

Chapter 2 - Introduction to food systems

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Primitive humans moved from place to place looking for food to satisfy their basic desires until they learned to cultivate the soil and raise animals. Since then, men and women have dedicated much of their time and intelligence to developing techniques and instruments to increase production of food in sufficient amounts to overcome scarcities.

Over time, distinct forms of social organization have evolved, modifying the direct relationships between man, land and food. Within every culture, the necessity of assuring an adequate food supply has contributed to the structure of society and the respective roles of men and women in producing and distributing food to consumers. Inequitable food systems have caused social revolutions. In any society, the availability and costs of food are variables closely linked with political decisions.



During the 20th century, countries have been able to establish food production and distribution systems which meet the needs of the majority of their populations. This has been possible because political decisions based on technical and economic criteria have resulted in systematic and continuous actions to improve the production and distribution of food.

Unfortunately, developed nations represent a minority of the world's population. In the developing countries of the world, conditions are very different:

- Overall performance of the agricultural sector in many developing countries has deteriorated during the 1980's.
- Technical agriculture, both in production and marketing, is lagging far behind that of developed countries.
- Over 50% of the food consumed in the world is still produced using predominantly human, non

During the past 30 years, the fields of social science, food technology and economics have contributed valuable methods and instruments for analyzing food systems. Given each discipline's particular biases and different objectives, one should not be surprised that their respective research techniques and methods of data presentation vary. For example, when presenting a flow diagram of a marketing channel for a particular commodity, the social scientist is likely to emphasize the human element (Figure 2.1A), food technologists the technical aspect (Figure 2.1 B), and the economist the institutional side (Figure 2.1 C). None of these methods is necessarily more correct than the others; each is simply a means for facilitating the comprehension of a complex system from a particular perspective.

[Figure 2.1A: The movement of beans from producer to consumer in Haiti](#)

Source: Murray and Alvarez, 1973, p. 19.

[Figure 2.1B: Steps in the postharvest system and percent losses at each step](#)

Source: Amezquita and La Gra, 1979, p. 18.

[Figure 2.1C: Marketing channels for salad and industrial tomatoes in the Dominican Republic](#)

Source: Secretaria de Estado de Agricultura, 1977, p. 155.

The three distinct methods, when treated individually, tend to produce a partial view of a food system. When the three disciplines are combined for the study of a specific

readers can probably recall decisions based on partial analysis which led to what are referred to as "white elephants" - projects which have been partially or totally abandoned because of their ineffectiveness. Often the mistakes are due to decision making without adequate situational and problem analysts. In other cases the cause may be related to a particular discipline bias, too little participation from key disciplines or local politics.

While nearly all professionals and decision makers everywhere agree on the need for closer cooperation, effective coordin2048 Ttile ne35 0 agree on the need for

productivity and/or poor product quality; poor cultural practices may have these same effects, as will poor harvesting practices; physical damage during harvest, transport or packaging will affect product quality further down the line, resulting in both physical and financial losses; physiological damage during storage will not only defeat the purpose for which storage was intended (extending the life and availability of the product) but will result in greater economic loss as a result of the storage costs.

Facilitating services

To overcome constraints within the food system, both the public and private sectors must provide effective services which benefit farmers, farmer organizations, intermediaries, and other key participants who make the commodity system work. The efficiency of any commodity system is in direct relationship to the efficiency of the support services received by the diverse participants. Some important services which are required at each point of the commodity system are identified in Figure 2.4. While services such as information, technical assistance and credit are required at nearly each step in the food system, others may be specific to particular points in the food system, e.g. transportation, standards and quality control.

Figure 2.4: Facilitating services to overcome physical and economic losses at distinct points in the commodity system

Figures 2.2, 2.3, and 2.4 thus show not only the interdependence of the diverse components of a food system but also demonstrate the usefulness of a multi-disciplinary, and preferably, multi-institutional approach in the identification and analysis of problems and alternative solutions.

Food security: another dimension

Increased production and marketing of basic foods as well as improvements in the system of distribution in third world countries has increased the physical availability of food to solvent consumers.

In spite of these improvements, the problem of hunger and malnutrition, far from being reduced over the past 25 years, has increased in many geographical areas. This is due, fundamentally, to low levels of income received by large percentages of the populations in many developing countries. Incomes are often so low that the food required to live at minimum health levels cannot be purchased, even when food is available in the marketplace.

The hunger and malnutrition suffered by the majority of low income populations constitute a chronic problem in Latin America, the Caribbean, Africa, and Asia. In light of this harsh reality, it is important that the fight against hunger and malnutrition concentrate on guaranteeing all individuals **real access to basic foods**. With this

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different segments of the population to acquire and make proper use of basic food. Therefore, in addition to the more common evaluation of economic costs and benefits, more attention must be given to the social costs and benefits of alternative policies, actions and projects.

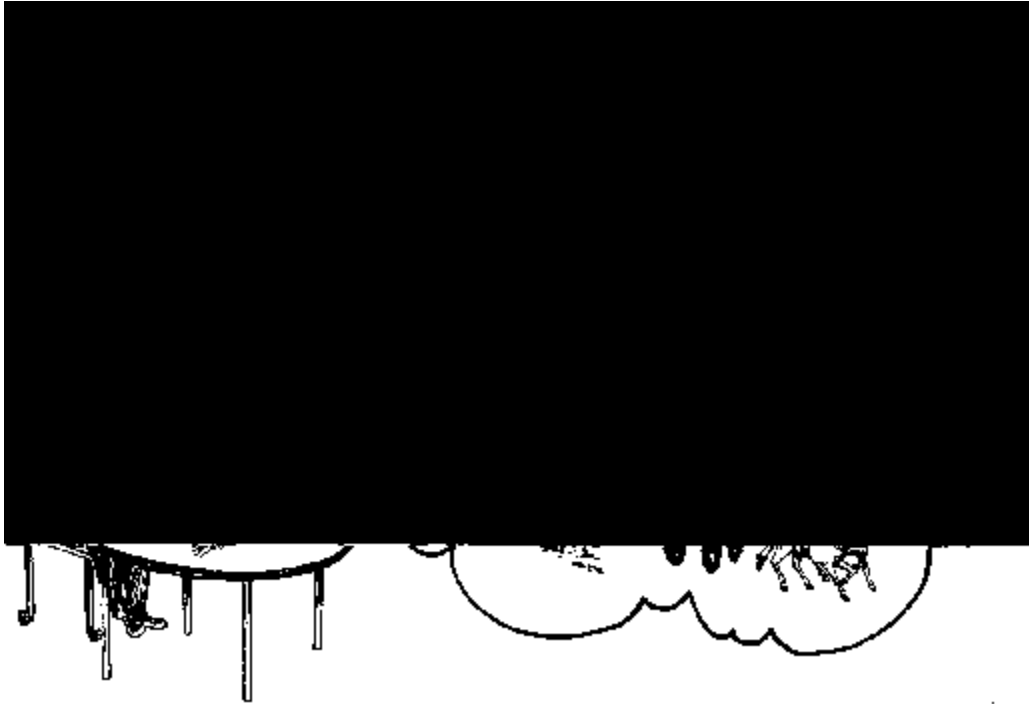
At the present time, nearly all developing countries lack systematic information which would allow decision makers to properly allocate resources among different crops, or between production and marketing systems, to insure that everyone has access to basic foods. Food security for all population segments is a goal which can only be considered in a multidisciplinary setting. The Commodity Systems Assessment Methodology presented in this document will generate information on selected commodity systems and organize it into a form which can be easily used by planners in their efforts to achieve national food security.

Chapter 3 - Priority components for problem analysis

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In order to overcome problems, their causes must first be identified. An economist dwelling upon costs and prices is likely to overlook problems of a technical or social nature. Likewise, the technologist and sociologist may fail to recognize important economic factors. A clear identification of problems requires looking in the right places and asking the right questions. If all the relevant disciplinary areas are investigated, then the important problems can probably be identified and ranked in some causal order.

As long ago as the mid-eighteenth century, the philosopher Rene Descartes, in his Discourse on Method (Descartes, 1975), pointed out that reality can only be understood by breaking it down into smaller and smaller parts. He suggested the need to



The application of existing methodologies, using an interdisciplinary team approach, will facilitate the identification of all relevant parts of any food system.

Although the relative importance of the different components of a food system may vary with the crop, country and other factors, a large number are common for most commodities. In Figure 3.1, twenty-six components are identified. In some cases they are of an institutional nature and focus on participants such as ministries of agriculture, farmers and intermediaries, and the roles each play in the commodity system. In other instances, the components are of a functional nature, such as harvest, storage and transport, concentrating on processes or activities which take place at a particular point in a food system. In still other cases, the component may simply indicate a need to provide statistical or descriptive information which is considered important for the decision-making processes, e.g., statistics on production/marketing of the crop or crop environmental requirements.

The twenty-six components in Figure 3.1 are presented in a circle format. The center part of the circle is divided in half, identifying those components which fall into the preharvest versus the postharvest stages. Each half-circle is further sub-divided to indicate whether the components deal with

- a. pre-production (planning, policies and institutions),
- b. production,
- c. postharvest handling,
- d. transformation, marketing and distribution.

[Figure 3.1: Principal components for a commodity systems assessment](#)

Each one of the twenty-six components is potentially important because the decisions or actions occurring at that point may affect production, productivity, quality or cost of the product at that or some later point in the food system.

However, **not all of the twenty-six components are relevant for each commodity system.** In some cases a commodity being produced in a particular geographical area may have a very short marketing channel and may bypass steps such as selection, packaging or storage. For example, industrial tomatoes may go directly from the farmer's field to the processing plant.

Components which may not be applicable to many crops include those such as preharvest treatments (component 10), delays (component 19), other operations (component 20), agro-processing (component 21), and exports (component 25). The other components should be relevant for nearly all commodity systems. On the other hand, it is expected that researchers of a specific commodity in a particular country may identify more than 26 relevant components. The 26 components included here are indicative, but not all encompassing.

The remainder of this chapter presents a short description of each of the twenty-six components. In each case the importance of the particular component and the type of information to be collected are described. An analysis of each relevant component for a particular commodity system will permit a good understanding of what takes place at each point in the food system and how production, productivity, product, quality, or cost may be affected.

For the researcher interested in designing a questionnaire to collect information on one or more of the twenty-six components, guideline questionnaires are provided in Annex 1. It should be stressed that these questionnaires are of a general nature and for reference purposes only. **Each questionnaire should be modified to meet specific needs of the country, the commodity, the geographic area, and the specific interests of the researcher and the institution s/he represents.**

As with the design of any questionnaire, the researcher must have a clear understanding of the type of output desired (tables, graphs, descriptive paragraphs, etc.) and how the information will be presented and utilized. It is only after the researcher has a clear understanding of WHAT information is required and HOW it will be presented that s/he should design the questionnaire to generate the desired results. In this way only useful information will be collected, thus minimizing time and expense.

Relative importance of crop - component 01

Crops and livestock vary in their importance to the national economy with respect to their relative significance in the national diet, their nutritional value, and their ability to earn foreign exchange. Crops and livestock for domestic consumption and for export can be ranked from most to least important either by quantities produced, Imported or exported, or the respective economic values of these quantities.

This section is intended to document the relative importance to the national economy of the commodity under study. The more important the commodity, the more likely it is to be taken into consideration in policy decisions and consequently allocated greater

amounts of resources. Commodities of low volumes and values are less likely to be provided with the infrastructure and services required for efficient operations.

The relative importance of the commodity can be determined by analyzing production, imports, exports, and national/regional development plans.

Specific questions might relate to the following areas:*

- a. Quantity and value of national and/or regional production by year.
- b. Total area harvested.
- c. Volumes and values of particular cultivars/varieties/types.
- d. Quantity and value of commodity imported and exported.
- e. Relative Importance of the crop in national development plans.
- f. Ongoing or planned projects or plans which will affect the production and marketing of this commodity.
- g. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 01.

Public sector policies - component 02

When the public sector establishes developmental policies for the agricultural sector, objectives are normally oriented to increase production and provide higher returns to

- f. What institutions are involved in determining the policies identified?
- g. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 02.

Relevant institutions - component 03

All countries have a variety of public and private sector institutions carrying out actions which have an impact upon pre- and postharvest losses of livestock and crops. The efficiency of the overall production and marketing system is often determined by the effectiveness of these institutions and the services they provide.

Because of the diversity of institutions, their internal complexity and their tendency to limit their activities to specialized areas, coordination and communication between them is normally lacking. Consequently, personnel from any one institution are unlikely to have a complete understanding of the whole commodity system.

The purpose of this section is to identify the principal institutions involved in preharvest and postharvest aspects of the commodity system under study and generate baseline information necessary to answer the following questions:*

- a. What institutions are involved in actions which will affect the production, processing and marketing of the commodity or commodity group under study?
- b. What functions, services or other actions are undertaken by the respective institutions which may affect the quantity, quality and price of the commodity in question?
- c. Why are they undertaken?
- d. Where in the commodity system are these actions undertaken?
- e. When are they undertaken?
- f. How are they undertaken?
- g. With what resources are they undertaken?
 - human?
 - financial?
 - physical?
- h. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 03.

Facilitating services - component 04

Productivity and product quality are often a function of the services available from public and/or private sector institutions. This is even more true in the case of small farmers with limited access to resources. If facilitating services (technical assistance, information, credit, farm inputs, and others) are adequate, yields and quality of products are likely to be high. When services are poor or nonexistent, yields and quality of produce are more likely to be low.

In this section, facilitating services offered by institutions identified in Component 03 will be described and evaluated. The purpose is to determine their positive or negative

impact upon the production, postharvest handling, and marketing of the commodity being studied.

Types of services to be considered include:

- construction and maintenance of farm-to-market roads,
- generation and transfer of technology,
- supply of planting material,
- supply of information for decision making,
- supply and access to credit,
- supply and access to farm inputs,
- availability of vehicles to transport produce,
- availability of technical assistance,
- availability of facilities for postharvest handling,
- and others.

For each type of service, questions should address such things as:*

- a. Frequency and quality of service.
- b. Accessibility of the service to the intended recipients.
- c. Timeliness of the service.
- d. Duplication/competition between institutions.
- e. Users' opinions of the service.
- f. Impact of the service on production, harvest, postharvest handling, and distribution.
- g. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 04.

Farmer organizations - component 05

In developing countries, livestock and crops are often grown by farmers on very small plots of land. In the case of fruits, they may be produced in backyard orchards consisting of only a few trees. Sometimes only the surplus is marketed. A few head of small animals may be maintained as a form of savings. As a result of these production practices, a large number of products are marketed in very small volumes and with a wide range in quality. If modern technologies are used, unit costs of production may be very high and net returns to the farmer quite low.

One way for small farmers to overcome this situation, in an attempt to increase net economic returns, is to organize into groups, associations or cooperatives. **The assembly of relatively large volumes of a particular commodity by a group of farmers can lead to economies of scale, improved postharvest handling and therefore better quality produce, higher prices and increased net returns.**

It takes many years to organize and develop effective farmers' organizations with the capability of providing effective services to their members. In the meantime, their organizational weakness or non-existence can be a serious deterrent to development. Existing farmer organizations should be identified and their respective strengths and weaknesses evaluated.

Types of information to be collected should include:*

- a. Names of farmers' organizations whose members produce, handle and/or market the commodity being studied.
- b. Quality of management and administration of the organization.
- c. Level of participation of members.
- d. Types, frequency and quality of services offered.
- e. Types of commodities handled.
- f. Experiences in production, marketing and processing.
- g. Availability of human, financial and physical resources.
- h. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 05.

Environmental requirements and constraints - component 06

The natural resources and environment of the production area affect not only the quantity of yields but also the quality of the produce and the time of maturity. Too much or too little rain, too high or too low temperatures, strong winds, steep slopes, or other negative environmental factors can significantly affect the quantity and quality of agricultural produce.

Since product quality normally cannot be improved after harvest, it is important to initiate the postharvest process with the highest quality possible. If low yields and/or low quality are due to particular environmental conditions, it is important to identify these constraints as early as possible. This will help to assure a more effective allocation of resources, reducing the risks of constructing roads or providing other infrastructure which may be infrequently used. The object is to avoid unnecessary costs which reduce the product's competitiveness.

Certain countries or regions of a country may have a comparative advantage due to their natural environment. Such is the case of Chile and New Zealand which can produce fruit and vegetables during the European and North American winters.

The types of information pertaining to the geographical area of production include:*

- a. Soil conditions and fertility.
- b. Amount and distribution of rainfall.
- c. Period of drought.
- d. Water logging.
- e. Danger of flooding during the growing season.
- f. Risk of damage caused by strong winds.
- g. Average relative humidity.
- h. Temperatures (high, average, low).
- i. Slope of the land.
- j. Altitude.
- k. Comparative advantages of environment as far as market opportunities are concerned.
- l. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 06.

Availability of seeds and other genetic materials - component 07

- soil preparation,
- planting techniques,
- fertilization,
- irrigation,
- use of labor,
- use of machinery,
- weed control,
- pest control,
- disease control,
- pruning,
- shade control,
- others.

e. Harvesting techniques and tools used.

- g. Description of ongoing or planned actions or projects to deal with constraints.
- h. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 09.

Preharvest treatments - component 10

Preharvest treatments, either physical or chemical, may have a favorable or unfavorable impact upon postharvest quality. Examples of treatments include such things as:

- a. The gathering of cauliflower leaves around the head prior to harvest to prevent yellowing.
- b. Twisting of cabbage (90 degrees) before harvest to break some roots and induce wilting - this causes the wrapper leaves to tighten, thereby helping to protect head during postharvest.
- c. Wrapping fruit while still on tree, e.g. apples, carambola (star fruit) and bananas may be wrapped with paper or plastic to prevent attack from birds, fruit flies and other pests or to enhance ripening or fruit color.
- d. Chemical treatments while in the field to extend postharvest storage life or enhance marketability, e.g., applying sprout inhibitors on potatoes or ethereal on apples to increase the red color.

In some cases chemical application can lead to postharvest residues which create marketing constraints.

All physical and chemical preharvest treatments which affect the postharvest quality of the commodity under study should be identified.

The information to be collected includes:*

- a. Identification and description of physical and chemical treatments

Production and marketing costs - component 11

Farming anywhere in the world is a high risk enterprise. For small farmers growing horticultural it is particularly risky. Failure to earn adequate returns from their efforts will directly affect their family's nutrition, health, and education, in addition to their future efforts to continue farming. If the farming business lacks economic incentives, the farmers' children and perhaps the farmer himself will migrate to urban areas searching for a better way of life.

The small producer of horticultural crops is cost conscious and will try to minimize his risks, especially when markets are uncertain. Minimizing costs affects the quality and quantity of produce. For example, if the farmer reduces his costs by restricting his use of fertilizers, he may reduce yields and affect produce size or flavor. Minimizing marketing costs usually results in poor packaging which leads to undesirable bruising of the product. Production and marketing costs vary greatly with farm type and size.

A complete analysis should consider labor, material, managerial inputs, and their relations in any given commodity system. For example, the organic farmer reduces input costs for chemicals while increasing costs for labor and management. An analysis of all production and marketing costs can provide useful insights into possible causes of low yields and/or low quality of produce. It may also demonstrate the economic advantages and disadvantages of using different inputs and different production/marketing strategies.

The type of information to be collected includes:*

- a. Establishment of assumptions regarding the size and operations of a typical farm.
- b. Identification of all types of production and marketing costs.
- c. Quantification of the production and marketing costs for a representative group of farmers.
- d. Comparison of costs of production and marketing recommended by the technician and those actually incurred by the farmer.
- e. Analysis of advantages and disadvantages of using each type of input.
- f. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 11.

Crop harvest - component 12

When and how a commodity is harvested affects its postharvest life. **A product harvested too early, too late, or damaged by improper techniques or tools, will have a shortened postharvest life.** Steep terrain in growing areas may cause further difficulty by increasing danger to laborers and increasing labor costs and damage to produce. Socioeconomic conditions which permit or stimulate the stealing of food may also be contributing factors. For example, where food theft is common, farmers harvest their produce before the fruit reaches its proper stage of maturity. This practice affects produce quality.

The techniques used to harvest the commodity can be identified and described. The impact of harvesting practices on marketable produce can be indicated.

The information to be collected should cover the following aspects:*

- a. Identification of who harvests the crop.
- b. Description of what actually takes place during harvest.
- c. Description of why the crop is harvested in a particular-manner.
- d. Identification of time when harvest takes place - time of year and time of day.
- e. Evaluation of how the harvesting techniques may affect marketable quantity and quality.
- f. Determination of relationships between harvesting practices and postharvest losses.
- g. Identification of alternative methods for improving harvest techniques.

This section identifies where selection, sizing, grading, and inspection occur in the commodity system and describes what takes place. The type of information gathered should include:*

- a. Identification of points in the commodity system where some form of grading, selection, classification, or inspection takes place.
- b. Description of the actions carried out at each point.
- c. Identification of who is responsible for each action.
- d. Identification of when each action is carried out.
- e. Description of where each action is carried out.
- f. Analysis of why the action is carried out as it is.
- g. Identification of the tools, equipment, other material and laborers used in carrying out the actions.
- h. Identification of what criteria are used in carrying out the actions.
- i. Description of the relationships between the respective actions and market requirements.
- j. Indication of the magnitude of postharvest losses at diverse points in the system. (It is relatively easy to quantify the volume of losses during selection, sizing, grading and inspection by analyzing quantities of each grade/size and volumes discarded at the end of operations during a specific time period.)

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 13.

Postharvest chemical and physical treatment - component 14

Horticultural crops are frequently treated chemically and/or physically during the postharvest stage as a means of extending shelf life or making the product more attractive to the consumer. As examples, calcium carbonate may be applied to the stem of cabbage to offset stem rot, ethylene gas may be used to enhance ripening of bananas, or dithane may be applied to root crops to control fungus. In treatment for fungal control, the chemical may be applied at the same time as the product is being washed.

Physical treatments include such actions as curing potatoes in the field, washing root crops, waxing citrus and bagging.

The types of chemical and physical treatments applied during the postharvest stage will be identified and described. The information to be collected should include the following:*

- a. Identification of physical and chemical treatments and chemicals used.
- b. Purpose of each type of treatment and how the quality of the commodity is affected.
- c. Identification of where and when in the postharvest system the treatment takes place.
- d. Description of how the treatment is carried out and what is actually done to the commodity.
- e. Identification of who carries out the treatment.
- f. Identification and description of the tools, equipment, materials and labor used in the treatment.
- g. Identification of the cost of each treatment in time and cash.
- h. Identification of the potential impact of the treatment in the marketplace (how will

consumers react?).

i. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 14.

Packaging - component 15

Packaging protects the product during postharvest handling and divides the product into more manageable units. It also improves the presentation of the product so it will be more acceptable to middlemen and consumers. Packaging is necessary for nearly all types of produce. As general rules: **the more perishable the commodity, the greater the importance of the quality of the package, and the more sophisticated the market, the more important the presentation of the package.**

The characteristics of packaging materials, methods used in packaging, and the relevant costs should be determined. Types of information should include:*

- a. Identification of the points in the postharvest system where packaging or repackaging occurs.
- b. Determination of the specific purpose of packaging.
- c. Identification of who undertakes the packaging and where it takes place.
- d. Description of what is done to the product during the packaging process and how it is carried out.
- e. Characteristics of the package: size, strength, presentation, color, label, availability, cost.
- f. Minimum packaging requirements on local and international markets.
- g. Number of times package can be used and procedure for recycling.
- h. Ownership of the package, if the package is reusable.
- i. Labor costs associated with the use of the package.
- j. Information on reuse of package.
- k. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 15.

Cooling - component 16

The temperature of fruits and vegetables at harvest is close to ambient air temperature, which may be as high as 40 degrees celsius. At this temperature the respiration rate of the product is usually extremely high. **The higher the rate of respiration the shorter the postharvest life of the commodity.**

It is often good practice to harvest early in the morning to take advantage of lower prevailing temperatures. However, early morning harvesting may not be feasible or temperatures may not be as low as desired. Rapid cooling (pre-cooling) of the product to the recommended storage temperature will prolong its postharvest life. Pre-cooling particularly benefits highly perishable produce such as strawberries and leafy vegetables.

Pre-cooling is not commonly carried out in most developing countries. Cooling for holding purposes at airports, seaports and marketing terminals is a more common practice. However, poor administration and operation of these installations frequently

results in high postharvest losses. The high costs of operation of cold storage facilities

- g. Method of operation of storage facilities.
- h. Type of damage caused to the commodity while in storage.
- i. Added costs to commodity price due to storage.
- j. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 17.

Transport - component 18

Produce, to be useful to consumers, must reach the diverse markets on a timely basis. As the commodity through the food system it may be transported by humans, animals, airplanes, boats, or ground vehicles. It may be transported many times and by different methods from remote rural farms. It may be carried by humans, animals, animal drawn carts or boats; from a rural assembly point, it may be transported by motorized vehicle to a regional or central wholesale market; from farms or from central assembly points it may be carried by airplane, train or ship to foreign markets. Each time the product is transported from one point to another it is handled, delayed, vibrated, placed under pressure, and subjected to a variety of conditions which may negatively affect the quality of the commodity and therefore its marketability.

Types of transportation used and points in the postharvest system where transport occurs should be identified and described.

Information to be collected should include:*

- a. Identification of the diverse points in the commodity system where transportation occurs, as well as the participants, and methods used.
- b. Description of the transportation process and the conditions during transport: enclosures, temperature, humidity, height of stacking, nearness of produce to heat source (e.g., engines, air circulation), time of day and others.
- c. Distance (kilometers or miles) and duration (hours, days, minutes) of the transport.
- d. Description of the type of damage which occurs to the commodity during transport and expected causes.
- e. Identification of the costs added to the value of the commodity as a result of transportation at different points.
- f. Others to be determined.*

Delays occur when conditions neither permit nor require the immediate execution of the next step in the postharvest system. This is not to be confused with a storage or processing operation.

While a product is undergoing a delay or is waiting, it may be adversely affected by temperature, humidity or other atmospheric conditions. The commodity may absorb undesirable odors, be subjected to direct sunlight, or in some other way be adversely affected by temporary conditions or circumstances, thus lowering product quality. In some cases the delays are natural steps in the postharvest system, e.g., tomatoes in a pile at the edge of the field awaiting the next step (packaging, grading). In other cases the delays may be for socio-economic or political reasons, e.g., customs personnel may delay produce at a port or border until papers are completed and "informal taxes" paid.

The information to be collected identifies where delays or waiting occur and why, and should include:*

- a. Points in postharvest system where delays and waiting occur.
- b. Characteristics of each delay:
 - cause of the delay,
 - person or thing responsible for causing delay,
 - length of the delay,
 - environmental conditions at point of delay.
- c. Normal conditions of the commodity at the point of delay.
- d. Damage done to commodity as a result of the delay and cause of the damage:
 - in terms of quality
 - in terms of quantity.
- e. Alternatives for reducing the delays or waiting period.
- f. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 19.

Other operations - component 20

- g. Added value and additional costs as a result of processing.
- h. Impact of processing on postharvest losses and markets:
 - reduction in losses,
 - increase in earnings to farmers,
 - benefits to consumers.
- i. Problems of supply of raw material.
- j. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 21.

Marketing intermediaries - component 22

In the marketing of any one commodity there are a wide variety of intermediaries - for example, local traders, wholesalers, retailers and exporters. These can be further subdivided depending upon characteristics such as their size of operations, products handled and the consumer groups they serve. Since different consumer groups demand different levels of services, the functions and characteristics of intermediaries vary widely.

In this section it is necessary to identify the principal types of intermediaries involved in the marketing of the commodity under study and describe their respective operations within the marketing system. Their characteristics should be outlined with the purpose of better understanding the workings of the system and identifying those factors which may affect the quantity and quality of the commodity being traded.

The types of information to be collected include:*

- a. Identification of the principal types of intermediaries.
- b. Description of the principal functions of each type of intermediary and where, when and how in the system the functions are carried out.
- c. Evaluation of the reasons why the functions are carried out in the present manner.
- d. Inventory of available equipment, facilities, infrastructure and other resources available and/or necessary for effective handling and marketing.
- e. Identification of the differences in quality if any, of the commodity handled by the different types of intermediaries and the reasons for the differences.
- f. Deficiencies in the operations which affect the quality of the commodity or lead to losses in quantity of product.
- g. Determination of the principal factors affecting marketing costs.
- i. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 22.

Market information - component 23

The most important aspect of a commodity system is the price for which that product can be sold. When prices are very low farmers may not even bother to harvest their crops. They may plow them under or leave them on the tree. This occurs when farmers anticipate that the added costs of harvesting and marketing will be greater than the expected sales price. At the opposite extreme, when prices are high, farmers and

intermediaries will be stimulated to use techniques to maintain quality and improve presentation, even at a high cost.

When prices are high, some consumers will accept lower quality for a lower price. On the other hand, when market prices are low, consumers demand higher quality. High levels of postharvest losses are sometimes caused indirectly by low market prices. An awareness of prices in the marketplace will provide useful insights on supply, demand, and possible causes of postharvest losses.

Market information includes more than just market prices, however. It is also important to have access to reliable information on existing and future supplies, as well as trends and conditions of consumer demand.

This section should identify types and sources of price and market information available and characterize that information.

Data to be gathered include:*

a. Price and market information available:

- type of information available and source,
- frequency, reliability and quality of information,
- time period and markets covered,
- types of analyses carried out.

b. Availability of information on supply of commodity:

- type of information and source,
- frequency, reliability and quality of information.

c. Analysis of price/market information:

- seasonal price Indices and high/low periods,
- causes of price fluctuation,
- relationships between price, quantity, quality and postharvest losses.

d. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 23.

Consumer demand - component 24

Demand for fresh and processed produce varies greatly by country and by consumer group within individual countries. Particular preferences are the result of diverse factors, such as income, time, customs and religion. Low income consumers tend to purchase lower quality produce, given their interest in minimizing costs. High income consumers are usually prepared to pay higher prices for better quality produce. As housewives' time becomes more valuable, demand increases for convenience products such as canned and fresh frozen produce. Social and religious customs can be major determinants for the type and quality of produce acceptable to consumer groups - for example, turkeys on

Thanksgiving Day and hams for Easter in the USA market. Many religions have specific requirements for food preparation, specifying quality content and timeliness of preparation.

In terms of the commodity being studied, it is Important to be aware of the economic status and the cultural and religious preferences of the consumers and/or potential consumers.

Proposed changes in any food system, whether to reduce postharvest losses, introduce new technology or modify packaging, must be tested to determine whether the proposed changes will be acceptable or not to the consumer in economic, cultural and/or religious terms.

Consumers can be identified and classified into categories, and their respective preferences for the commodity characterized.

Types of information to be generated include:*

- a. Identification of principal markets: international, regional and domestic.
- b. Identification of consumer groups within each important market: high, medium and low income; ethnic groups and religious groups.
- c. Identification of particular preferences for the commodity in question: cultivar, size, color, flavor, texture, maturity, acid/brix ratio, quality desired, packaging requirements, number units/package, others.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 24.

- present sources of supply to each market,
- tariff and non-tariff trade restrictions,
- transportation problems to importing countries,
- potential labor (off loading) problems of importing country and other constraints,
- reliability of importer/brokerage services,
- form in which payments will be made.

c. Characteristics of supply of the particular cultivar:

- availability of commodity over time,
- volume of actual and potential exports,
- ability to meet the demand requirements (quantity, quality, price, product characteristics, transportation),
- pest/disease constraints,
- postharvest handling constraints, -infrastructure constraints,
- ability to compete favorably with other countries, -other constraints.

d. Others to be determined.*

* For GUIDE QUESTIONNAIRE, see Annex 1, Component 25.

Postharvest and marketing costs - component 26

In marketing systems around the world large numbers of persons wholesale and retail a great variety of produce. One can observe produce in woven baskets, fertilizer bags, new or used cardboard boxes, homemade wooden boxes, waxed or styrofoam boxes with ice and produce without packaging of any sort. Transportation may be undertaken with human or animal power, vehicles, boats, airplanes, or other methods. The hectic pace of the market system gives constraints to importing countries,

a. For each type of participant (farmer, intermediary, cooperative, marketing board,

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