

Meeting consumers' needs and preferences for fruit and vegetables



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Contents

- 1. Introduction 1**

- 2. Domains of demand and supply 3**
 - Consumer domains 3
 - Supplier domains 3
 - Fruit and vegetable networks: a conceptual approach for linking
supply and demand 4

- 3. Consumer needs and preferences 7**
 - Effective demand – the key to consumption 7
 - Factors affecting consumption 8

- 4. Expanding and diversifying fruit and vegetable supplies 10**

- 5. Summary 12**

Chapter 1

Introduction

Meeting consumer needs and preferences for fruit and vegetables at recommended FAO/WHO levels would appear to be a simple process, but is it? It requires more than looking to close gaps between the amount grown and that consumed. In fact, there are considerable socio-cultural, commercial, educational and technical challenges to expand and diversify fruit and vegetable production and consumption in almost every country. Overcoming these challenges requires country-specific, multi-sector policies and programmes.

Fruit and vegetable consumers are influenced by the availability, desirability and accessibility of the produce. Furthermore, just as there are different types of consumers, there is also a multiplicity of products and associated supply chains.

Adequate intakes of fruit and vegetables are essential components of healthy diets. They are promoted for their multiple nutritional benefits, as they are a good source of vitamins, minerals and dietary fibre preventing specific nutrient deficiencies, promoting healthy bowel function and reducing the risk of under-nutrition and chronic diet-related diseases.

The FAO/WHO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases held in 2002 recommended a daily intake of at least 400 g/person/day (146 kg/person/year) of fruit and vegetables. Although FAO food balance sheet data for 2001 indicate a global availability of 173 kg/person/year of fruit and vegetables, well above the recommended amount per person, not all people eat sufficient fruit and vegetables. There are significant variations between and within regions, countries, communities and households. Food availability is not synonymous with food consumption, especially with such perishable products as fruits and vegetables. The losses at the retail, institutional and household levels may lead to a gross overestimation of actual consumption. Even when a “sufficient” amount of fruit and vegetables has been consumed, inappropriate storage, handling, distribution and processing can significantly lower the nutritional value of the produce.

Achieving the necessary adjustments to increase and balance the demand and supply of fruit and vegetables requires broad-based action among a wide range of people at different levels. Interactions among consumers, producers, well-oriented market forces, backyard gardeners, technological advances, and private and public sector investment and expenditure are needed to improve fruit and vegetable consumption.

All this will occur in an increasingly complex food environment. On the supply-side, changes are taking place, for instance, the appearance of new players such as large processors and specialised traders. In many parts of the world supermarkets are gaining in importance as fruit and vegetable suppliers, which means that a number of growers, wholesalers, retailers and terminal markets must adapt their operations to the new systems of procurement and the increasing bargaining power of large buyers. As a result the horticultural industry is moving towards vertical integration or concentrating on adding value to products. The value-added industry is one of the fastest growing food sectors, and is developing in response to strong consumer demand for convenient horticultural produce, coupled with improved technologies that enable advances in product formulation.

Markets are becoming global with the opening up of new international sources of supply for fruit and vegetables, especially from developing nations. In 2001, the value of developing countries' exports of horticultural commodities accounted for 37% of total world horticultural exports. Also, new trade agreements are rapidly expanding South-to-South trade, within and outside of regions, even though developed nations are still the main destination market.

Among the changes in the supply-side is the development of global strategic alliances spurred by the retail sector's desire for a continual supply of a large array of products. There is a double purpose behind this trend: to reduce transaction costs and improve the quality, safety and reliability of the supply of fruit and vegetables. Cutting costs (pricing, quality and quantity, consistency, bargaining power, marketing, credit management) is essential in an increasingly competitive sector.

Finally, the whole supply chain has benefited from new technologies for producing, processing and distributing fruit and vegetables. For instance, reduced costs and losses, extended shelf life and enhanced quality and safety of fruit and vegetables. While the horticultural industry is trying to react swiftly and efficiently to changes in consumer demand, it is noteworthy that, at the same time, the new supply conditions are also shaping consumer preferences.

Chapter 2

Domains of demand and supply

CONSUMER DOMAINS

Individual groups of consumers of fruit and vegetables have varied preferences, make decisions, and use supply channels in such a manner that they represent distinctly different domains of consumers. Such consumer domains refer to socio-economic groups characterised by how they acquire and use fruit and vegetables. In a given locality such groups might include: subsistence farmers, pastoralists, small-scale semi-commercial farmers, commercial farmers, peri-urban dwellers and urban dwellers. These groups can be clustered into the following major consumer domains:

- **Market-dependent consumers** - urban/peri-urban dwellers;
- **Auto consumers** - self-sufficient subsistence farmers/pastoralists;
- **Mixed consumers** - some purchases, some auto production - semi-commercial producers/home gardeners;
- **Institutional consumers** - such as schools, worksites and food service settings are also a unique consumer domain.

Each of these domains are not homogeneous, and even within a given setting they can be split into more discreet domains of consumers characterised by how and with what they provision themselves. For example, among market-dependent consumers in a country there might be distinct regional, social or ethnic groups having very different food preferences as well as very different physical and economic access to fruit and vegetables.

If effective policies and programmes to promote adequate consumption of fruit and vegetables are to be designed and implemented, then planners must be aware of how specific target groups perceive, acquire and use fruits and vegetables. What may be appropriate for one domain of consumer may not be relevant to another. Identifying population groups that are at-risk of under-consuming fruit and vegetables and understanding why they are at-risk, is essential for developing sound interventions.

All potential consumers are influenced by the availability, affordability and perceived desirability of the fruit and vegetables and their willingness and ability to acquire, prepare and consume the available fruit and vegetables. To be successful in achieving improved intakes interventions need to focus on modifying one or more of these factors.

SUPPLIER DOMAINS

As with consumers, there are different domains of fruit and vegetable producers. The three broadest domains are:

- **Small-holders** - rural and urban and peri-urban households who garden and produce primarily for their own consumption;
- **Small-scale commercial** producers and processors, commonly found in both rural and peri-urban areas;
- **Large-scale commercial** producers and processors. These may be further divided depending on factors such as their location, type of produce, type of processing or marketing outlets.

Specific fruits and vegetables are supplied to different consumers in different ways. Each commodity and product has its own supply chain within each consumer domain. Some of these chains are very short, for example that for fresh homegrown tomatoes - plant them, pick them, and eat them. Other chains are more complex, for example those for commercially canned tomatoes or tomato paste.

The longer chains involve practices and technologies that form the 'the post-harvest supply chain. These practices aim to protect and preserve the quality (desirability, edibility, nutritional content) of produce and to extend the opportunities for moving food

from where it is produced to where it will be consumed. Post harvest technology includes storage of fruit and vegetables in a manner that preserves their key attributes, processing of products to transform them into new products that can be safely stored, and transport of a product from another region or nation.

The common elements of the longer chains include: production, processing and storage, packing and packaging, transportation, marketing and distribution, preparation and feeding. Recognising these elements is important because it is within them that factors limiting the availability, affordability and desirability of fruit and vegetables can be identified and remedial action taken.

The following operations are the most important steps used to provide quality fruit and vegetables¹:

1. Use of good agriculture practices to produce food of the quality expected by the consumer;
2. Transport from the field to the pack-house and/or processor;
3. Grading of products to maximise both the value and use of the harvested product;
4. Packaging that minimises damage and ensures the appropriate atmosphere is maintained around the product during transport;
5. Maintaining products at safe storage temperatures with minimum variation. For fresh products this is generally below ambient;
6. Products reaching the requirements for consumption as 'fresh' fruit and vegetables must be moved to the consumer through a 'cool chain' which may involve storage, transportation and retailing;
7. Products not suitable, or not intended, for consumption as 'fresh' fruit and vegetables, or when supply exceeds storage capacity, must be processed into a product that can be safely stored or disposed of. Preserving, fermenting, canning/bottling, drying and freezing are common methods of processing fruit and vegetables;
8. The processed products must be moved to the consumer. This may involve one or more of storage, transportation and retailing, but typically without the need for a 'cool chain'.

These operations can take place regardless of whether the fruit and vegetables were grown in a home garden and consumed within the home or on a commercial farm and exported to another country. The fundamental differences relate to the scale of the operations and the physical distance the product moves. Clearly, greater physical distances and scale of operation introduce a new set of potential difficulties and problems, but these relate to the distance and scale not to the fundamental processes used. For example, it is possible to physically damage (bruise) fruit carrying it from a home garden to the house in just the same manner as when the fruit is transported several hundred kilometres. However, the opportunities for damage to occur increase with distance and hence more complex protective systems are needed.

It is important to stress that the post-harvest operations occur in such a manner that food safety is assured, typically through the application of processes such as HACCP and that the food is accurately described and labelled.

FRUIT AND VEGETABLE NETWORKS: A CONCEPTUAL APPROACH FOR LINKING SUPPLY AND DEMAND

To explore potential and existing constraints and opportunities to improve the availability, desirability and accessibility of fruit and vegetables the starting point is the consumer domain. For each consumer domain the supply web consists of many sources of fruit and vegetables that may be of differing scale and which may change throughout the year. Building an analytical model of such a web is difficult; however, it is possible to construct

¹ The order provided here does not infer a strict sequence of operations for all fruit and vegetables, it is usual for some operations to be omitted and it is possible for operations to be inserted for specific products.

a conceptual framework for analysis (Figure 1). The framework is developed for each consumer domain and must include:

1. Description of the demand for fruit and vegetables from the consumer domain;
2. Identification of sources of supply of fresh and processed fruit and vegetables;
3. Characterisation of the complexity of each supply chain;
4. Identification of any temporal variations in availability, desirability, and affordability for each source of supply;
5. Identification of processes used to extend the shelf-life of fruit and vegetables;
6. Integration of the results of the elements above to form a consumption calendar for all sources of fruit and vegetables.

The table produced in step 6 may depict the situation for the aggregate total of fruit and vegetables, or it could represent the situation for any chosen sub-set.

TABLE 1 : Framework for analysis of supply network for each consumer domain (with an example of a rural small-scale commercial farmer)

Sources of supply	Complexity of supply chain	Temporal variations	Processing options	
Grow own vegetables and fruit	Very simple/short	Seasonal supply, little change in desirability, no change in affordability unless sale in local market becomes attractive	Household level storage for root crops, processing by drying (e.g. peppers), making of pickles and other condiments	
Purchase vegetables and fruit in local market where producers are up to 50km away	Basic, transport involved but no cold chain	Seasonal supply, expect gluts and large quality variation, variations in both desirability and affordability	Household level bottling, jams	
Processed fruit and vegetable products (e.g. canned products)	Moderate complexity	Expect good availability, desirability depends on local tastes, affordability could be a problem	No further processing feasible	
Consumption Calendar				
Source of supply	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Fresh products	Nil	Some early crops	Plentiful, good range	Nil
Home processed products	Some	Possibly available, depending on process used	Possibly available, depending on process used	Some
Purchased processed products	Available but may not be affordable	Available but may not be affordable	Available but may not be affordable	Available but may not be affordable
Stored products	Available, but some deterioration in quality	Nil	Nil	Plentiful

This approach identifies the gaps in supply and by further analysis of each supply chain the possible means to augment the supply. Augmentation includes options such as reducing losses in a supply chain, spreading production to reduce the impact of oversupply at a particular time, alternative processing techniques, improved storage technologies, introducing new sources of supply and so on.

The benefit of this framework is more conceptual than pragmatic, in that it is not suggested that a detailed analysis is undertaken to complete the consumption calendar for an actual consumer domain. The benefit is derived through recognition that a wide range of factors influence consumption and that identification of an opportunity to increase consumption is realised by investment in the associated supply chain. Furthermore, consumption is the result of the effective operation of a number of supply chains delivering

fruit and vegetables to a domain of consumers who then choose to acquire and use the product. It all starts and stops with the consumer making a choice, and this is where interventions need to focus: how to create and meet consumer needs and preferences.

Chapter 3

Consumer needs and preferences

Among consumer domains in many countries there has been a notable change from a traditional food system to a more diversified diet, made up of more purchased and processed foods. This shift has come about because of several inter-linked socio-economic phenomena including urbanisation, globalisation, population and income growth, and associated changes in lifestyle and household structure. These have had a dramatic impact on the way fruit and vegetables are produced, distributed, purchased and consumed.

The main features of this change are an increase in the amount, especially of non-staples, and variety of foods consumed. Often, there is an increase in animal products, animal and vegetable fats (the latter particularly in developing countries), flavourings, condiments and caloric sweeteners. This diversity raises the average level of consumption of fresh and processed fruit and vegetables, and also meat, dairy products, fish and eggs.

The increased availability of fruit and vegetables in both developing and industrialised countries in recent years is considerable (Table 1). It has paralleled growth in consumption, because of factors such as greater consumer awareness of the importance of fruit and vegetables in the diet, income growth, aging of populations and increased development, trade and market promotion.

TABLE 2. Supply of vegetables by region, 1979 and 2000 (kg/capita/year)

Region	1979	2000
World	66.1	101.9
Developed countries	107.4	112.8
Developing countries	51.1	99.8
Africa	45.4	52.1
North and Central America	88.7	98.3
South America	43.2	47.8
Asia	56.6	116.2
Europe	110.9	112.5
Oceania	71.8	98.7

Source: Fresco L.O., Baudoin WO. Food and nutrition security towards human security².

However, for individual consumers the impact of the diet transition on their fruit and vegetable intake is less consistent because the impacts are neither heterogeneous across countries, communities and consumer domains, nor for all products. It is especially important to recognise the distinct differences in consumption seen within each consumer domain.

The different responses by different consumers to the broad array of factors affecting fruit and vegetable intakes illustrate just how difficult it can be to gauge, much less influence, consumer preferences. Factors most commonly cited include taste, availability, price (cost relative to income), convenience, socio-cultural factors associated with a given commodity (i.e. status) and nutrition and health concerns.

EFFECTIVE DEMAND – THE KEY TO CONSUMPTION

Effective demand for fruit and vegetable consumption is difficult-to-measure. It is an indicator of how much of a product consumers are willing to purchase, and is a function of income, relative prices and consumer priorities, preferences and choices. Raising

² In: Proceedings of the International Conference on Vegetables, (ICV-2002), 11-14 November 2002, Bangalore, India. Bangalore, Dr Prem Nath Agricultural. Science Foundation (in press).

consumer incomes, lowering product prices and increasing the desirability of the product can increase effective demand for a product. However, a large part of the world population has markedly inadequate fruit and vegetable consumption because they are too expensive to eat.

In some consumer domains, typically, but by no means exclusively, high income consumers, the limitation on demand is not price, but the desirability of the available fruit and vegetables. Taste and perception have varying degrees of importance to different consumers. Convenience, that is the time and ease of preparation and consumption, is a significant factor as consumers want products that fit into busy lifestyles. Simply producing more of the same horticultural produce will not necessarily contribute to increased consumption or to improving nutrition unless people want to purchase the products and can afford to do so. Thus, meeting the recommended intake of fruits and vegetables requires not only raising and diversifying supply, but also primarily increasing the effective demand.

Effective demand is the parameter that most usefully links supply with consumption when analysing situations and planning interventions to increase fruit and vegetable intakes. By looking at aspects of supply, effective demand, actual consumption and recommended intakes more appropriate interventions can be designed. For example, several situations can exist in which consumption falls below the recommended level of intake, but the reasons could be quite different and consequently so would the interventions needed to correct them (Table 2).

TABLE 3. Examples of supply and demand scenarios where consumption is below recommended intakes (RI)

Situation	Intervention implications
Effective demand is equal to actual consumption, and supply exceeds demand and RI	Focus on increasing effective demand – food and nutrition education, consumer awareness, marketing promotions
Effective demand exceeds actual consumption and supply	Expand supplies/diversify products to meet unrealised consumer demand
Supply exceeds effective demand but is below RI	Increase effective demand and expand/improve supplies

The gap between the recommended intake of fruit and vegetables and actual consumption is the 'consumption gap' and the difference between effective demand and supply to the consumer is the 'supply gap/surplus' as the case may be. The consumption gap and supply gap will be different for various consumer domains. The supply gap is aggravated by the physical losses and quality degradation occurring between harvest and consumption.

Quantitative analysis of mechanisms to close the consumption gap is hampered by the lack of information on effective demand for the various consumer domains. Research is needed to identify consumption trends and purchasing behaviour patterns, and to determine incentives and other socio-cultural and economic factors facilitating the consumption of fruits and vegetables. This is particularly so for developing countries, given their lack of quality and in-depth information on production, distribution and consumption of fruits and vegetables.

FACTORS AFFECTING CONSUMPTION

A range of social, demographic and economic factors influence the effective demand for, and thus consumption of, fruit and vegetables. Any plan to expand consumption within different consumer domains must identify and overcome the barriers to consumption within each domain. Table 3 shows some factors influencing the consumption of horticultural produce.

TABLE 4. Factors influencing the consumption of fruit and vegetables

Economic factors	Demographic changes
National/community wealth Household income growth Relative prices: food and non-food Improvements in marketing and transport infrastructure and regulatory frameworks	Rapid urbanisation Population growth Immigration Changes in household structures
Food preferences and changing lifestyles	Supply factors
Year-round availability Better quality and variety Convenience (eating out, processed foods) Health concerns, and greater consumer awareness of "clean and green" produce Female employment outside of the home Loss of traditional culinary skills, and Growing concerns over food safety	International trade Concentration and consolidation at the buyer and supplier level Increasing competitiveness Growing value-added industry New technologies available New trade agreements stimulating exports of fruit and vegetables

When taken together with some of the common reasons that many consumers give for not eating more fruit and vegetables, the above factors indicate areas in which planners can focus. Some of the reasons that constitute the barriers that must be overcome if consumers are to eat more fruit and vegetables are:

- not part of traditional dietary habits, or of newly acquired or aspired to dietary habits,
- not tasty,
- high cost, especially of fruit,
- low availability or high variability (including by season) in availability, quality and price,
- time consuming and inconvenient to prepare,
- lack of skills to shop for, clean, store and prepare,
- concerns about food safety including microbial contamination, pesticide residues, and biotechnology.

Overcoming these barriers is essential if the supply and consumption of fruit and vegetables are to reach recommended levels. Consumers need access to products they want at affordable prices. Individual fruits and vegetables are products, and these are what consumers and producers purchase and grow. Consumers do not purchase fruit and vegetables as a class of foods, they purchase bananas and beans; a point easily overlooked when analysing the performance of the sector as a whole. Consumer products have a life cycle that often reflects significant changes from the time a product is introduced to a market until, in the case of many fruit and vegetables, it becomes just another commodity where taste, price and convenience are the dominant factors in determining sales. The case of kiwifruit in western markets is instructive: it was a high value specialty product when introduced, but it is now just another commodity fruit.

Chapter 4

Expanding and diversifying fruit and vegetable supplies

What will it take to fill the supply and consumption gaps of every consumer domain? Identified consumer concerns include many issues that the various sub-sectors of food and agriculture need to address. Generally, national and local food systems need to ensure the availability of a range of affordable foods that are marketed vigorously to all groups, that consumer concerns about product safety are ameliorated, that products meet consumer taste and convenience expectations and that consumers are aware of their need for adequate fruit and vegetable intakes and their incorporation into daily meals and snacks. Significant improvements to the various supply networks are needed to lower costs and improve the quality and image of fruits and vegetables.

Price is an important element in the consumption of fruit and vegetables. They are expensive components of many diets, especially compared with cereals and other staples. In Italy, household consumption of horticultural produce dropped from 460kg in 2000 to 418kg in 2003, equivalent to a 10% reduction of fruit and vegetables purchases (IHA Italia, 2003). This fall was directly related to price increases. The price of fruit rose by 16% and of vegetables by 11% in 2002; the trend slowed in 2003, the price of both rose by 8%.

In supermarkets and larger scale co-operative enterprises that achieve economies of scale significant improvements in supply networks can be quickly realised. Small-scale actors in the supply networks (smallholder farmers, small and medium-scale food processing and handling enterprises) may be disadvantaged in their efforts to maintain cost competitiveness. It can be argued that this is an inevitable outcome of a competitive market for a commodity where price is the key determinant of sales causing a downward pressure on prices throughout the supply chain. Conversely however, it is possible to argue that, for example, smallholder farmers can carry out grading, packing and quality assurance functions in the field thus eliminating or reducing these functions within the supply chain. The farmers, by 'adding value' at source, can increase their returns. Also, consumers may pay a premium for higher quality, better tasting and more convenient products, and small-scale producers may better meet such criteria.

Whilst improving cost competitiveness is an essential strategy for fruit and vegetable supply networks, experience from other consumer sectors shows the greatest increase in returns occurs when new products, which compete on attributes other than price, are introduced. Which is not to say they are necessarily expensive, it simply means the market price is not closely tied to the cost of production. However, a high priced product may not grow effective demand in the market.

Unfortunately, supply chain optimisation is not occurring in a significant number of consumer and producer domains. The failings can be grouped under two areas. Firstly, physical infrastructure such as transport, energy, cool or cold storage, packing/processing facilities, clean water and waste management networks. Without an adequate physical infrastructure it is almost impossible to establish efficient fruit and vegetable supply chains. For example, Africa and parts of South America have both very high costs and limited transport networks and a very low supply of fruit and vegetables (Table 1). Secondly, a lack of food quality and safety regulatory framework and/or the capacity to use it in a credible manner. The inadequate application of national and international food quality and safety standards in a number of regions has greatly constrained the development of local food systems. There is an increasing awareness in many producer domains of the importance of quality and safety assurance. Considerable investment is being made to help producers understand and use good agriculture and manufacturing processes so as to comply with acceptable standards. In addition to protecting consumer

health, much of the motivation behind this trend has been the mitigation of risks to reputation and/or commercial risks. Also, in some product lines and industries these moves have been part of commercial strategies of differentiation. Whatever the motivation, action in this area must continue to expand.

Action in other areas also must continue. Most importantly, the industry needs to expand the products it offers to consumers and ensure that these products remove barriers to consumption. For example, the development of pre-washed, sorted and packaged salads in Europe and North America are offered as being more convenient than traditional salads, and they are more profitable for the producers. Such a win-win situation must be developed if increasing fruit and vegetable intakes are to be realised.

Chapter 5

Summary

Increasing fruit and vegetable consumption globally requires an appreciation that different domains of consumers have distinctly different mechanisms by which they acquire fruit and vegetables. Furthermore, there are significant differences between the domains of consumers in the means they use, and can use, to increase fresh fruit and vegetable availability on a year round basis. For each domain of consumers there are multiple supply chains creating a supply web or network. An analysis of the supply web being used along with potential additional sources of supply is needed to improve fruit and vegetable availability.

Supply chain optimisation is crucial to closing the supply gap and lowering costs can impact on the consumption gap. Product innovation has a critical role in closing the nutrition gap and improving the returns to the people in the supply chain.

Building a sound supply system requires a strong foundation in supply chain optimisation, physical and social infrastructure at local and national levels, and a fair and free international trading environment. Efficient mechanisms allowing consumers and producers to interact to produce product innovations are needed. Such a foundation is reliant on capable public and private sectors.

At the heart of the efforts to increase and diversify fruit and vegetable consumption must be a strong commitment to strengthening consumer knowledge, attitudes and skills needed to enable them to acquire and use what they need according to their preferences.

