and children have also been produced.

#### 3.11.4 THAILAND

*Dr Somchai Durongdej, Mahidol University, Bangkok, Thailand*

Recent Thai data show that the numbers of overweight children are increasing. In 2000 about 14% of schoolchildren in Bangkok aged 6–12 years were recorded as being overweight or obese. In view of this finding, Mahidol University launched a project to promote fruit and vegetable intake among young schoolchildren. The objectives for the first phase are to:

- identify major determinants of fruit and vegetable consumption;
- determine the quality and quantity of fruit and vegetable consumption among school adolescents in 10 provinces of the Central Region of Thailand;
- recommend strategies for appropriate interventions.

The stakeholders involved in the project are the university, the Ministries of Health and Agriculture, local authorities, the Parental Association, NGOs, community leaders and WHO. The project will take into account ongoing activities such as the promotion of food-based dietary guidelines and the healthy school project.

Several barriers for project implementation were identified, namely:

- competing priorities in schools; that the promotion of fruit and vegetables as part of a healthy diet is not seen as important in an over-crowded curriculum;
- the proposed intervention perceived by the schools as too demanding;
- lack of teacher involvement/support for sustainability.

Thus the next steps are to identify concrete and sustainable strategies for increasing the consumption of fruit and vegetables among schoolchildren, to address how great an increase can be achieved, and to establish means for parental involvement.



## 4 Workshop Conclusions



- > While there is strongly suggestive evidence that there is potential for increased consumption of fruit and vegetables to reduce the risk of ischaemic heart disease, stroke and type 2 diabetes mellitus, further research is needed to evaluate specific fruits and vegetables. Further studies are needed on the role of fruit and vegetable consumption in obesity, weight management, and cancer prevention.
- > A daily intake of at least 400 g of fruit and vegetables, within the context of ensuring a better general dietary pattern as a population goal, was reconfirmed as an appropriate basic message.
- > Messages about fruit and vegetable consumption need to be integrated into food-based dietary guidelines, to be country-specific and culturally relevant, and coordinated with other messages about healthy diets.
- > In the face of ongoing nutrition transition, decreasing cereal consumption and a shift towards excessive fat consumption, there is a risk that the opportunity to promote fruit and vegetables as an integral part of a balanced diet is being lost.
- > There are major differences among countries and population groups in the kinds of nutrition-related problems that occur – ranging from under-nutrition and micronutrient deficiencies to over-nutrition. Intervention strategies to promote increased fruit and vegetable consumption need to be sensitive to these differences.
- > Farmers can be key players in overall strategies aiming to increase fruit and vegetable consumption: they are likely to be motivated by expectations of economic returns. Policies are needed to empower farmers so that diversification can become a reality along with cost-effectiveness in their production systems, and so that their harvests can be scheduled and managed to ensure year-round supplies of a range of safe produce.
- > Intervention strategies need to be multidisciplinary and coordinated, should comprise a balance of components to stimulate growth in both demand for and supply of fruit and vegetables. They need equally to recognize and address basic differences that exist between the respective supply chains for fruit and vegetable commodities and to take account of the range of supply and consumption scenarios – from subsistence to supermarkets.
- > Evaluating projects is essential in order to learn what works and what does not and to avoid wasting time and resources on inappropriate approaches.
- > The roles for WHO and FAO working jointly could include:
  - sponsoring and brokering health–agriculture partnerships in Member States to implement "fruit and vegetables for health" initiatives;
  - supporting countries in piloting and evaluating new projects to determine effective approaches for increasing intake, especially in developing countries;
  - taking the lead in the development of models of fruit and vegetable promotion interventions that are effective particularly in developing countries (as has been done in the case of other interventions e.g. models to promote breast feeding);
  - developing a simple evaluation tool that could be adapted in developing countries to facilitate measurement of the effectiveness of current and future interventions to promote fruit and vegetables;
  - helping to understand the effects of, and the potential and scope for, incentives and subsidies to stimulate growth and efficiency in fruit and vegetable supply chains, by compiling lessons learned, positive and negative experiences, and highlighting sensitive areas.







## ⑤ A framework for promoting fruit and vegetables at national level

This framework was elaborated and endorsed unanimously by the participants of the WHO/FAO workshop on fruit and vegetables for health, held at the WHO Centre for Health Development, Kobe, Japan, in September 2004.

The framework will guide the development of cost-efficient and effective interventions for the promotion of adequate consumption of fruit and vegetables at the national or sub-national level. In this process, national or local production capacities, traditional agricultural and dietary practices, prevailing patterns of nutrition, the health status of the population, and existing fruit and vegetable promotion programmes need to be taken into consideration. This framework includes general principles and examples of possible interventions for various consumer domains, in order to appropriately tailor fruit and vegetable promotion programmes to the target group(s).

### >>> 5.1 Guiding principles for a fruit and vegetable programme

Globally the right to nutritious food and the will to end hunger and ensure food security has been affirmed on several occasions. Article 25 (1) of the Universal Declaration of Human Rights, adopted and proclaimed by the UN General Assembly in December 1948, states:

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food [...] <sup>17</sup>

In 1992, Ministers and the Plenipotentiaries present at the International Conference on Nutrition, declared:

We recognize that access to nutritionally adequate and safe food is a right of each individual. <sup>18</sup>

The World Food Summit Plan of Action of 1996 refers particularly to the production of fruit and vegetables under paragraph 21, objective 2.3 (c) by calling on governments, in partnership with all actors in civil society, to

encourage, where appropriate, the production and use of culturally appropriate, traditional and underutilized food crops, including grains, oilseeds, pulses, root crops, fruits and vegetables, promoting home and,

where appropriate, school gardens and urban agriculture, using sustainable technologies [...] <sup>19</sup>

Five years later, in 2002, the Declaration of the World Food Summit reaffirmed “the right of everyone to have access to safe and nutritious food”. It emphasizes in paragraph 14

the need for nutritionally adequate and safe food and highlight the need for attention to nutritional issues as an integral part of addressing food security. <sup>20</sup>

Fruit and vegetable promotion goes also hand in hand with Target 2 of the Millennium Development Goals, which states:

Halve, between 1990 and 2015, the proportion of people who suffer from hunger. <sup>21</sup>

The general principles of a national project to promote fruit and vegetables may include:

- availability
- accessibility
- affordability
- acceptability (quality, taste, safety, type of food, cultural sensitivity)

<sup>17</sup> Available from: <http://www.un.org/Overview/rights.html>

<sup>18</sup> Available from:

<ftp://ftp.fao.org/esn/nutrition/ICN/icndec.htm>

<sup>19</sup> Available from: [http://www.fao.org/wfs/index\\_en.htm](http://www.fao.org/wfs/index_en.htm)

<sup>20</sup> Available from:

<http://www.fao.org/DOCREP/MEETING/005/Y7106E/Y7106E09.htm#TopOfPage>

<sup>21</sup> <http://www.developmentgoals.org/Poverty.htm>



- equity (including underprivileged)
- holistic or integrative approach
- sustainability
- marketing/creating awareness of fruit and vegetables in foods and food programmes.

The establishment of a set of more specific guiding principles for a national fruit and vegetable promotion programme may be shaped by the following general principles:

- A coordinated fruit and vegetable promotion programme should include initiatives which target both demand and supply-side issues and should be based on a needs assessment.
- A fruit and vegetable promotion programme should be coherent with, and complementary to, national policies and action plans such as food and nutrition, health, agriculture, and environmental policies, if existing.
- A programme should attempt to mobilize existing resources (people, information, initiatives, policies).
- A fruit and vegetable promotion programme should be socially inclusive and participatory. From the beginning it should target all social classes through specific actions, and particularly the poor.
- Messages should be consistent across policies and programmes. Every policy or intervention should promote a healthy diet including increased fruit and vegetable intake (e.g. school meal programmes or welfare food programmes should promote increasing fruit and vegetable consumption as part of their provision).
- The main outcome should be increased consumption of fruit and vegetables by the target group(s);
- An interdisciplinary, integrated, holistic approach should be followed in all parts of the programme;
- The process and all interventions should be evaluated;
- Best practices should prevail.

## >>> 5.2 Consumer domains and fruit and vegetable supply networks

An important issue in the design of intervention strategies is the fact that different types of consumers (i.e. socioeconomic groups) acquire and utilize fruit and vegetables in different ways, and there are different types of producers and suppliers. In order to design sound

interventions to improve fruit and vegetable intake, it is essential that the under-consuming population groups are identified and efforts made to understand their consumption behaviours.

All consumer domains differ widely within and between countries. The characteristics outlined below are not meant to be exhaustive, but to provide examples which may guide characterization of consumer and supplier domains in specific countries and areas.

### 5.2.1 CHARACTERISTICS OF CONSUMER DOMAINS AND FRUIT AND VEGETABLE SUPPLY NETWORKS

Fruit and vegetables are acquired in varying amounts and from various supply sources, ranging from home production, through purchase in local, rural markets to supermarkets in urban centres. Some consumers – they may be classified as auto-consumers – produce their own fruit and vegetables. Those who are totally dependent on markets to procure fruit and vegetables may be termed market-dependent consumers and may be further divided into two distinct groups; those who acquire fruit and vegetables for the needs of the household, and those for whom fruits and vegetables are purchased and prepared by others, e.g. feeding programmes. The latter category, loosely defined as institutional consumers, also includes consumers of school and hospital meals, military and worksite catering, hotel and restaurant catering, etc. Those consumers that both produce and purchase fruit and vegetables may be classified as mixed-consumers.

Similarly, different types of suppliers produce and market fruit and vegetables in different ways and through different channels. Smallholder subsistence farmers produce for themselves and possibly for a local market, while small-scale commercial producers and large commercial firms produce mainly for markets both near and far. Specific characteristics of the consumer domains mentioned above are expanded below.

### Rural smallholders producing fruit and vegetables for own consumption and market supply

#### Characteristics:

- own production of fruit and vegetables;
- collection of fruit and vegetables;
- exchange of fruit and vegetables for other goods, including gifts;
- often task division between men and women; men produce cash crops, women produce fruit and vegetables for own consumption around the house or in a small garden;
- vegetables consumed are more often home-grown; fruits, if consumed, more often purchased.

The role of smallholders in the market is usually limited to selling very small quantities of surpluses generated in local informal markets (in towns, along roadsides, etc.) that are within an easily-reached distance. Selling may be direct, or through collectors (more common in the case of fruits, spices).

### Mixed consumers – rural and particularly urban gardeners, but also dependent on market supply

#### Characteristics:

- occasional fruit and vegetable producers, but their major income is non-agricultural;
- often belonging to low- to mid-income levels;
- may have limited knowledge of the nutritional value of fruits and vegetables and/or a cultural bias against certain fruit and vegetables;
- commonly purchase fruit and vegetables from local markets or small shops;
- fruit and vegetables which they grow are limited in range and amount.

The local markets or small shops that typically supply mixed consumers are often small operators outside the organized formal supply networks. They may comprise urban/peri-urban growers selling their produce (which may include traditional and indigenous types in some countries) direct in informal street markets, small-mixed grocery shops or stands selling a limited range of seasonal vegetables and fruit acquired from wholesalers or producers.

### Market-dependent consumers

#### Characteristics:

- dependent on cash economy, most of them living in urban or peri-urban areas thus they have a limited ability to grow food;

- many women in this group work outside the home; hence there is less time available for food preparation and a greater need for convenience and processed foods;
- part of food consumption is outside the home, less cooking takes place in the household;
- poor consumers in this group often purchase in small amounts because of a lack of cash; hence are not able to benefit from supermarkets offering bulk purchases to reduce costs, resulting in higher food costs;
- many do not have access to conditional transfers (transfers of resources to poor families on condition that they engage in some behaviour, e.g. sending children to school, taking children to health clinics), social safety nets or food aid programmes.

The supply network corresponding to this consumer domain is that typical of urban and peri-urban areas, i.e. more or less specialized growers in rural or peri-urban areas with a source of water, selling to collectors, processors, retailers either direct or through assembly or wholesale markets, or sometimes direct to consumers through farmers' markets. The wholesale/retail chain, especially where supermarkets and specialized greengrocers are involved, may be characterized by cold chains and transport of produce over distances, depending on the country and region concerned.

Import-export of exotic and out-of-season commodities is a feature of the fruit and vegetable supply chains in many countries. At the retail end of the supply chain there may be a range of formal, well-organized operations, such as wet-markets, supermarkets, small greengrocer shops, small-scale informal street and roadside stalls, and itinerant sellers. Processed, semi-processed and pre-packaged fruit and vegetables can form a very significant proportion of this kind of supply network, as can street food. Where there are formal market supply chains, they may be subject to financial, fiscal, food safety and health regulations.

### Institutional consumers

Characteristics:

- Schools – here the consumers are children and youth. Fruit and vegetables are acquired through school meal programmes/government provisions, private companies, brought from home or purchased at school.
- Worksites – here the consumers are usually healthy adults. Fruit and vegetables are usually brought from home, bought on site (at cafeteria, vending machines, pre-paid programmes), or bought outside e.g. fast foods/restaurant foods.
- Hospitals and care facilities, including child care and care of the elderly – here the consumers are usually persons who are unwell or at high risk e.g. orphans/elderly. Fruit and vegetables are provided as part of institutional meals.
- Military – here the consumers are usually healthy, young adults. Fruit and vegetables are provided as part of set meals.
- Prisons – here the consumers may be at risk of malnutrition. Fruit and vegetables are provided as part of institutional meals.
- Feeding programmes – here the consumers are at risk of malnutrition. Fruit and vegetables are provided, in kind or through purchase vouchers, as part of the programme.

The supply network corresponding to this consumer domain is similar to that of market-dependent consumers, although direct purchasing of fruits and vegetables from producers or wholesalers may be more frequent especially where institutional use is large-scale, regular and long-established.

#### 5.2.2 ENTRY POINTS FOR FRUIT AND VEGETABLE PROMOTION PROGRAMMES

This section outlines, according to the consumer domains established above, possible entry points where fruit and vegetable promotion programmes could be initiated at country level.

### Rural smallholders producing fruit and vegetables for own consumption and market supply

Entry points:

- Water – ensuring sustainable supply for plant growth.
- Eating preferences – promoting those fruit and vegetables that are known locally and widely accepted.
- Women – empower women through:
  - freeing time from other tasks to allow fruit and vegetable production and preparation
  - providing financial support for fruit and vegetable production
  - education about health benefits, and
  - inclusion of small-scale year-round fruit and vegetable production into extension work.
- Schoolchildren – teaching children in rural areas to grow, prepare and consume vegetables.
- Local markets – providing education on production techniques/crop diversification, food safety and health benefits.
- Encouraging use of simple technologies for production, post-harvest handling and conservation.

### Mixed consumers – rural and urban gardeners, but also dependent on market supply

Entry points:

- Own production and/or trade with neighbours – providing education on production techniques/crop diversification, food safety and health benefits.
- Local markets – improving infrastructure of market; providing education on production techniques/crop diversification, food safety and health benefits for consumers; methods to improve post-harvest handling.
- Supermarkets/retailers – providing education on health benefits for consumers.
- Small-scale trade – providing education on marketing, food safety, health benefits for consumers.

### Market-dependent consumers

Entry points:

- Own production (where possible) – promoting fruit and vegetable growing e.g. in small gardens (micro-growing).
- Local/urban (farmers') markets – providing education on health benefits for consumers.
- Commercial suppliers, retailers/supermarkets – providing education on health benefits for consumers.

### Institutional consumers

Entry points:

Schools:

- Educating and instructing of parents through curriculum and parent-teacher associations.
- Identifying food items to be included and excluded from school environment, e.g. in lunch (provided from home), changing choices in vending machines, specifying percentage of fruit and vegetables to be included in school lunch programmes.
- Educating children and creating awareness about fruit and vegetables and what constitutes a healthy diet e.g. through comics (example from Brazilian programme), posters and visible reminders in classrooms.
- Building children's food skills, e.g. how to select fruit and vegetables, how to prepare foods.
- Producing, and teaching about, fruit and vegetables via school gardening programmes.



- Encouraging a clean environment; encouraging washing of food and proper hand-washing.
- Reviewing curricula e.g. including nutrition in science classes, home economics.

Worksites-for both large and small companies:

- Ensuring that fruits and vegetables are available, whether foods are bought or brought from home.
- Providing minimum kitchen facilities for preparation of foods e.g. microwave or heating implement, sink for washing, refrigeration.
- Changing choices available in vending machines, fruits, vegetables, dried, canned, fresh, unsweetened 100% juices.
- Encouraging fruits and vegetables in cafeteria programmes.
- Organizing worksite programmes to increase nutritional awareness of workers; increasing education of management that nutrition is important for healthy workers and productivity.
- Ensuring a clean environment.
- Providing reminders such as posters, educational materials, audio programmes, seminars, recipes for healthy foods.
- Asking nearby restaurants to display healthy-diet posters and nutritional information for available foods.
- Enforcing labelling of foods purchasable at the worksite.

These recommended entry points are also generally applicable to other institutional consumers such as hospitals, prisons, armies, etc.

### 5.2.3 BARRIERS TO FRUIT AND VEGETABLE PROMOTION/CONSUMPTION

Each country needs to identify potential barriers specific to their own situation but may consider the following general barriers and those more specific to each consumer domain.

General barriers to fruit and vegetable promotion:

- climate – seasonality, water availability, extremes of heat and cold, drought, rain;
- lack of horticultural technology and knowledge of management practices;
- competing government priorities (e.g. policies promoting cereal production on arable land or with available irrigation water);
- economic issues – price, income, affordability at a local and individual level;
- attitudes of producers;
- cultural influences on consumers – traditional diets and cooking practices (can be both barrier and facilitating factor), cultural misperceptions affecting dietary preferences (e.g. fruit causes diarrhoea);
- taste and habit formation of diet patterns in childhood;
- lack of awareness/knowledge of benefits of fruit and vegetables, of preparation of fruit and vegetables, of what constitutes a balanced diet as income increases (role of increasing meat/fat consumption), also misperception of advertised health claims of other products (functional foods);
- unhygienic practices in production and preparation of food;
- perception or communication of food-safety risks – chemical or microbiological contamination (should be emphasized relative to the risk in each country, where applicable);
- misinterpretation or distortion of information by the mass media;
- introduction or rapid increase of fast-food culture; ready-to-eat

fruit and vegetables are not easily available, but ready-to-eat fast food is easily available;

- competition for funding with other promotion programmes, and with more popular foods;
- social acceptability of fruit and vegetable promotion interventions;
- lack of availability, inadequate marketing facilities;
- negative experiences with overproduction necessitating strategies for diversification, better scheduling, value chain efficiency enhancement, and/or production shifts.

Specific barriers to fruit and vegetable promotion according to consumer domain:

#### Rural smallholders producing fruit and vegetables for own consumption and market supply

- extreme poverty of producers and consumers
- low-quality varieties of crops (no crop improvement)
- non-availability of seeds/planting material
- human resource and labour constraints
- lack of basic enabling knowledge.

#### Mixed consumers – rural and urban gardeners, but also dependent on market supply

- insufficient land and/or lack of urban/peri-urban land-use policies for horticulture
- low income
- lack of appropriate technology
- inadequate supplies of clean water and thus food contamination risks.

#### Market-dependent consumers

- high price of fruit and vegetables in retail outlets
- change in employment and lifestyle with urbanization; lack of time for preparation and cooking as urbanization increases and more women work outside the home.

#### Institutional consumers

- acceptability and feasibility of promotional programmes
- interests of the institutional food provider competing with fruit and vegetable promotion.

### >>> 5.3 Identification of stakeholders

The possible stakeholders to be involved in both promoting increased supply and demand of fruit and vegetables are listed below. At the national level, each country should make an assessment of its relevant stakeholders.

#### Public sector

- Ministry of Health – public health and health promotion
- Ministry of Agriculture, Food and Fisheries (horticulture development and marketing departments, irrigation department, extension departments)
- Ministry of Education – research (university, scientific leadership), nutrition education
- Ministry of Social Development – food security, land reform
- Ministry of Labour – worksite programmes, worksite hazards
- Ministry of Public Works/planning
- Ministry of Water Affairs
- Ministry of Transport
- Ministry of Environment
- Ministry of Women
- Ministry of Information/communication
- Ministry of Science and Technology
- Regional and local governments, municipalities (e.g. local land use planning, market organization)
- Government department or agency responsible for food safety
- School and hospital administrations.

#### Private sector

- Agricultural input suppliers
- Producer organizations – small/ medium/ large or rural/peri-urban/urban
- Fruit and vegetable industry – processing, packaging, transport, (storage)
- Fruit and vegetable marketing associations – small and large retailers, wholesalers, shipping companies, importers
- Media e.g. journalists' associations
- Financial institutions – banks, micro-credit institutions
- Heads of companies
- Worksite management
- School and hospital administrations.

#### Nongovernmental organizations/civil society

- Community groups (including garden, women's, cultural, and religious groups)
- Consumer groups
- Health promotion organizations (e.g. cancer, CVD), food-security, environment, agriculture etc.
- Farmers' cooperatives/associations, women's producer groups
- Farmers' unions
- Horticulture promotion groups e.g. fruit and vegetable associations
- Parent–teacher associations
- Traditional healers
- Community/religious/traditional leaders
- Health professionals' associations (doctors, nutritionists, nurses).

#### International bodies

- WHO, FAO, UNDP, UNICEF, WFP, World Bank, IFAD, and their regional or national representatives,
- Regional economic groupings e.g. European Union, African Union, Association of Southeast Asian Nations, South African Development Community, etc.
- Bilateral donors
- Consultative Group on International Agricultural Research (International Food Policy Research Institute and others).



## >>> 5.4 National coordinating team

### 5.4.1 CONSTITUTION OF NATIONAL COORDINATING TEAM

There is a need to ensure that a multisectoral coordinating mechanism, drawing upon existing structures, is present to promote fruit and vegetable production, supply, and consumption. When selected, members of this coordinating team should draw upon other stakeholders (yet to be identified) and ensure visibility of the team. The coordinating team should provide leadership at national level and define mechanisms for its internal leadership.

The coordinating team could involve representatives from the following areas:

- agriculture/horticulture sector
- nutrition sector
- public health sector (e.g. public health nurse)
- education sector
- financial sector
- private sector in general
- farmers' unions, smallholders' associations (representing producers)
- consumers' associations
- academic sector (especially for programme design and monitoring)
- local community leaders
- women's groups.

### 5.4.2 ROLES OF NATIONAL COORDINATING TEAM

A range of possible roles for the coordinating team are proposed below. At country level, the appropriate roles for the team need to be determined based on this list, to which others may be added.

- To facilitate the development and implementation of national intervention programmes, including resource mobilization.
- To create an environment for stakeholders to pursue these programmes with their respective departments and institutions.
- To take responsibility to advocate for, and guide, policies and actions (including research and extension) and strategies/action plans to be implemented by various stakeholders at various levels.
- To coordinate action of different stakeholders.
- To monitor different programmes aimed to increase consumption and report on a regular basis.
- The national-level coordinating team should be responsible for developing coordination at different administrative levels, i.e. national, regional, municipal.



### Points raised in the discussion

The Coordinating team:

- cannot develop policies, they can only guide
- should promote the decentralization process
- should have accountability and transparency

Leadership: could be joint, or rotating e.g. between Ministries of Health and Agriculture – but should ultimately be left to the country to determine.

## >>> 5.5 Identification of national goals and objectives

Goals will differ from country to country and, in particular, according to the kinds of nutrition-related problems that fruit and vegetable promotion programmes are seeking to address. General goals are suggested below:

### Overall goal

To contribute to the prevention and control of NCDs and micronutrient-deficiency diseases through increased production and consumption of a variety of fruits and vegetables.

### Health goal

- Improve nutritional status, specifically decreasing micronutrient deficiencies and the risk of under-, and over-nutrition, and hence the risk of NCDs.

### Nutrition goals

- Increase fruit and vegetable intake.
- Bring individual consumption of fruit and vegetables to at least 400g per day in order to decrease prevalence and incidence of chronic diseases and reduce micronutrient deficiencies.

### Production goals

- Increase availability of fruit and vegetables.
- Increase production and/or availability of adequate amounts of fruit and vegetables to allow consumers to achieve the medium and long-term recommended consumption goals.

### Distribution goals

- Improve efficiency of distribution networks and marketing possibilities for small-scale producers of fruit and vegetables through availability of transparent price information and promotion of fair and sound practices by intermediaries.

#### 5.5.1 CONSIDERATIONS REGARDING GOAL-SETTING

National programmes should establish realistic goals and timeframes, according to circumstances.

Beneficiaries should be the national population, i.e. consumers, with positive side-effects such as improving socioeconomic status of producers.

Culturally-relevant fruit and vegetable consumption targets should be set, but they should encourage people to increase the amount of fruit and vegetables they eat, preferably fresh or adequately processed, e.g.:

- 400g/day minimum fruit and vegetable intake as population nutrient intake goal is an important global long-term health target.
- Using the 400g/day minimum goal as a short- or medium-term objective may not be appropriate or achievable, for example in African countries where current consumption is so low.
- It may be appropriate to set a target for the proportion of the population to reach the 400g/day intake goal.
- Keeping numbers in the national objective may be useful but simply globalizing the 'Eat 5 fruit or vegetables a day' message (in short: "5 A Day"), used currently in many, mostly developed, countries, is not

necessarily considered appropriate. The 'number' goal should be set nationally. Its presentation could relate to the number of meals in which people eat fruit and vegetables, or number of plates (e.g. as used in Thailand), or number of portions or number of different types of fruits and vegetables (e.g. as in several European countries and the United States of America) depending on what is best understood culturally.

### Objectives

When setting objectives at the national level to reach these goals, distinguishing between short-, medium- and long-term objectives may be useful, as may differentiation between generic and specific objectives. The following should serve as examples:

*Short-term* – to increase the number of people with home gardens by 20% within two years.

*Medium-term* – to increase productivity within existing gardens by 20% within five years; to increase diversity of crops grown to at least six per household within five years.

*Long-term* – to increase intake of fruit and vegetables to recommended levels in the target group within 10 years.

### Further examples of specific and generic objectives

#### *Specific*

- Assess current fruit and vegetable consumption to identify and target groups with the lowest intake by reviewing data or using rapid assessment techniques.
- Try to aim for the minimum recommendation of at least 400g/person per day as the population nutrient intake goal by (set time-frame and allow transition).
- Obtain introduction of policies for augmenting proportion of fruit and vegetables into government food programmes.
- Decrease post-harvest losses and educate target groups about appropriate (according to health needs and availability) conservation and preservation technology (e.g. solar drying, pickling).



### *Generic*

- Increase and diversify fruit and vegetable production, quality and safety through:
  - empowerment of women
  - job creation.
- Increase availability and affordability of fruit and vegetables.
- Change knowledge, attitudes, behaviour.
- Change/increase amount and variety of fruit and vegetables consumed to ensure a better general dietary pattern (accompanied by an improvement of general dietary pattern).
- Create an awareness within institutions of the need to increase fruit and vegetable consumption.
- Sensitize civil society to the importance of fruits and vegetables through the media.
- Involve the community in services and programmes with nutritional aspects (e.g. provide knowledge and funds to the community).

## >>> 5.6 Activities at national level

### 5.6.1 EXISTING NATIONAL POLICIES AND ACTION PLANS

All countries have subscribed to the universal declaration of human rights, cited above, which includes the right to food. Many countries have food and nutrition, or food security, policies and/or action plans (see below) into which a fruit and vegetable promotion policy should ideally be embedded. The multisectoral national coordinating team should identify relevant policies and actions including finance, agriculture, health promotion, environment, food policies.

There may be a need to update, integrate or revise existing national policies (e.g. food security policies) if they do not consider fruit and vegetables. For example: to include promotion of vegetable gardens; to add fruit and vegetables to nutrition policies if the latter are focused on cereals and pulses; to integrate fruit and vegetables in any way feasible in policies and programmes on school feeding, and therapeutic and emergency feeding.

The national coordinating team should also ensure relevant, practice-oriented research to inform policy development.

Policies which may need to be taken into account when planning fruit and vegetable promotion at national level include:

- food security policies and programmes
- nutrition policies (food-based dietary guidelines)
- agricultural (production) policies
- food safety and quality policies
- health policies
- NCD prevention and control policies
- education policies (health education policies) including school curricula
- credit policies
- input policies
- environmental policy
- family farming policy
- labour, land and water policies

- policies on commerce and transportation e.g. small business development and marketing reforms
- food and agriculture taxation policies
- national horticulture plan
- national poverty reduction strategy
- GAP policies (including proper and safe use of pesticides)
- donor programmes (bilateral and multilateral) and priorities.

### 5.6.2 POSSIBLE INTERVENTIONS AT NATIONAL LEVEL

#### General considerations

It is important to plan both production and consumption interventions in rural, urban and peri-urban areas. The urban/peri-urban setting is very varied in countries regardless of their income level, and even varies regionally within a country. The intervention(s) selected should take account of the particular context in which they are to be introduced.

When designing interventions for a country it may be necessary to differentiate those related to fruit from those related to vegetables, since different issues need to be tackled to increase consumption of each, e.g.

- people generally like to eat fruits and they are easy to eat; constraints on their consumption may often be related to price and seasonality
- vegetables need to be prepared, and it is necessary to educate people about preparing and cooking them, as well as emphasizing the need for their increased consumption.

Every intervention programme should be based on a thorough needs assessment and should incorporate an evaluation plan.

#### Examples of possible interventions

Examples of areas for action, possible interventions and programmes are provided in the tables below for each consumer domain (target population).

Rural smallholders producing fruit and vegetables for own consumption and market supply

Goals	Areas for action/possible interventions
<p>Increase and diversify fruit and vegetable production to achieve year-round diversity, safety and quality</p>	<p>Build capacity for research for local adaptation, extension, planting-material multiplication, and distribution, focusing on following key aspects:</p> <ul style="list-style-type: none"> <li>• <i>Safety and quality to increase intake:</i> <ul style="list-style-type: none"> <li>- safe fruit and vegetable programme</li> <li>- GAP - focus on pesticide use and prevention of contamination</li> </ul> </li> <li>• <i>Cultivar improvement, selection and promotion: targeting nutrient content, quality, flavour:</i> <ul style="list-style-type: none"> <li>- promote crops/varieties with high nutrient levels, e.g. yellow sweet potatoes, dark green leaves, etc.</li> </ul> </li> <li>• <i>Promoting techniques to extend production season:</i> <ul style="list-style-type: none"> <li>- phasing production</li> <li>- Water</li> </ul> </li> </ul>
<p>Increase availability and affordability of fruit and vegetables</p>	<p>Build capacity for:</p> <ul style="list-style-type: none"> <li>• <i>Technologies for post-harvest loss reduction</i> <ul style="list-style-type: none"> <li>- harvesting technology</li> <li>- processing technologies</li> <li>- better storage</li> <li>- packaging for freshness</li> <li>- reducing domestic level losses through education of women</li> </ul> </li> <li>• <i>Scheduling and managing production to reduce seasonal gaps and gluts to safeguard producer and consumer price convenience</i></li> <li>• <i>Creating new networks to facilitate transport, baulage and marketing</i></li> <li>• <i>Increasing small grower involvement and benefit sharing through:</i> <ul style="list-style-type: none"> <li>- promoting small farmer entrepreneurship</li> <li>- promoting schemes for transparent price information and fair practices by intermediaries</li> <li>- disseminating market information e.g. boards with prices in rural areas (as practised e.g. in Mozambique)</li> <li>- direct marketing (promotion of farmers' markets)</li> </ul> </li> </ul>
<p>Change knowledge, attitudes, behaviour</p>	<ul style="list-style-type: none"> <li>• <i>Education programmes</i> – for women, children, farmers, development agents, extensionists, policy makers and planners, managers, subject-matter specialists</li> <li>• <i>Access to existing information and knowledge</i> – ensure use of proper media</li> <li>• <i>Behaviour change</i> – facilitated participatory planning</li> <li>• <i>Social marketing</i> – produce marketing boards, where active, to support groups, programmes, networks</li> </ul>
<p>Increase amount of fruit and vegetables consumed, replacing energy-dense, nutrient-poor foods, where needed</p>	<ul style="list-style-type: none"> <li>• Use local media (especially radio), competitions, role play, theatre, market-place exhibitions</li> <li>• Educate mothers about a healthy diet at child-weighing or vaccination clinics, promote fruit and vegetable consumption instead of nutrient-poor foods</li> </ul>

Mixed consumers – rural and particularly urban gardeners, but also dependent on market supply

Goals	Areas for action/possible interventions
Increase and diversify fruit and vegetable production, quality and safety	<ul style="list-style-type: none"> <li>• Collect, collate and disseminate information on successful gardening programmes</li> <li>• Foster gardening networks, communities, clubs, etc.</li> <li>• Make land available for gardening in urban and peri-urban areas</li> <li>• Organize training and extension programmes on gardening, nutrition, food safety, etc.</li> <li>• Rescue traditional varieties/indigenous fruit and vegetables</li> </ul>
Increase availability and affordability	<ul style="list-style-type: none"> <li>• Improve marketing infrastructures</li> <li>• Promote income-generating programmes</li> </ul>
Change knowledge, attitudes, behaviour	<ul style="list-style-type: none"> <li>• Organize media campaigns</li> <li>• Review school curriculum and other national policies and strategies to support gardening and educate about health benefits of fruit and vegetables</li> </ul>
Increase amount of fruit and vegetables consumed, replacing energy-dense, nutrient-poor foods, where needed	<ul style="list-style-type: none"> <li>• Develop and promote simple small-scale food preservation methods at household level</li> <li>• Promote recipes using fruits and vegetables</li> </ul>



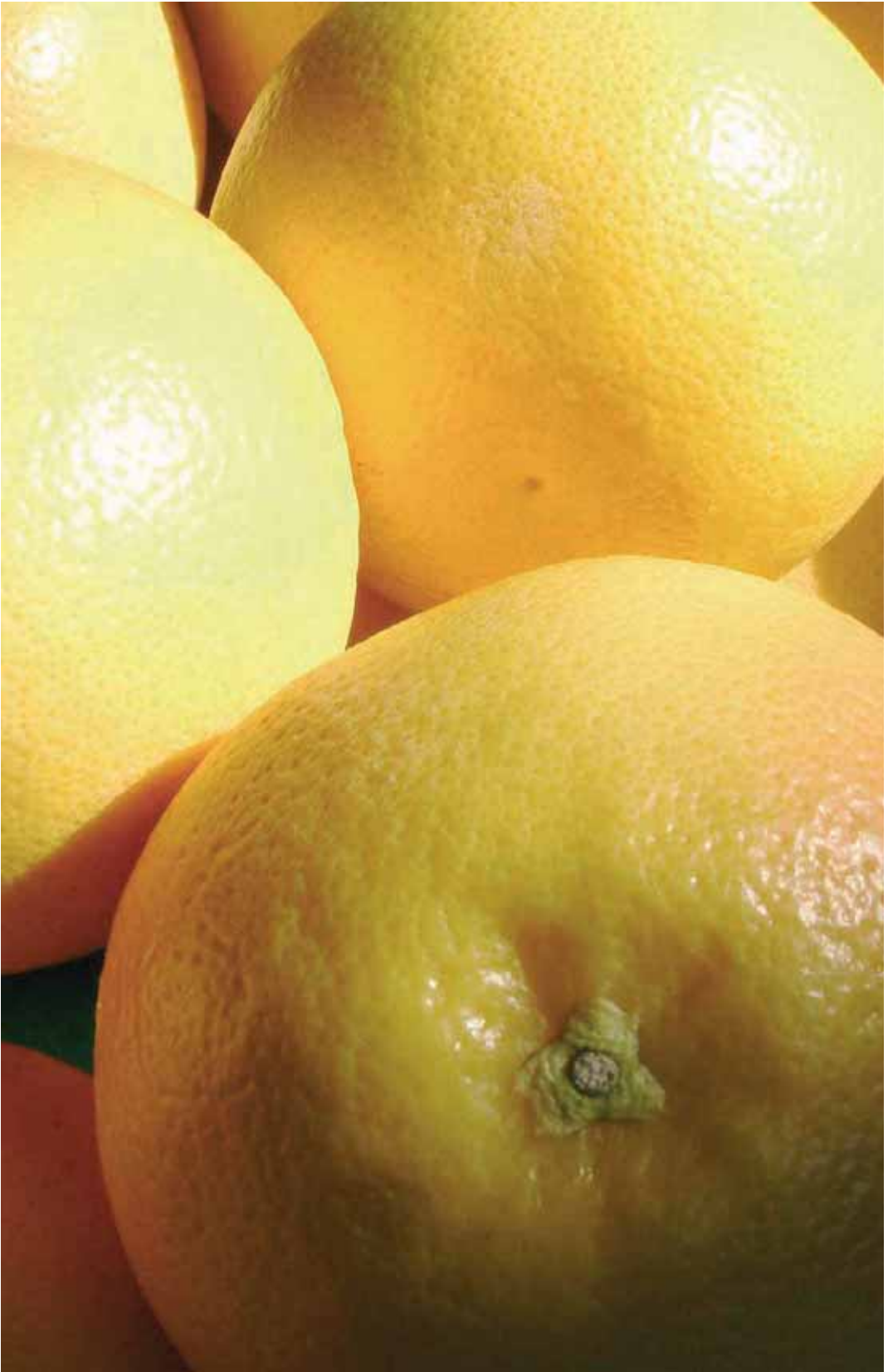
## Market-dependent consumers

Three key areas of intervention are suggested:

- Communication, education and advertising – three approaches which target a wide population but which tend to be expensive;
- More targeted interventions involving changes in the environment, i.e. through improving access to, and availability of, fruit and vegetables – these require intersectoral action;
- Regulation, e.g. fiscal policies, regulation of health claims or advertising, facilitation of sound health claims for fruit and vegetables.

Goals	Areas for action/possible interventions
Increase and diversify fruit and vegetable production, quality and safety	<ul style="list-style-type: none"> <li>• Work with peri-urban small-scale producers to identify types of fruit and vegetables that are appropriate for these types of projects</li> <li>• Supply-chain improvement projects addressing efficiency from seed/field through market to table with appropriate technological innovation and information systems; need to take account of food safety issues (use of safe water supply)</li> <li>• Agricultural training in whole range of techniques and issues about efficient and safe production; from production to preparation for sale. This should include education and training about environmentally-friendly production methods</li> <li>• Training to ensure that production or food preparation does not have unintended negative health impacts</li> </ul>
Increase availability and affordability	<ul style="list-style-type: none"> <li>• Small scale production/ home production, food preparation and selling (for income generation)</li> <li>• Alternatives for commercialization – promote approaches to complement distribution through supermarket chains</li> <li>• Importance of specific policies to support such local supply</li> <li>• Need to ensure food safety but without impeding small-scale producers from selling at outlets such as street fairs, farmers' markets, mobile markets from trucks</li> </ul>
Change knowledge, attitudes, behaviour	<ul style="list-style-type: none"> <li>• Education targeting women and men about:               <ul style="list-style-type: none"> <li>- good nutrition and how to achieve this in the diet</li> <li>- fruit and vegetables as part of balanced diet</li> <li>- importance of fruit and vegetables for tackling micronutrient deficiencies in children</li> <li>- prevention of CVD, obesity, cancer etc.</li> <li>- safe preparation and culturally-appropriate cooking and storage techniques</li> </ul> </li> <li>• Mass media education campaigns to inform about the benefits of fruit and vegetables for tackling over-nutrition, NCDs and micronutrient deficiencies</li> </ul>
Increase amount of fruit and vegetables consumed, replacement of energy-dense, nutrient-poor foods where needed	<ul style="list-style-type: none"> <li>• Public education campaigns to promote increased utilization of fruit and vegetables in restaurants (education regarding health benefits and how to increase fruit and vegetable sales)</li> </ul>





## Institutional consumers

General considerations regarding interventions that could be advocated as part of a national agenda include:

- Specific strategies in schools, worksites and other institutions – must consider literacy, access to media, rural or urban environment, gender roles, social roles, food industry, and national policies.
- National policies should attempt to create a win-win situation, e.g. primary and food industry may be encouraged to work with these programmes through the opening of large government-brokered markets (e.g. school lunch programmes, and home-grown supply schemes).
- In terms of gender roles, it is useful to get women involved in supply-chain optimization, including education in the kitchen.
- Schools and hospitals are visible to the public; if they are not consistent and they promote healthy diets but actually provide unhealthy food they undermine the whole programme. Hospitals and schools represent a good opportunity to not only promote healthy diets but also provide healthy food.

Goals	Areas for action/possible interventions
Increase and diversify fruit and vegetable production, quality and safety	<ul style="list-style-type: none"> <li>• Linked to institutional feeding programmes organized by the government e.g. for hospitals, camps, armies, schools, correctional facilities, provide seeds and training to help local communities produce fruit and vegetables for feeding programmes</li> <li>• Supply-chain-based horticultural development projects to encourage farmers and peri-urban growers in suitable areas to grow fruit and vegetables and benefit from value chains linked to institutional feeding programmes</li> </ul>
Increase availability and affordability of fruit and vegetables	<ul style="list-style-type: none"> <li>• School-linked gardens:               <ul style="list-style-type: none"> <li>- encourage the use of indigenous fruits and vegetables; teach both boys and girls how to cook</li> <li>- get parents and other adult members of wider school community involved</li> </ul> </li> </ul>
Change knowledge, attitudes, behaviour	<ul style="list-style-type: none"> <li>• Engage public figures to promote increasing intake of fruit and vegetables (e.g. in Thailand a royal figure is promoting health and nutrition, in the USA a senator is promoting fruit in schools in his state)</li> <li>• Link healthy diet with physical activities/sports</li> <li>• Give recognition to NGOs and religious leaders working towards promoting better nutrition</li> <li>• Education regarding cooking and preparation of fruit and vegetables for food workers in communities, schools, restaurants</li> <li>• Retain or (re)insert nutrition and cooking as part of the school curriculum</li> <li>• School gardens – education regarding gardening and balanced nutrition</li> <li>• Field trips to local markets or supermarkets to educate school children about fruit and vegetable availability</li> <li>• Providing fruit snacks in schools and worksites (e.g. as offered in Denmark, Norway and the UK)</li> </ul>
Increase amount of fruit and vegetables consumed, replace energy-dense, nutrient-poor foods, where appropriate	<ul style="list-style-type: none"> <li>• School food programmes (at school and national levels; whether free, subsidized or paid meals) tailored so that they increase fruit and vegetable consumption by schoolchildren (i.e. as part of balanced diet, not just about under-nutrition), connected with supply-side interventions to promote/support local production</li> <li>• Government food programmes need to be consistent with national nutrition policies and should promote purchase and consumption of fruit and vegetables.</li> </ul>

Simple, valid and rapid tools are needed to collect data for all groups on supply and consumption e.g. rapid appraisal tool.

#### *Baseline data*

Information that should be collected as baseline data, if not already available:

- what people buy and what they eat on a daily basis (by age, sex, household size, marital status, income or educational status)
- where people obtain fruit and vegetables
- where people eat: home, restaurants, schools, worksites, street food
- how they eat (which form of food, cooking etc)
- cost of fruit and vegetables from different supply sources, and price of fruit and vegetables compared with different food types.

#### *Some general principles for data collection*

- ensure that qualified persons (e.g. university researchers) are carrying out the data collection and that the methodology is standardized and validated;
- sensitize researchers to the kinds of data needed, and avoid overly-complicated research;
- create a central databank in the country e.g. in bureau of statistics;
- link assessment surveys to monitoring and evaluation.

## >>> 5.7 Sources of data and data collection

Collection of data on supply and consumption of fruit and vegetables should be integrated into a national nutrition monitoring system (e.g. including anthropometry, food balance sheets, food surveys). It is essential to collect or utilize (as far as possible) existing primary and secondary data to understand current behaviours of consumers and producers. Many countries already collect routine data on dietary habits, agricultural production etc. most of which can be accessed and used when developing a fruit and vegetable promotion programme.

Ideally, the national coordinating team should include a specialist who can supply or collect these data, or the team should plan or commission this work from the start. Collection of specific data, using an appropriate methodology, may be required for an intervention programme. All data collected should be made public and be used for the purpose of the programme.

#### General sources of data

These include:

- agricultural census reports;
- dietary intake surveys, including in institutions, where assessment of supply can also be carried out if sources of fruit and vegetables are identified, e.g. cafeteria, brought from home, bought outside;
- purchase data on food items bought by institutions e.g. worksites, hospitals, military establishments.

#### Data provided by FAO and WHO

Helpful web sites to access data provided by FAO and WHO include:

##### *FAO*

General site to all statistics:

[http://www.fao.org/waicent/portal/statistics\\_en.asp](http://www.fao.org/waicent/portal/statistics_en.asp)

##### *WHO*

InfoBase on risk factors for chronic diseases:

[http://www.who.int/ncd\\_surveillance/infobase/web/en/](http://www.who.int/ncd_surveillance/infobase/web/en/)

Micronutrient deficiency information system:

[http://www.who.int/nut/db\\_mdis.htm](http://www.who.int/nut/db_mdis.htm)

#### Methodology for data collection

General methodologies which can be used to collect data in all consumer domains include:

- World Bank/International Food Policy Research Institute survey technique
- participatory rural appraisal
- rapid rural appraisal.



## >>> 5.8 Monitoring and evaluation

The following general principles should be stressed:

- Create a culture of evaluation – build capacity for monitoring and evaluation.
- No programme should be contemplated which does not include a mechanism for regular evaluation. Incorporate monitoring and evaluation into the planning, design and implementation processes, and include a specific budget allocation for monitoring and evaluation.
- Define the monitoring and evaluation strategy during programme design, ensuring the availability of baseline data and planning of initial surveys such that they can be used for monitoring in the future.
- Use experts in the evaluation team (e.g. statistician, economist for cost-benefit analysis, programme manager to determine what should be evaluated).
- Do in-process monitoring frequently, but formal evaluations to change guidance less often.
- Monitor all guiding principles: accessibility, affordability, etc.
- Ensure dissemination of evaluation results.

### What should be monitored?

Monitor process (operational, implementation aspects), outcome (e.g. is fruit and vegetable consumption increased), impact (e.g. on health) and cost-effectiveness.

### *Process evaluation*

All programmes should include process evaluation for troubleshooting and to achieve effective implementation, i.e. to:

- assess whether the programme is being implemented as planned
- identify constraints to implementation
- use information to improve implementation; identify, test, and implement corrective measures as needed.

### *Outcome evaluation*

This should be undertaken to assess whether intended outcomes have been achieved as a result of project implementation.

### *Impact evaluation and cost-effectiveness*

Careful, rigorous evaluation needs to be conducted to test impact and cost-effectiveness of the intervention programme in different contexts. However, this does not need to be done for all programmes because it tends to be cost- and resource-intensive. The impact evaluation should focus on assessing whether the programme has reached its stated goals, and also assessing success factors.

### Selecting appropriate indicators

#### *Process evaluation*

Include indicators of

- targeting (e.g. whether the intervention is reaching its targeted beneficiaries)
- coverage (what percentage of the population is being reached)
- provision/delivery (whether the intervention is delivered as planned, what can be done to improve operational aspects of the programme and make implementation more effective).

#### *Outcome evaluation*

Indicators that mark the outcome could be for example:

- whether fruit and vegetable consumption at the population or household level has increased;
- whether intake at the individual level has increased for different age groups;
- whether the availability of fruit and vegetables was increased.

#### *Impact evaluation*

Indicators are needed that illustrate if the intervention is meeting its stated objectives – for example:

- whether nutritional status has changed (e.g. less deficiency of a micronutrient)
- whether risk factor profiles for NCDs are maintained or improving
- whether health status has improved.

Some indicators from ongoing surveys could be used, for example:

- dietary surveys for monitoring intakes
- biochemical indicators for monitoring micronutrient deficiencies
- anthropometric measures for monitoring obesity
- illness and hospitalizations for monitoring chronic diseases.





# Annex I

## Participants

Mrs Rosanna Agble,	Retired Chief Nutrition Officer, Ghana Health Service/World Bank, Ghana
Dr Antonio Agudo,	Epidemiologist, Department of Epidemiology and Cancer Registration (SERC), Catalan Institute of Oncology (ICO), Spain
Prof Jonathan Olatunbosum Babatola,	Horticulturist, National Horticultural Research Institute (NIHORT), Nigeria
Mr Korbkiat Bansiddhi,	Government Officer, Ministry of Agriculture and Cooperatives, Thailand
Dr Sabastiao Barbosa,	Coordinator for International Cooperation, Brazilian Agricultural Research Corporation-Embrapa, Brazil
Dr Lydia Bazzano,	Physician, Beth Israel Deaconess Hospital, United States of America
Mr Chavalvut Chainuvati,	Government Officer, Ministry of Agriculture and Cooperatives, Thailand
Mr José Manuel da Graca,	Director, Agriculture and Rural Development, Ministry of Agriculture and Rural Development, Mozambique
Dr Somchai Durongdej,	Professor, Department of Nutrition, Faculty of Public Health, Mahidol University, Thailand
Professor Anna Ferro-Luzzi,	Head, WHO Collaborating Centre for Nutrition, National Institute of Research on Food and Nutrition, Italy
Ms Patrícia Chaves Gentil,	Nutritionist and Technical Consultant, Brazilian Food and Nutrition Policy Coordination, Ministry of Health, Brazil
Mr Tawatchai Hongtrakul,	Government Officer, Ministry of Agriculture and Cooperatives, Thailand
Professor Nahla Houalla,	Professor and Chairperson, Department of Nutrition and Food Science, American University of Beirut, Lebanon
Mr Melaku Jirata,	Household Food Security National Project Coordinator and Team Leader of Dry Land Extension, Ministry of Agriculture and Rural Department, Ethiopia
Dr Roya Kelishadi,	Assistant Professor and Head, Preventive Pediatric Cardiology Department, Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences, Islamic Republic of Iran
Dr Cho-il Kim,	Chief and Head Researcher, Korea Health Industry Development Institute, Republic of Korea
Dr Karen Lock,	Research Fellow, London School of Hygiene and Tropical Medicine, Keppel Street, United Kingdom
Dr Guansheng Ma,	Executive Director, Institute of Nutrition and Food Safety, China
Mrs Emelia Oberye Monney,	Senior Agriculture Officer, Ministry of Food and Agriculture, Ghana
Professor Carlos Monteiro,	University of San Paulo, Brazil
Dr Saïdu Muàzu,	Civil Servant, Projects Coordinating Unit, EMARD, Nigeria
Ms Oúlia Mucauro,	Agricultural Engineer, Provincial Directorate of Agriculture and Rural Development, Mozambique
Dr Prem Nath,	Chairman, P.N. Agricultural Science Foundation, India
Mr Raghaw Pandey,	Government Officer, Department of Agriculture and Co-operation, Kristi Bhawan Ministry of Agriculture, India

Ms Angela Peres,	Agricultural Engineer, Ministry of Social Development and Fight Against Hunger, Brazil
Ms Christine Quested,	Nutritionist, Ministry of Health Nutrition Centre, Ministry of Health, Samoa
Ms Célia Hortese Ribeiro,	Agricultural Officer, Support to Private Sector Initiatives in the Agriculture Sector (ADIPSA), Mozambique
Dr Marie Ruel,	Division Director, International Food Policy Research Institute (IFPRI), United States of America
Mrs Sujit Saleepan,	Technical Nutrition Officer, Nutrition Division, Department of Health, Ministry of Public Health, Thailand
Ms Suwanrangsi Sirilak,	Ministry Counsellor, Office of Agricultural Affairs, Royal Thai Embassy, Japan
Mr Rene Sleiman-Figueroa,	Technical Assistant, FAO/PESA, Venezuela
Dr Beth Carlton Tohill,	Epidemiologist, Nutrition and Physical Activity Division, Centers for Disease Control and Prevention, United States of America
Mr Richard Twumasi-Ankrah,	Agricultural Economist & SPFS Coordinator, Ministry of Food and Agriculture, Ghana
Professor Hester Hendrina Vorster,	Director of Research, Faculty of Health Sciences, North-West University, Republic of South Africa
Dr Workafes Woldetsadik,	Head, Horticulture & Floriculture Department Ministry of Agriculture and Rural Departments, Ethiopia
Mr Montri Wongrakpanich,	Government Officer, Ministry of Agriculture and Cooperatives, Thailand

# Observers

Dr Laurent Damiens,	General Manager, Agence pour la Recherche et L'Information en Fruits et Légumes (Aprifel), France
Mr Tom Heilandt,	Economic Affairs Officer, Trade Policy and Governmental Cooperation Branch, Trade Development and Timber Division, United Nations Economic Commission for Europe (UNECE), Switzerland
Ms Nina Kolbjornsen,	Programme Officer, WFP UN offices, Bangladesh
Ms Hitomi Sato,	Official, Ministry of Agriculture, Forestry and Fisheries, Japan
Ms Wendy Snowdon,	Nutrition Education and Training Officer, Secretariat of the Pacific Community (SPC), New Caledonia

# FAO

Mr William Clay,	Chief, Nutrition Programmes Service, Food and Agriculture Organization of the United Nations, Italy
Mr Wilfried Baudoin,	AGPC Consultant, Horticultural Crops Group, Food and Agriculture Organization of the United Nations, Italy
Ms Alison Hodder,	Agricultural Officer, Acting Leader - Horticultural Crops Group, Food and Agriculture Organization of the United Nations, Italy

# WHO

Dr John G. Cai,	Coordinator, Ageing and Health Programme, WHO Centre for Health Development, Japan
Dr Tommaso Cavalli-Sforza,	Regional Adviser, Nutrition and Food Safety, WHO Regional Office for the Western Pacific, Philippines
Dr Enrique Jacoby,	Regional Adviser for Diet and Physical Activity, WHO Regional Office for the Americas/Pan American Health Organization, United States of America
Dr Tomo Kanda,	Technical Officer, Ageing and Health Programme, WHO Centre for Health Development, Japan
Ms Ingrid Keller,	Technical Officer, Primary Prevention of Chronic Diseases Unit, World Health Organization, Switzerland
Dr Gerald G Moy,	Scientist, Food Safety Department, World Health Organization, Switzerland
Dr Chizuru Nishida,	Scientist, Nutrition for Health and Development Department, World Health Organization, Switzerland
Dr Colin Tukuitonga,	Coordinator, Primary Prevention of Chronic Diseases Unit, World Health Organization, Switzerland





# Annex 2

## Workshop agenda

### DAY 1 (WEDNESDAY, 1 SEPTEMBER 2004)

09:00–09:30	Registration
09:30–09:40	Welcome Address <i>Dr Wilfried Kreisel, Director, WKC</i>
09:40–09:50	Introduction to the topic, objectives and the goals of the meeting <i>Dr Colin Tukuitonga</i>
09:50–10:10	Introduction of the participants (self-introduction)
10:10–10:20	Nomination of chairperson, vice-chair, rapporteurs and adoption of agenda
10:20–10:50	Coffee & tea

### ***Plenary 1***

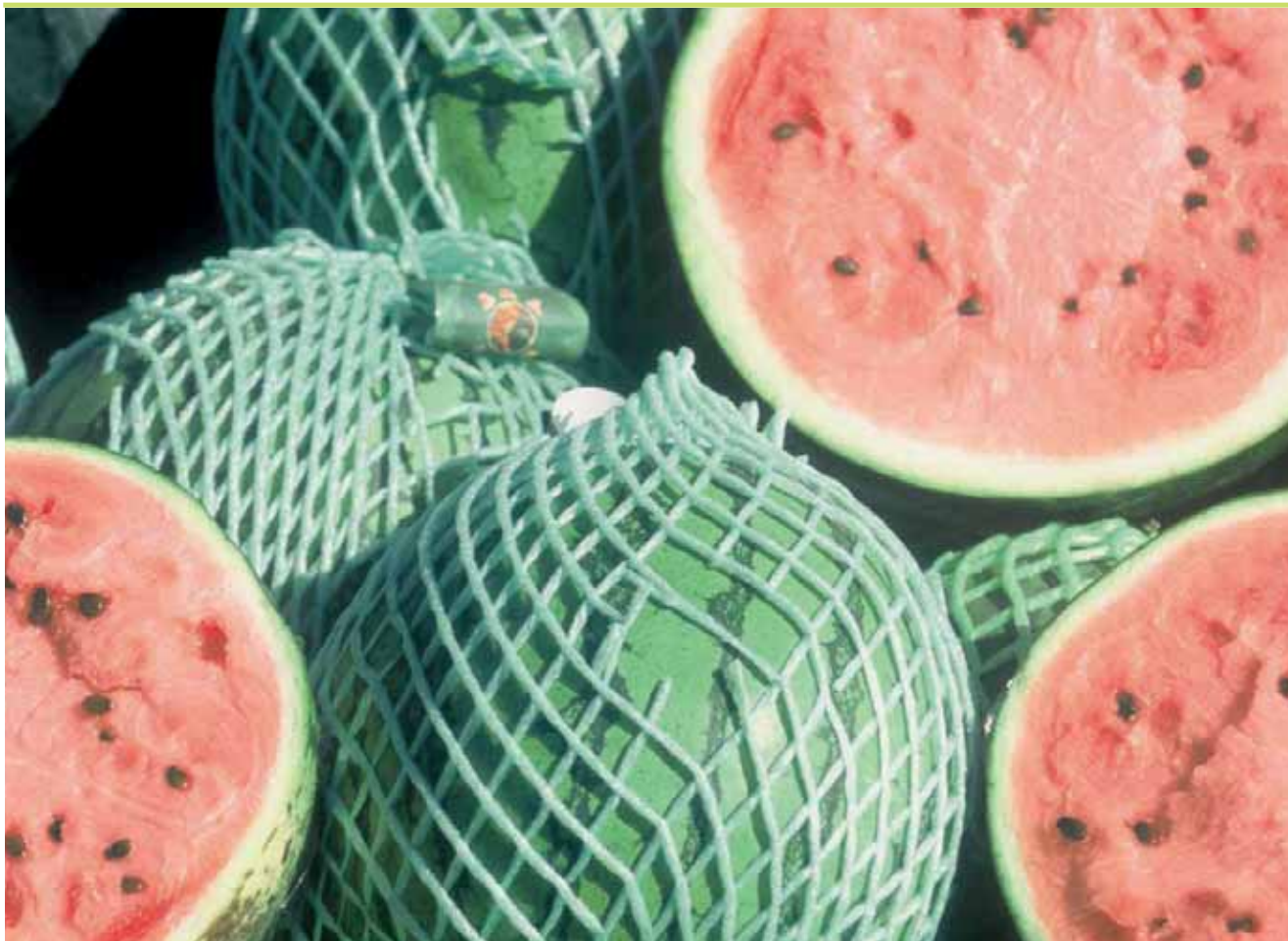
The objective of this session is to provide a background review of the existing evidence on the role of fruit and vegetables in the prevention of NCDs and an overview of the global fruit and vegetable production and consumption trends

10:50–11:20	Overview of health effects of fruit and vegetables regarding cancer, CVD, obesity and diabetes – background information <i>Dr Anna Ferro-Luzzi</i>
11:20–11:50	Trends in fruit and vegetable consumption and effects as part of the nutrition transition <i>Dr Carlos Monteiro</i>
11:50–12:20	Production of fruit and vegetables worldwide <i>Ms Alison Hodder</i>
12:20–12:50	Discussion
12:50–14:00	Lunch

## Plenary 2

The objective of this session is to provide an overview of fruit and vegetable interventions and promotion programmes that work, including country experiences

14:00–14:30	Measuring intake of fruit and vegetables <i>Dr Antonio Agudo</i>
14:30–15:00	Effectiveness of interventions and programmes promoting fruit and vegetable intake <i>Dr Karen Lock</i>
15:00–15:30	Production interventions <i>Mr Wilfried Baudoin</i>
15:30–16:00	Discussion
16:00–16:30	Coffee & tea
16:30–17:00	FAO's involvement in the WHO/FAO Fruit and Vegetables Initiative <i>Ms Alison Hodder</i>
17:00–18:00	Presentations of country case studies - Brazil, <i>Ms Angela Peres</i> - Ethiopia, <i>Dr Workafes Woldetsadik</i> and <i>Mr Melaku Jirata</i> - Iran, <i>Dr Roya Kelishadi</i> - Thailand, <i>Dr Somchai Durongdej</i>
18:00–18:30	Discussion and closure of the day



## DAY 2 (THURSDAY, 2 SEPTEMBER 2004)

### *Plenary 3*

The objective of this session is to review barriers, opportunities and incentives for fruit and vegetable promotion along the supply chain, through food safety and economic issues

09:00–09:30	Supply chain – describing the different components of the supply and value chain from production to consumption <i>Mr William Clay</i>
09:30–10:00	Food Safety Issues <i>Dr Gerald Moy</i>
10:00–10:30	Patterns and determinants of fruit and vegetable demand in developing countries: a multi-country comparison <i>Dr Marie Ruel</i>
10:30–11:00	Discussion
11:00–11:15	Introduction to working groups
11:15–11:35	Coffee & tea
11:35–13:00	Working groups
13:00–14:00	Lunch
14:00–15:00	Working groups
15:00–15:20	Coffee & tea
15:20–17:30	Working groups
18:25	Group photo (in entrance hall, 1st floor)

## DAY 3 (FRIDAY, 3 SEPTEMBER 2004)

09:00–10:00	Working groups
10:00–11:00	Plenary, reports from the working groups 1–4 and discussions
11:00–11:20	Coffee & tea
11:20–12:30	Plenary, reports from the working groups 1–4 and discussions (continued)
12:30–14:30	Lunch
14:30–16:30	Final discussion and adoption of the outline of the framework
15:30–15:50	Coffee & tea
16:30	Closure of the workshop by Dr W Kreisel, Director, WKC.





ISBN 978-92-5-105268-6



Y5861E/2/08.10

ISBN: 92 4 159281 8

