

Consumer Expenditures on Fresh Fruit and Vegetables

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I Introduction

The sustained demand for fresh fruit and vegetables is reflected in consumer expenditures on this food category. Expenditures are a function of income and prices and vary across countries, reflecting their level of economic development and disposable incomes. The general relationship between income and expenditure on various foods has been captured by the Engle curve (for some new applications, see [Chai and Moneta, 2010](#)). Empirical verification of the general relationships depicted in the Engle curve indicates a fairly steady growth in expenditure on fruits and vegetables as incomes increase. The objectives of this chapter are to: discern differences between expenditures on fruits and vegetables as separate categories, illustrate preferences for specific fruits and vegetables and evidence the differences in choices of various fruits and vegetables across countries with different income levels and climatic zones. The information will demonstrate similarities and opportunities for international trade and the challenges to postharvest handling. Insights from this exercise provide an additional justification for using the systems approach to effectively meet consumer expectations across various income strata on a global scale in the delivery of fresh produce.

Expenditures on fruits and vegetables, along with fresh produce preferences are illustrated using data collected by the Central Statistical Office (CSO; in the case of Poland) or data collected via household surveys from urban consumers (in the cases of the Republic of Korea, Ghana and Uganda). The countries studied represent a diversity of consumers in the contemporary world in terms of disposable income, preferences, consumption and natural resource endowment conditioning the supply of domestic fresh produce and indirectly determining the potential for trade. Incomes in these countries have been growing in recent times and fruit trade has been increasing. In comparison to some post-industrial economies, the consumption of fruits and vegetables in these countries shows a tendency to increase. For example, fruit consumption in the United States has been

fairly steady and changes affect the type but not the total volume of consumed fruits and vegetables, while in countries with growing incomes the drivers of consumer purchases are preferences for fruit variety, convenience and novelty (see Chapter 2). All three features create opportunities for increased trade in fresh produce, but require that produce retain its quality and are safe, traceable, accessible and affordable.

II Recommended daily fruit and vegetable consumption

The World Health Organization recommends a daily intake of about 400–500 g of fresh fruits and vegetables (WHO, 2003; p. 89). Few countries actually meet that level. Various consumer education and food programs have been developed by national governments to encourage greater fruit and vegetable consumption (EUFIC Review, 2012). In the United States, a food pyramid was presented in 1992 to promote the desired eating patterns and make fruits and vegetables a sizeable part of the healthy diet (Neuman, 2011). It was modified in 2005 and has been recently replaced by a logo in the shape of a dinner plate. Other countries adapted graphic guidelines to promote proper nutrition, emphasizing the importance of fruits and vegetables familiar to their societies (Figure 7.1). Such efforts to emphasize the importance of fresh fruit and vegetable consumption coincided with the systems approach for delivering quality fresh produce to satisfy consumer expectations. Yet, the differences in fresh produce consumption across countries reflect a multitude of factors including demographic and socio-economic status, personal factors (e.g., perceived time constraints) and social environments (e.g., meal patterns, attitudes towards fruit and vegetables) (EUFIC Review, 2012). The lack of a standardized data collection methodology for fruit and vegetable intake across countries is a major obstacle for cross-country comparisons (EUFIC Review, 2012) and should be kept in mind when reading this chapter.

The average consumer in the Republic of Korea consumes about 197.5 g of fruits and 283.5 g of vegetables, giving a total of 481 g daily. This level is one of the highest amounts of consumption in the world. But among Asian countries the average consumption varies widely and a number of countries do not meet the WHO standard. In Europe, the average Polish consumer eats 577 g of both fresh and prepared fruits and vegetables per day (EUFIC Review, 2012). This amount is higher than the average in many other European countries, where the most fruits and vegetables are eaten in countries of the European Union (EU). Among countries outside the EU, for example in Ukraine, the average consumption of fruits and vegetables in 2005 and 2006 decreased by 3.2% and increased by 3.3%, respectively (based on State Statistical Service of Ukraine, 2007) and does not meet the WHO recommendation. In Sub-Saharan Africa, the average consumption of fruits and vegetables is also relatively low as compared to the WHO recommended daily volume.



FIGURE 7.1

An example of the “food pyramid” concept adjusted to improve communicating the message about fruit and vegetable consumption to Chinese consumers (poster placed at Shanghai Academy of Agricultural Sciences, China).

Photo: Zweling Kong.

In the two countries representing East and West Africa in this chapter, the consumption is quite different and illustrates the differences not so much in terms of location, but ability to purchase fruits and vegetables and their relative importance in daily diets. Ghana, a West African country, reports the daily fruit and vegetable consumption level close to the WHO recommendations at 400–500 g per day. Using per capita consumption of fruits and vegetables converted from the FAO statistics (FAO, 2013) to daily per capita consumption in grams, an average person in Ghana consumed 456 g of fruit and 88 g of vegetables per day in 2009 (excluding roots and tubers such as sweet potato; calculations made for this chapter are by the authors). However, one has to recognize that spoilage and waste (including peel) lower the volume, as most vegetables are cooked rather than eaten raw because preparation lowers microbial contamination (Wright et al., 2009) and increases the availability of nutrients (Wrangham and Conklin-Britain, 2003). In Uganda, the daily per capita consumption of fruits and vegetables is estimated at 425 g and 77 g, respectively, using the same calculation method as in the case of Ghana.

However, the figures seem to be much higher than the observed consumption, and figures from the household survey support the view that the calculated figures are far too high and, because of the calculation method, ignore the waste from preparation and spoilage. More importantly, casual observations suggest that daily consumption is highly variable across regions and between seasons. Regional differences reflect the variation in household incomes in Uganda. As is the case in many lesser-developed countries, the highest per capita income is enjoyed by residents of the capital city, making that urban market particularly attractive for fruit and vegetable sellers. In all countries considered in this chapter, there is a wide variability in the variety of consumed fresh fruit and vegetables, and to a varying extent it includes fruit and vegetables that are obtained outside the formal distribution channels. However, all countries considered in this chapter are experiencing an increasing presence of formal retail outlets, including supermarket chains.

A Income growth

In the case of all four countries, the growth of per capita income has been a prerequisite for the growth of fruit and vegetable consumption. In the Republic of Korea (South Korea), incomes grew substantially between 1990 and 2011 and the per capita income (measured as Gross National Income, GNI, in current \$) increased by 360.3% during that period (KOSIS, 2013). The economy in Poland, after its transition to a market economy, has been steadily growing (Florkowski, 2013). Similarly, the Ghanaian and Ugandan economies have been expanding. From 2003 to 2012, the average GNI per capita (in current \$) increased 20% annually in Ghana (calculation based on World Bank, 2013), while Uganda maintained an average real Gross Domestic Product, GDP, growth of 7.48% from 2003 to 2011 (World Bank, 2012).

Increasing incomes have been reflected in fruit and vegetable expenditures and consumption. For example, in Poland the average per person monthly expenditure on fruit increased by 26.8% between 2006 and 2011, while the corresponding expenditure on fresh vegetables grew by 14.7% during the same period. Vegetables are a main or side dish of many meals and are ingrained in culinary traditions. Fruit is often consumed as a snack or dessert. Given the place of fruits and vegetables in the diets of many countries, the consumption of vegetables tends to be more stable than that of fruit. The essential role of vegetables in the diet means the expenditure on fresh vegetables tends to be more important for countries or households with lower incomes than expenditure on fresh fruit. Fruit expenditure is more responsive to increasing incomes (assuming prices remain constant) because it is viewed as less essential to the diet and weakening household budget constraint allows more free choice by consumers. A recent study of consumer demand for fruit in Scotland supports the influence of prices on both short- and long-term demand for fruit (Revoredo-Giha and Florkowski, 2013).

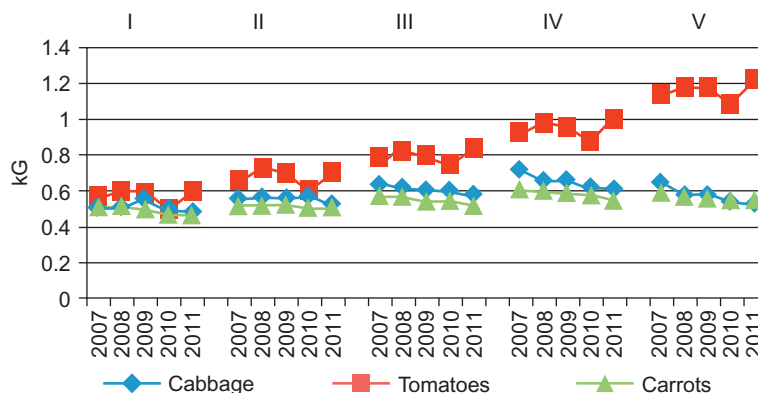
B Average expenditure on fruits and vegetables

Average expenditure on fruits and vegetables are illustrated with figures from four countries. In the case of Poland, the figures refer to the average monthly per capita expenditure on all fruit and vegetables and are based on time-series data for the period 2007–2011 obtained from Główny Urząd Statystyczny (GUS) (CSO). Fresh fruit and vegetable expenditure in case of the Republic of Korea and Uganda refers to weekly household expenditure in the week preceding the interview with a respondent. The figures are cross-sectional data obtained from a survey of urban residents in selected large cities in each of the three countries, seven in the Republic of Korea, three in Ghana and five in Uganda. The figures illustrate the relative importance of fruit and vegetable expenditure in different countries and contrast with the figures by income quantiles or groups discussed in the next section.

In the Republic of Korea, based on responses from 1100 urban women, the average expenditure in a week preceding the survey amounted to \$109.8 on fresh vegetables and \$157.4 on fresh fruit. The data from the survey of Polish households suggested the average monthly per capita expenditure on vegetables amounted to 26.67 zlotys (\$8.33 at the exchange rate \$1 = 3.20 zlotys) and fruit expenditure was 13.60 zlotys (\$4.25) (at current prices) for the period from 2007 to 2011 (Central Statistical Office, CSO; Polish acronym: GUS, various issues). Among the 1076 consumers in three urban centers surveyed in Ghana in the first half of 2011, the average weekly household fresh vegetable expenditure amounted to 12.90 cedis (\$8.31), while the household fresh fruit expenditure was 5.71 cedis (\$3.68). Another survey among 1646 consumers from five cities (Kampala, Gulu, Lira, Soroti and Mbale) in Uganda implemented in 2011 shows the average per person weekly expenditure of fresh vegetables and fruits as UGX 952.82 (\$0.42) and UGX 694.49 (\$0.31), respectively.

III Expenditure by income quantile in selected countries

Preferences for fresh fruit and vegetables vary, but from the produce marketer's standpoint, the ability to purchase is the key indicator in stimulating the delivery of preferred quality. The analysis of consumer purchases based on income quantiles leads to insights that distinguish various segments of the population. In general, the quantile analysis shows markedly different consumption or expenditure pattern as income increases. Often, consumers in the highest income quantile, whose expenditure is constrained little by income, display a distinctly different choice of fruits and vegetables. In other words, the highest income group presents market segmentation opportunities for special quality fresh produce that differ from consumers classified in other income quantiles in a given country. This pattern will be illustrated in this section using data from four countries from three different continents and from different climatic zones, income levels and dietary

**FIGURE 7.2**

Per capita consumption of selected vegetables by five income quintiles in Poland, 2007–2011. Note: GUS defined per person income levels for each quintile in 2010 as: I – 644.88 zł (\$195.4) or less, II – from 645.00 zł to 898.57 zł (\$195.4–\$272.3), III – from 899.00 zł to 1182.61 zł (\$272.4–\$358.4), IV – from 1182.65 zł to 1600.64 zł (\$358.5–\$485.1), V – 1601.67 zł (\$485.2) or more; the applied exchange rate: \$1 = 3,3 zł.

Source: GUS, *Budżety Gospodarskich Domowych w: 2007, 2008, 2009, 2010, 2011*, Warsaw, Poland. 2008; 2009; 2010; 2011; 2012.

patterns, namely Ghana, Poland, the Republic of Korea and Uganda. The similarities and differences have implications for the supply of specific quality produce to specific consumer groups and highlight the benefits for a systems approach to the postharvest handling of fresh fruit and vegetables.

The CSO in Poland provides details on per capita consumption only for a limited number of fruits and vegetables. However, the data are reported in various configurations. For the purpose of illustration, three fruit and three vegetable categories have been selected. The vegetables are tomatoes, cabbage and carrots because they are commonly consumed not only in Poland, but also in other European and non-European countries. The selected fruits include apples (the most commonly eaten fresh fruit internationally, although some argue that mango is eaten by a larger number of people across the globe), berries (which include several varieties including strawberries, blueberries, and red and black currants), and a broad category of exotic fruits. The name of the latter category was assigned by the CSO and includes citrus, bananas (two main types of imported fruit), as well as other sub-tropical or tropical fruit (e.g., pineapple, pomegranate, persimmon and kiwi). Therefore, the term “exotic fruit” refers to the interpretation of the data-collecting agency and this interpretation should be kept in mind while reading this chapter.

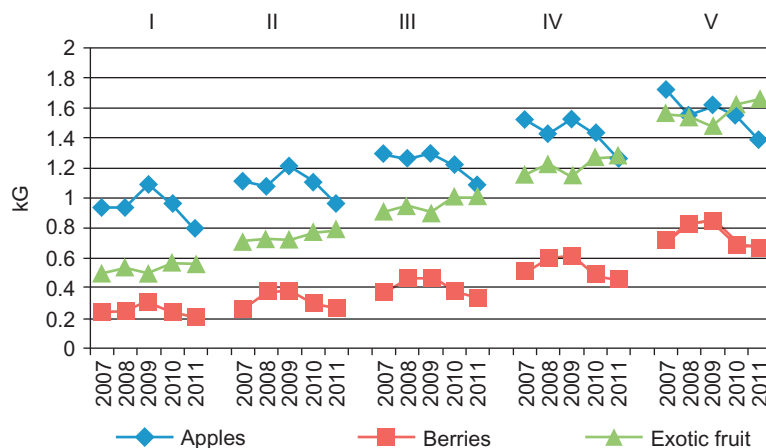
Figure 7.2 shows per capita consumption of three vegetables by five income quintiles in Poland between 2007 and 2011. Consequently, each plotted line shows the amount and changes in the amount consumed over the period of

five years. Each vegetable is eaten both fresh and cooked although, traditionally, carrots tend to be eaten cooked in larger quantities than fresh, while cabbage is eaten both cooked or pickled (sauerkraut) in larger volumes than fresh. Tomatoes are eaten fresh and processed, because fresh, high quality tomatoes have become readily accessible year-round through the expanding supermarket chains in larger quantities than in the past. All quintiles show very similar tendencies in consumption. In terms of quantity consumed, tomatoes are eaten in larger volumes than cabbage, which is consumed in larger amounts than carrots (except for the lowest and the highest quintile in some years). Moreover, the volume of tomatoes increases rapidly across the four lower quintiles, but the increase in volume consumed in each quintile does not show a steadily increasing tendency. The volume of the other two vegetables increases from quintile to quintile, but at a much lower rate than tomatoes and in the highest quintile it is not much different from that of the middle quintile (Figure 7.2). It appears also that the per capita consumption of cabbage and carrots has been declining in all quintiles. Such a decline is not necessarily desired from the standpoint of nutrition and disease prevention (see also Chapters 3 and 5), but consumers have an increasingly wide selection of fresh vegetables – a manifested success of proper postharvest handling procedures.

The strong preference for tomatoes among households as their income increases is likely the effect of a combination of factors, which vary in importance to different quintiles. The factors include progress in postharvest handling of good-tasting tomatoes (variety selection and postharvest efforts), tomato suitability to the forms of consumption (sandwiches, salads), convenience (ready-to-eat food with little waste), storability under home conditions and little, if any, waste. For example, for the highest quintile, the taste and convenience could be relatively important factors, while lack of waste and storability matter relatively more to lower quintile income groups. Tomato attributes and accessibility resulting from increased density of food retail outlets also encourages consumption growth.

Per capita consumption of fruit (Figure 7.3) also shows an interesting pattern of differences across quintiles and over time. As could be expected, per capita volume consumed of all fruits increases across quintiles reflecting income increase and the weakening budget constraint. However, year to year fluctuation in the consumed volume within a quintile show that households remain price sensitive. The consumption volume of berries increases across quintiles, but is lower than that of exotic fruits and apples. Because berries include a variety of fruits, the change in consumption between 2007 and 2011 shows that the berry consumption was declining in the second half of that period and the decline was more pronounced in higher quintiles. However, berry consumption was considerably higher in the highest income quintile.

The volume of exotic fruit consumed shows a big difference between the lowest and the highest quintile – the amount in the highest quintile is roughly 2.5 times higher than in the lowest quintile. The volume of exotic fruit consumed seems to show less variability than that of apples. This tendency reflects the smaller variability

**FIGURE 7.3**

Per capita consumption of selected fruit by five income quintiles in Poland, 2007–2011.

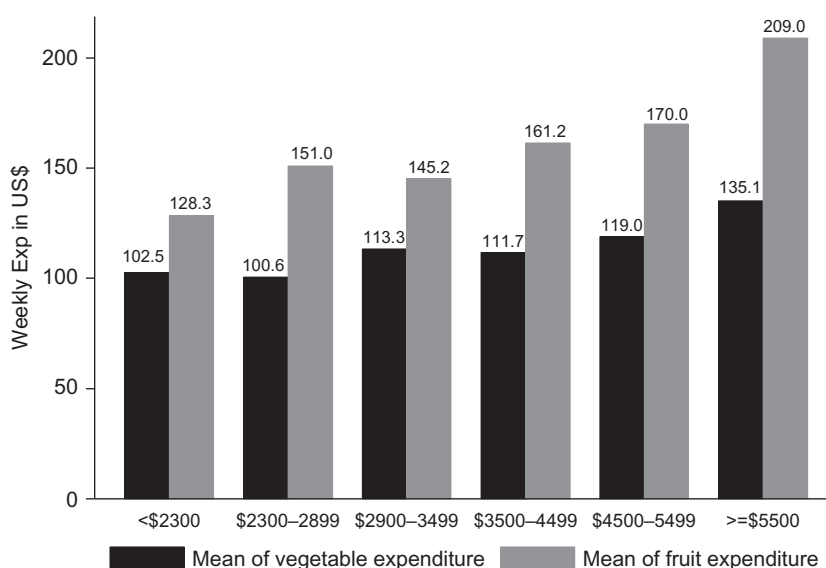
Note: GUS defined per person income levels for each quintile in 2010 as: I – 644.88 zł (\$195.4) or less, II – from 645.00 zł to 898.57 zł (\$195.4–\$272.3), III – from 899.00 zł to 1182.61 zł (\$272.4–\$358.4), IV – from 1182.65 zł to 1600.64 zł (\$358.5–\$485.1), V – 1601.67 zł (\$485.2) or more; the applied exchange rate: \$1 = 3,3 zł.

Source: GUS, *Budżety Gospodarców Domowych w: 2007, 2008, 2009, 2010, 2011*, Warsaw, Poland. 2008; 2009; 2010; 2011; 2012.

in the retail prices of exotic fruit than primarily domestic apples. Apple prices respond to domestic supply conditions, and the supply is determined by annual crop affected by weather, primarily any late spring frost. More importantly, the consumption of exotic fruit exceeds the apple consumption in the highest quintile, suggesting a particularly strong preference for this fruit type among well-off households.

Still, per capita consumption of apples by households in the highest income quintile is larger than in the other four quintiles suggesting that these households remain important apple buyers. But the consumed apple volume shows a decline in each quintile during the period under consideration. The pattern of the consumed volume also shows that apples tend to be more important to households in the lowest quintile, where the increase in the consumed volume is the largest (in 2009) in response to the price decline that year. The increases in other quintiles were lower and in the highest income quintile virtually muted. [Florkowski \(2013\)](#) showed that apples are a much more important fruit for low income households than for well-off households when measured by expenditure.

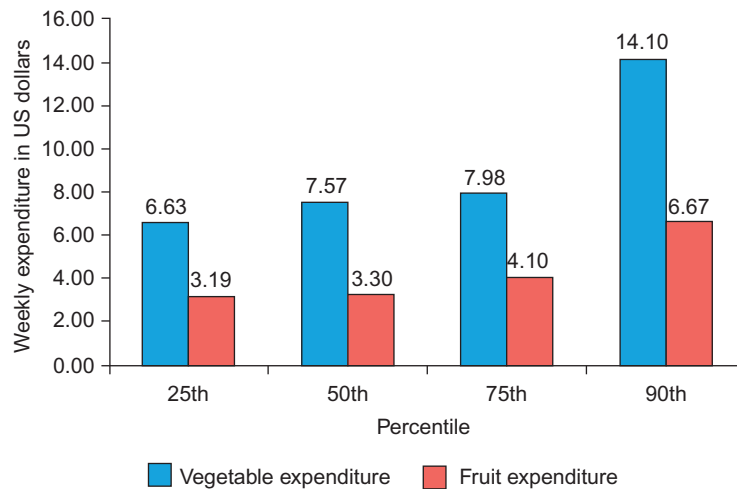
In the Republic of Korea, the expenditure on fresh fruits and vegetables in a week preceding the interview with the respondents during the 2007 survey shows the expected pattern of accelerated fresh fruit expenditure increase as income increases ([Figure 7.4](#)). The increase in expenditure on fresh vegetables across six categories suggests that households in the two lowest categories spent about a

**FIGURE 7.4**

Weekly fruit and vegetable expenditures in urban households in the Republic of Korea by six income categories based on the 2007 survey data, in \$. Note: currency converted at the exchange rate \$1 = 929 Korean won as of September, 2007.

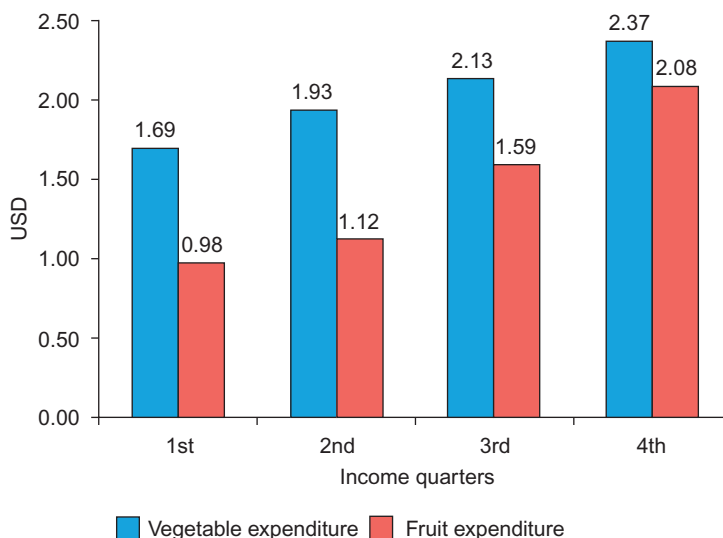
fourth more on fresh vegetables than the highest income category. The observation is important from the fresh vegetable marketing point of view, providing insights about spending in terms of household income. In the case of the Republic of Korea, it does not imply that households in the lowest income groups eat an inadequate amount of fresh vegetables because the household size is not taken into account and figures are measured in terms of money. In developed economies, the lowest income households contain a sizable number of one-person households comprising individuals who are living on pensions. Therefore, it is important to pay attention to the details of presented tendencies. Despite this possible household size confounding effect, households in the highest income group clearly outspend all other shown groups (Figure 7.4) although the fifth income group also spends more than other income groups. Because the traditional Korean diet is heavily dependent on vegetables and the average person eats the WHO recommended daily amount of fresh fruit and vegetables, the opportunities for an increased intake of fresh vegetables probably depend on innovative forms of preparation, eating occasions, or changes in the shares of individual vegetables or vegetable categories, which is likely to demand innovative postharvest handling to ensure high quality.

The increase in fresh fruit expenditure is more pronounced across the six income categories (Figure 7.4) than is vegetable expenditure, suggesting a very

**FIGURE 7.5**

The weekly fresh fruit and vegetable expenditures corresponding to income quantiles in Ghana (in \$; converted at the exchange rate \$1 = 1.52212 Ghanaian cedi as of June 1st, 2011).

high association between expenditure and household income in the Republic of Korea. All households spend more on fresh fruit than on fresh vegetables. Although the results could have been affected by the generally higher fresh fruit prices as compared to fresh vegetables prices, the increase in expenditure on fresh fruit is much more strongly pronounced across the six income categories. First, households in the lowest income category spent much more (28%) on fresh fruit than on fresh vegetables. This is interesting because, as shown later in this chapter, households from lowest income groups in less developed economies spend very little on fresh fruit purchases. The strong preference for fresh fruit among Korean households is reflected in the rapid increase in per capita intake of fruit in recent decades, which contrasts with the rather slow to stagnant growth in per capita vegetable intake. The second, third and fourth income categories (Figure 7.4) spend a similar amount on fresh fruit (expenditure ranged from \$145 to \$161) and about 30–40% more than they do on vegetables at the time the survey was taken. The fifth income category spend somewhat more than the middle three income categories and considerably more than they do on fresh vegetables (43% more on fresh fruit). The highest income category (Figure 7.4) reported much higher fresh fruit expenditure than any other category, \$209 or about 63% more than the lowest income category. Interestingly, a strong growth in fresh fruit expenditure can also be observed among the surveyed Ghanaian households (Figure 7.5), suggesting that in this particular income group, the budget constraint weakens and allows more choice in fruit purchases. Consumers in the highest income category may be open to trying a wider variety of fruit, but also may be willing to spend more if the fresh fruit meets their quality expectations, an

**FIGURE 7.6**

The weekly fresh fruit and vegetable expenditures by income quarter in Uganda (in \$, converted at the exchange rate \$1 = 2273.7495 UGX as of June 2011).

implicit requirement of proper postharvest handling. The highest income category spends more than other categories on fresh fruit (Figure 7.4) in the Republic of Korea, and the amount was larger than that spent on fresh vegetables. It outspends the fifth category by 23%, a considerable increase that should not escape the attention of fruit marketers.

The expenditure on fresh fruit and vegetables by urban households in Ghana refers to respondents surveyed in three large cities: Accra, Takoradi and Tamale. For the purpose of evaluating fruit expenditure tendencies, the focus on major urban centers is useful because such cities represent the largest domestic markets for domestic suppliers and fresh fruit traders. Figure 7.5 shows fresh fruit and vegetable expenditure based on the responses of 1076 households. Fresh vegetable expenditure continues to grow as income increases from the first to the third quartile, then the expenditure doubles for households with incomes in the 90th percentile. The relative increase in fresh fruit expenditure is largest between the lowest and the middle quartile, and the rate of expenditure growth decelerates in the two highest quartiles. Overall, the expenditure on fresh vegetables increases more rapidly than that on fresh fruit.

In Uganda, the average fresh vegetable expenditure is higher than the average expenditures on fresh fruit across all income quarters (Figure 7.6). However fresh fruit expenditure has increased faster for the higher income quarters; average vegetable expenditure increases by about 10% from the second to the third quarter, and by about 14% from the third to the fourth quarter. But the corresponding

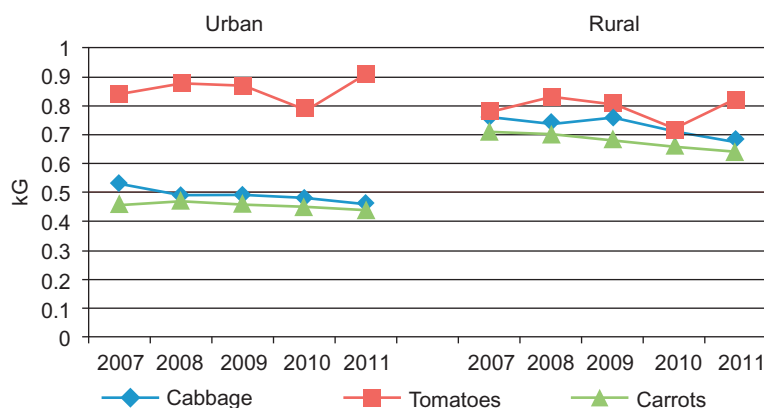
increases in average fruit expenditure are 31% and 42%, respectively. The pattern of faster increase in expenditure on fresh fruit than on fresh vegetables is similar to that observed across income categories in the other countries considered in this chapter.

When calculated in terms of expenditure per household member (children under four years old excluded; also, household size is highly variable especially across Africa), the pattern of higher average expenditure associated with higher income persists for fruit expenditure. This indicates that the income elasticity in fruit expenditure is strictly positive across all four income quarters. However, the pattern of vegetable expenditure is different. Compared to the lowest income quarter, higher income quarters are, generally, associated with higher vegetable expenditure. But the second quarter has the highest average vegetable expenditure of the four groups considered in this study. Such a result seems reasonable because higher income groups are less budget constrained and thus are more likely to purchase other foods, for example, fresh fruits, in addition to a certain amount of vegetables. This is also reflected in the purchase pattern of the households in the top 10% income group (not shown in [Figure 7.6](#)). The highest income households have the highest weekly total and per capita expenditure on fruits (UGX 5437.1 or \$2.39 and UGX 1034.2 or \$0.45, respectively), although their vegetable expenditure is slightly lower than the calculated expenditure in the third quarter. The average weekly household total and per capita vegetable expenditures by the top 10% income group are UGX 5191.4 and UGX 976.9 (\$2.28 and \$0.43), respectively. It is important to note that the fruit expenditure in the first income quarter is substantially lower than in the highest income quarter. The average weekly household total and per capita fruit expenditures in the first income quarter are only about half (47% and 55%, respectively) of their counterparts in the highest income quarter.

An important overall pattern to consider is that the share of expenditure on fresh fruits and vegetables, although increasing from the lowest to the highest quantile or income category, is decreasing in total household expenditures. That relative decrease has potentially important implications for quality and purchase. Consumers from well-off households may pay less attention to a single purchase of fresh produce with a quality below expectations. The less well-off households, in turn, may put up with lower quality if the price reflects the quality defects. The effects of the relative share of fresh produce expenditure in total expenditure may have different implications for consumer choices and purchase in countries with varying per capita income. Quality is placed in the context of affordability, allowing for different marketing strategies, which could have implications for postharvest handling.

A Examples of other factors which influence the choice of fresh produce

Consumption of fresh fruits and vegetables is conditioned not only by economic factors, especially income, but also by socio-demographic factors, household location, access to fresh produce and perceptions, including perceived health benefits.

**FIGURE 7.7**

Per capita consumption of three vegetables by urban and rural residents in Poland, 2007–2011.

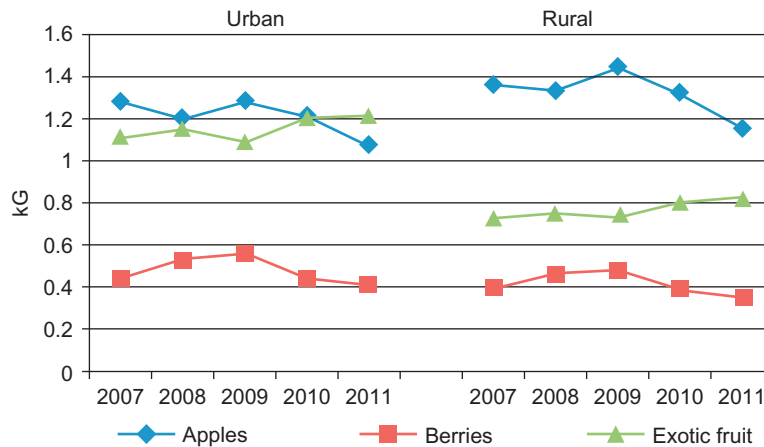
Cultural factors further condition fresh produce choices. The following subsections illustrate the relevance of various factors other than income to the consumption or purchase of fresh fruits and vegetables. It is assumed throughout the chapter that the purchase of fresh produce implies its consumption, although at household level, spoilage constricts the actually consumed volume.

Education

The data from the survey in Ghana reveal a strong association between secondary or higher education level and the reported fruit-eating frequency. The number of households with at least secondary education level and the number of households with primary and lower education are roughly equal, however, two-thirds of households reporting eating an apple weekly are from higher education groups and only a third are from the lower education group.

Urban versus rural household location

The available data also provide insights into differences in fruit and vegetable consumption between urban and rural consumers in Poland between 2007 and 2011. Figure 7.7 shows that urban consumers ate more tomatoes than rural residents in per capita terms between 2007 and 2011. The difference was relatively small in the case of tomatoes, but was much more pronounced in the case of per capita consumption of cabbage and carrots. Rural residents ate only slightly more cabbage per capita than carrots and the per capita volume of both was smaller than that of tomatoes. Urban consumers ate carrots and cabbage in very similar volumes in per capita terms during the period under consideration, but the consumption level was considerably below that of rural residents. For both urban and

**FIGURE 7.8**

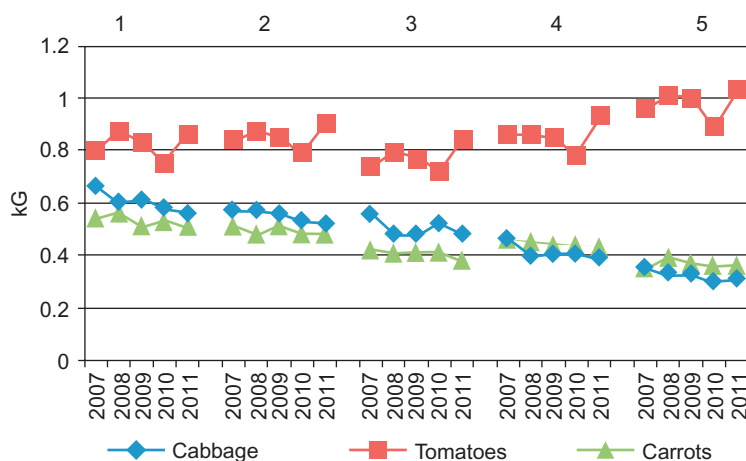
Per capita consumption of two fruit and a fruit category by urban and rural residents in Poland, 2007–2011.

rural residents, the per capita consumption has been steadily declining, with the rural per capita carrot consumption showing the most pronounced decrease.

Apples are the most popular fruit among rural residents and they are consumed in quantities that are larger per capita than for urban consumers in Poland (Figure 7.8); even so, their consumption is declining over time. The most noticeable per capita consumption difference between urban and rural consumers is the exotic fruit category and the fact that its consumption per capita is growing for both groups. Per capita berry consumption shows similar patterns among urban and rural residents during the period 2007–2011. Overall, the pattern of differences in per capita consumption of major fruits between urban and rural consumers reflects, among other things differences in accessibility and preferences.

City size and vegetable consumption

Urban consumers may have been offered a wider selection of fresh vegetables than rural residents because of higher density and competition among retail outlets offering fresh produce. Figure 7.9 shows the per capita consumption of three vegetables by residents in five town sizes in Poland in the period 2007–2011. Cabbage and carrot consumption steadily declines as the town size increases. Although the per capita consumption of cabbage is higher than carrot consumption in the three smaller town sizes, the opposite is true for residents of the two large sized cities. The importance of cabbage and carrot consumption for residents of smaller sized cities is quite evident, and may also reflect different densities of large retail outlets and shopping habits. The per capita tomato consumption is relatively stable with town size, except for the higher consumption in the largest city category (over 500,000 residents). This is an example of the influence of logistics and

**FIGURE 7.9**

Urban resident per capita consumption of three vegetables by five town size categories in Poland, 2007–2011. Note: the plotted lines range from the smallest size on the left to the largest on the right; the city categories are: 1 = less than 20,000 residents; 2 = 20,000–99,000 residents; 3 = 100,000–199,000 residents; 4 = 200,000–499,000 residents; 5 = 500,000 or more residents.

postharvest handling tailored to supplying large urban centers where supermarket chains dominate the retail landscape. Tomatoes, well liked, versatile, and easier to handle than many other fresh vegetables, are the most frequent choice of consumers, especially residents of the largest cities who also tend to differ in lifestyle from residents of other locations.

Accessibility

Differences have been confirmed by results from the household survey in Ghana in terms of distance from the potential supply source. The already mentioned example of the weekly eating frequency regarding the domestic orange and imported apple shows markedly different frequencies across the three large cities. Accra and Takoradi respondents consumed oranges with similar frequency (the proportions of households eating an orange weekly in these two cities are both about 35%), while Tamale respondents ate oranges more often (45% of Tamale households ate an orange weekly). Apple consumption frequency was the highest in Accra, where 15% of households reported eating an apple weekly, followed by Takoradi, 9%, and Tamale, 7%, respectively. The distance from the port of entry (most likely Greater Accra or Takoradi) could influence the accessibility of imported fruit and, eventually, the consumption frequency. It takes up to 12 h for a truck to travel the distance from Accra to Tamale. Nevertheless, it also has to be recognized that incomes and locally available fruit selection differ across the three cities and could influence the choice of fruit.

Regional differences

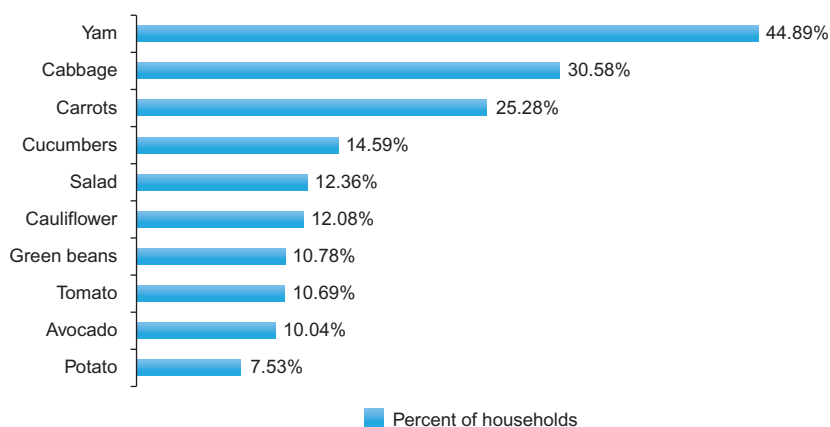
The review of urban Korean household survey data reveals that the weekly expenditure on fresh fruit and vegetables varies widely. The weekly fresh vegetable expenditure in the surveyed seven urban areas in September 2007 were \$129 in Busan, \$121 in Ulsan, \$116 in Inchon, \$114 in Seoul, \$102 in Daejeon, \$93 in Daegu and \$87 in Kwangju. Busan and Ulsan are located in the industrialized southeastern part of the country and are densely populated, though relatively far from domestic supply sources. The observed differences could reflect the possible local supply and demand conditions at the time of survey implementation. The weekly fresh fruit expenditure shows a very different pattern. Weekly expenditures were \$176 in Inchon, \$170 in Seoul, \$168 in Ulsan, \$165 in Daegu, \$142 in Busan, \$127 in Daejeon and \$83 in Kwangju. Clearly, fresh fruit expenditure shows a different pattern suggesting that the largest agglomeration of the capital city and Inchon are likely to represent a highly concentrated demand area. This illustration serves as a reminder that fresh produce marketing must recognize regional differences, and that shipped fresh produce must be appropriately handled.

IV Most commonly eaten fruits and vegetables

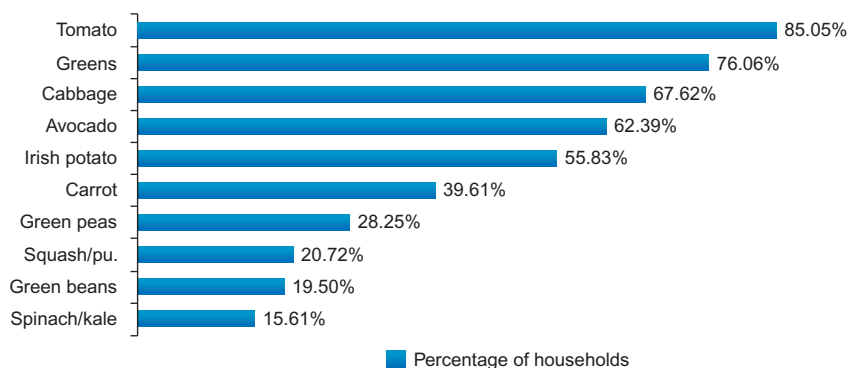
This section is based on household survey data from Ghana and Uganda. The data illustrate similarities in vegetable consumption. The most frequently eaten fruit shows larger differences than the most frequently eaten vegetables between the two countries (and across countries overall).

A Vegetables

Figure 7.10 shows the percentage of surveyed households reporting weekly consumption of the 10 most often named vegetables in Ghana. More than 44% of households named yam, which outdistanced all other vegetables. Yams are very popular and well liked and they are also domestically produced in Ghana. Moreover, the country also exports yams, primarily to the European Union. Exported yams are selected from the domestic supply to meet size and quality requirements in the destination markets. The yams remaining in the domestic market are highly variable in size and quality, but are eaten boiled or roasted, not fresh. Cabbage and carrots were also reported to be eaten weekly by 31% and 25% of households, respectively. The share of households reporting weekly consumption of the next six vegetables ranged from 14% for cucumbers to 10% for avocado. Only about 7% of households reported eating the Irish potato on a weekly basis. The variety of fresh vegetables is affected by the season, but for many of them, there is a nearly continuous domestic supply since there is usually a region with suitable growing conditions.

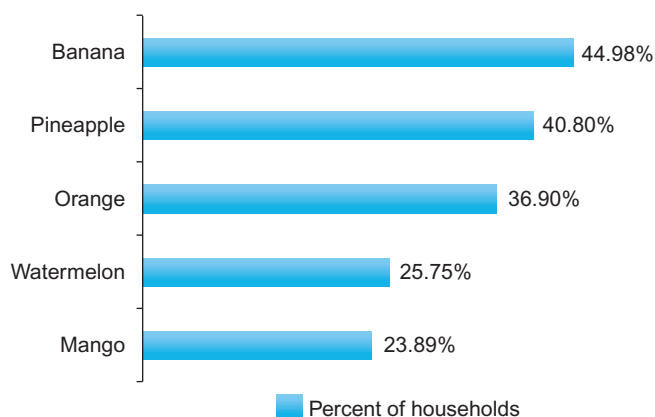
**FIGURE 7.10**

The proportion of surveyed households reporting eating weekly the 10 most-often-selected vegetables in Ghana, in percentages.

**FIGURE 7.11**

The proportion of surveyed households reporting eating regularly the ten most often selected vegetables in Uganda in percentages.

The survey data from urban households in Uganda reveal that the largest share of households reported “regularly” eating tomatoes among the 10 top vegetables (Figure 7.11). This result is consistent with vegetable consumption frequency in many countries of the world regardless of their level of per capita income. The tomato is a versatile vegetable (botanically it is a fruit, however) and is universally liked, therefore it finds an almost unending number of uses. The high share of households reporting eating greens supports casual observations and the reported forms of eating selected foods. Greens are typically cooked and eaten with rice or beans and peanut sauce. Meat is added to such a meal if it is

**FIGURE 7.12**

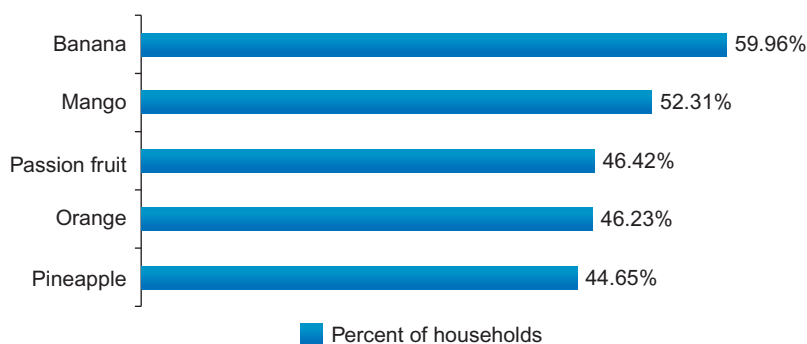
The proportion of surveyed households reporting eating weekly the five most often selected fruit in Ghana, in percentages.

available. Other popular vegetables are cabbage, avocados, carrots and green beans, which were named among the top 10 vegetables eaten on a weekly basis by urban households across Ghana (Figure 7.10).

B Fruit

In Ghana, bananas and pineapples were the most frequently eaten fresh fruit (Figure 7.12). The southern parts of the country are suitable for growing bananas, which require little effort to produce a crop. Pineapples have traditionally been the major exported fruit from Ghana. Oranges are commonly grown and supplied in large volumes to the open-air markets. However, a large portion of oranges spoil before they can be eaten or processed. Oranges are competitively priced and available throughout the country. Watermelons, followed by mangoes, are also among the top five eaten fresh fruits, but the reported consumption frequency is considerably less than that of pineapples or bananas. It is possible that the time period of survey implementation influenced the observed frequencies, but, in general, they reflect the availability of fresh, domestically produced fruit. In terms of the post-harvest handling system, the pineapple sector has developed a well-functioning system stimulated by the export market. Other fruit is mostly consumed domestically, and postharvest handling procedures vary widely from supplier to supplier.

The Ugandan urban respondents provided answers about the “regular” consumption of fresh fruits or vegetables (Figure 7.13). The phrasing of the question was finalized after the pilot test, which suggested that the initially requested information about consumption frequency measured on a daily, weekly, or monthly basis caused difficulty in providing answers. In Uganda, the five most often consumed fresh fruits, with the exception of passion fruit, are the same as in Ghana (Figure 7.12),

**FIGURE 7.13**

The proportion of surveyed households reporting eating regularly the five most often selected fruit in Uganda, as percentages.

but the order of frequency is somewhat different. Not surprisingly, bananas are consumed regularly by the largest percentage of households, 60%. Banana plants grow unimpeded in Uganda due to favorable conditions in large parts of the country. The plant bears fruit without any special care. Mangoes have been reported as being eaten regularly by 55% of the surveyed urban households, while the three other fruits have been eaten on a regular basis by 45–46% of the households, implying little variation in regular consumption of passion fruit, oranges, or pineapples.

V Concluding comments

Huge discrepancies in fresh fruit and vegetable consumption across countries and within countries across economic strata, socio-demographic groups and locations create tremendous opportunities for fresh produce suppliers. Many countries are far from reaching the goal of eating the recommended 400–500 g of fresh produce per day. Reaching various groups and consumer segments with quality fresh produce they can afford poses postharvest challenges, many of which still have not been addressed.

Globally, for the time being, consumer disposable incomes will continue to drive the purchase and, subsequently, trade direction and consumption of fresh vegetables and fruit. As the variety in the market place increases, competition among various produce types will increase. To deliver the quality expected by consumers will require cooperation among various players of the distribution system and value chain. Consumer education will be increasingly necessary to encourage sustained consumption because of the many choices even if price and quality expectations are fulfilled.

A factor not considered in detail in this chapter is the fragmentation of motives behind purchasing and eating fresh produce. Relatively more affluent

societies, but aging and experiencing declining health, will demand fresh produce in expectation of disease prevention and health maintenance. Affluent households across all countries will seek fresh produce as a tool to manage weight as the problem of overweight and obesity becomes a global scourge inflicting increasing costs on economies. The less affluent, as their incomes increase, will rapidly increase fresh produce consumption simply because they want to eat more of it if their budget constraints weaken. The interpretation of what is an exotic fruit or vegetable will be defined locally, but it will remain an influential factor driving purchase and consumption, requiring adjustment of postharvest handling for various climates, cultures and distribution systems.

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