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The Fruit and Vegetables Global Value Chain

ECONOMIC UPGRADING AND WORKFORCE DEVELOPMENT



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“Skills for Upgrading: Workforce Development and Global Value Chains in Developing Countries”

This research project examines workforce development strategies in developing countries in the context of the shifting upgrading dynamics of global value chains. Funded by RTI International and carried out by Duke CGGC, this research addresses policymakers, donors and development practitioners to improve our understanding of how workforce development strategies can enhance the upgrading efforts and competitiveness of developing countries in global industries.

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None of the opinions or comments expressed in this study are endorsed by the companies mentioned or individuals interviewed. Errors of fact or interpretation remain exclusively with the authors.

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Duke University Center on Globalization, Governance and Competitiveness (Duke CGGC)

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Acronyms

| | |
|------------------|--|
| ASOEX | Asociación de Exportadores de Frutas de Chile |
| BRC | British Retail Consortium |
| CORFO | Corporación de Fomento de la Producción |
| DAARP | Dryland Agriculture Applied Research Project |
| DUKE CGGC | Duke University, Center on Globalization, Governance and Competitiveness |
| ECLAC | Economic Commission for Latin America and the Caribbean |
| EU | European Union |
| FAO | Food and Agriculture Organization |
| FDA | Food and Drug Administration |
| FDI | Foreign Direct Investment |
| FFV | Fresh Fruit and Vegetables |
| FHIA | Fundación Hondureña de Investigación Agrícola |
| FUNDER | Fundación para el Desarrollo Empresarial Rural |
| GAP | Good Agricultural Practices |
| GDP | Gross Domestic Program |
| GIAC | Groupement Interprofessionnelle d’Aide au Conseil |
| GMP | Good Manufacturing Practices |
| HACCP | Hazard Analysis Critical Control Point |
| HCDA | Horticultural Crops Development Authority - Kenya |
| IFOAM | International Federation of Organic Agriculture Movements |
| ISO | International Organization for Standardization |
| IT | Information Technology |
| JEPA | Jordan Exporters & Producers Association For Fruits & Vegetables |
| JORICO | Jordan River Company |
| KARI | Kenya Agricultural Research Institute |
| MEC | Moroccan Economic Competitiveness |
| M&S | Marks and Spencer |
| ODEPA | Oficina de Estudios y Políticas Agrarias |
| OTIC | Organismo Técnico Intermedio para Capacitación |
| NGO | Non Governmental Organization |
| SA | Social Accountability |
| SENCE | Servicio Nacional de Capacitación y Empleo |
| SOP | Standard Operating Procedures |
| SPS | Sanitary and Phytosanitary Standards |
| SQF | Safety Quality Food |
| USDA | United States Department of Agriculture |
| USAID | United States Agency for International Development |
| WDI | World Development Indicator |
| WTO | World Trade Organization |

Executive Summary

This report uses the global value chain (GVC) perspective to examine the role of workforce development initiatives in a number of developing countries that are participants in the global fruit and vegetable industry. Since the 1980s, international trade of fruit and vegetables has been characterized by tremendous growth, driven by rising incomes and the expansion of the middle class worldwide. At the beginning of the 21st century, the global industry accounted for US\$56.1 billion, and, by 2008, exports reached more than twice that value at US\$139.6 billion (UNComtrade).¹ Motivated by this growing global demand, developing countries have actively pursued the production and export of this high-value agricultural subsector and have successfully captured a large portion of the horticultural² market.

The horticulture export industry offers an important source of employment for developing countries. Cultivation of fruit and vegetables is substantially more labor-intensive than growing cereal crops and offers more post-harvest opportunities to add value (Joshi et al., 2004; Weinberger & Lumpkin, 2005; World Bank, 2009). Packing and processing services—such as washing, chopping, and mixing as well as bagging, branding, and applying bar codes—are now often carried out at the source rather than at the end-market destination. Despite the labor-intensive nature of the industry, workforce development has been underestimated in this sector in the past, as horticultural operations typically employed rural workers with a minimum level of education. As the complexity of the value chain increases, growing competition amongst developing country suppliers and the enforcement of strict public and private industry standards, workforce skills are becoming a more important factor for industry competitiveness.

This report examines the role that different workforce development initiatives have played in the evolution of the global fruit and vegetable industry in five developing countries: (1) Chile, (2) Jordan, (3) Kenya, (4) Honduras, and (5) Morocco. These nations represent different stages of industry development. Chile is the country that has achieved the greatest value chain advancement in the sector. While Morocco currently exports more than Kenya, Kenya has been more successful in its upgrading initiatives taking on an important role in providing packing services for major supermarket chains in European Union (EU) and exporting a higher-value product. Honduras and Jordan offer two examples of smaller countries that are entering the value chain.

Our analysis reveals the following findings with respect to workforce development and upgrading in this sector. The main stages of the horticultural value chain are as follows:

¹ Fruit and vegetables consumption has been positively correlated with income levels, with per capita consumption being the highest in high-income countries (Wu Huang, 2004).

² Generally, the term “horticulture” includes the production of cut flowers in addition to fruit and vegetables. Cut flowers, however, are not included in this study and references to horticulture in this paper refer to the fruit and vegetable sectors.

1. **Inputs:** Elements needed for production, such as seeds, fertilizers, agrochemicals (herbicides, fungicides and pesticides), farm equipment, and irrigation equipment.
2. **Production for Export:** Includes the production of fruit and vegetables and all processes related to the growth and harvesting of the produce, such as planting, weeding, spraying, and picking.
3. **Packing and Cold Storage:** Grading, washing, trimming, chopping, mixing, packing, and labeling are all processes that may occur in this packing stage of the value chain. Once the produce is ready for transport, it is blast chilled and placed in cold storage units ready for export.
4. **Processed Fruit and Vegetables** include dried, frozen, preserved, juices, and pulps. Many of these processes add value to the raw product by increasing the shelf life of the fruit and vegetables.
5. **Distribution and Marketing:** The produce is distributed to different channels, including supermarkets, small scale retailers, wholesalers, and food services.

Due to the fragile and perishable nature of the product, this industry requires a high degree of coordination between the different actors along the chain and each stage requires a strong emphasis on workforce development to drive both productivity and upgrading. Logistics and transportation are key supporting activities in the global fruit and vegetable value chain. These functions ensure the perishable product reaches its destination in good condition. Cool storage units are used throughout the chain to keep the produce fresh, and both air and sea freighting supported by the cold chain are key elements to ensure timely delivery.

Economic Upgrading

Several basic conditions must be met for a country to enter the fruit and vegetable value chain. These include climate allowing for year found supply; adequate road and transport infrastructure, such as ports and airports, essential for moving fragile produce to market efficiently; establishment of sanitary and phytosanitary regulatory systems to prevent diseases spreading around the world; and favorable trade policies that improve the competitiveness of the supplier.

Conditions for entry into the fruit and vegetable GVC have changed as a result of the adoption of rigorous standards in the industry. Entry is now much more difficult for newcomers to the industry than it was for suppliers, such as Chile and Kenya, which began exporting in the late 1980s and early 1990s. Today, entry strategy into the global produce market for some developing countries, such as Honduras and Jordan, requires them to leverage regional markets where standards are generally less rigorous. Only countries that are able to comply with high standards are rewarded with easy access to developed countries' markets. Conversely, countries that have problems in meeting the standards may lose the export market.

Developing countries have experienced greater success upgrading into the packing segment of the value chain than into the processing segment. Upgrading into packing is dependent on understanding the market needs, investment in capital goods and the availability of supporting activities within the country.

- Understanding the market is a priority in this sector, especially as this is a buyer-driven value chain. Maintaining open lines of communication regarding demand preferences in products, quality, packing—and fostering buyer involvement—is critical in all stages of the value chain. Associations in Chile and Kenya, for example, organize trips to key markets, and they observe interactions at the point of purchase.
- Investment in new technologies increases the shelf life of produce. Kenya upgraded into the packing segment via initial investments by private firms in a wide variety of equipment to attain very high standards of hygiene within the packhouse operations, as well as on-site laboratories for product and staff health tests (Jaffee & Masakure, 2005).
- Upgrading into the packing segment depends significantly on the existence of a local packaging industry to supply the appropriate containers on a regular and reliable basis. Jordan’s horticultural sector has been greatly inhibited in its upgrading along the value chain by the lack of good quality packing materials. Much of the produce destined for the EU is shipped to neighboring countries where it is repackaged, resulting in a significant loss of value for Jordan.

Upgrading into the processing segment of the value chain has been difficult to achieve for low-income developing countries since the processing of fruit and vegetables is cost prohibitive at low levels of crop production. Therefore, countries must gain a level of expertise during the production stage to increase output to a level that will enable the country to upgrade to the fruit and vegetable processing stage. As a result of joint efforts by the government and private sector to expand and add value to fresh fruit and vegetables, Chile is the only country in this study that has been able to effectively upgrade into the processing segment to date.

Product and process upgrading emerged as key elements in industry development in the country studies. Process upgrading was essential to help all of the countries studied to meet the growing number of public and private standards in both the production and packing segments of the chain. The health and safety protocols in packhouses, for example, have been key factors in protecting consumers from disease and meeting Sanitary and Phytosanitary Standards (SPS) around the world. Product and process upgrading to cultivate and handle increasingly fragile and perishable product varieties in Chile (berries), Honduras (Asian vegetables), and Kenya (French beans) offer greater financial returns than commodified fruit and vegetables.

Global-Local Interactions

Given the significant level of buyer control in this value chain, producers in developing countries are directly impacted by the requirements and practices of lead firms. Two particularly important consequences for industry upgrading are discussed below.

First, lead buyer requirements and standards have led to the restructuring of the supply chain in all of the countries studied, favoring mid-size and large producers and exporters that can more easily meet new demands. While this has led to the exodus of many smallholder farmers from the industry, the private sector's focus on training and development and investment in capital goods allows for more rapid upgrading.

Secondly, the implementation of these standards has had an impact on the end-markets targeted by developing countries. Only countries that are able to comply with high standards are rewarded with easy access to developed countries markets. While both Chile and Kenya have been proactive in establishing standards and aligning their own Good Agricultural Practices (GAPs) with GlobalGap,³ rather than invest in compliance initiatives, citrus producers in Morocco preferred to switch markets from the EU to Russia, which has less stringent traceability standards. In Jordan, the maturity of standards adoption is low, and they export their products to regional markets that do not have strict standards in place.

Workforce Development

These changes have begun to alter the approach to workforce development in the industry. As the case studies reveal, remaining competitive and upgrading in this sector now requires a workforce development component in order to improve productivity, meet standards, align skills with demand needs, diversify products, and develop innovative new packing systems. These workforce initiatives have been implemented in different ways across the countries: on-the-job informal training, on-the-job formal training and assessment, off-job regular classes, off-job short courses, industry training sessions, training led by educational institutions that grant a certification, training by buyers, and training by governments, nongovernmental organizations (NGOs), and donor organizations.

Four important workforce themes can be identified from the case studies:

Standards training today is a basic requirement to compete in high-value markets, and efforts to reduce the cost of implementation are important to ensure adoption. This requires a number of initiatives: First, it is important to understand global requirements; second, identify the skills needed to meet these global requirements; and finally, train the workforce on those skills. Central to standards training are programs focused on food safety and health-related training, particularly to target employees in the packing houses to avoid transfer of disease from packers to consumers in other countries. In Chile, the

³ In 2008, ChileGap was validated by GlobalGap and, in 2010; KenyaGap was also authorized to act independently.

government and private sector developed and implemented training programs to enable producers to meet the Chile-GAP standards prior to the evolution of more rigorous standards in the EU and the United States, ensuring they remained highly competitive. Previous basic training may also be necessary to ensure that standards training is successful. In Kenya and Morocco, for example, given the importance of the ability to read pesticide labels and understand barcodes amongst others, standards have led to additional training initiatives to improve adult literacy.

Return on investment for training is fundamental for providing incentives for this expenditure and ensuring overall workforce skills can rise, particularly for temporary workers. In the more advanced countries, an array of additional social benefits have been incorporated into employment arrangements, such as housing, day-care facilities for young children, and unemployment and healthcare benefits to recruit and retain labor. In Kenya, the leading firms are even reversing the tendency to rely on flexible labor and are shifting toward a more permanent workforce to capture the gains (Jaffee & Masakure, 2005). Chile's National Labor Skills Certification System (see *Box 1*), on the other hand, offers an interesting example of how the horticultural sector can benefit from improving the skills of the temporary workforce. As the Chilean industry depends mostly on off-farm labor, this helps to facilitate the mobility of skills across the industry, leading to increased productivity and maximizing national return on investment in training.

Formal higher education remains important for key positions in the value chain, and the lack of this creates bottlenecks that prevent upgrading. Agronomists are fundamental to increase the industry's productivity levels and maintain its competitiveness in production, and all of the countries studied depend significantly on this professional staff. In addition to agronomists, innovation in packing, processing, and cold chain technologies also require formal education in food technologies, food safety, and management. These positions are increasingly responsible for delivering technical assistance and training to semi-skilled and unskilled workers. Increased collaboration between educational institutions and private sector firms is important to ensure that the education programs meet the needs of the industry. In Chile, this has been facilitated through the establishment of the public-private council.

Skills training must be carried out in all job categories of the value chain to maximize growth and upgrading opportunities. Investments in training are required for all job categories, from farm workers to managers. The training needs to be oriented to all value chain job categories. This industry involves three quite distinct groups of workers: (1) farming activities and the workforce within the agriculture sector; (2) packing and storage positions; and (3) the processing stage in which workers are classified under the industrial workforce. All three types of workers require training programs, albeit differentiated based on group and entry-level skills of the workers.

Institutional Involvement in Workforce Development

The private sector is a highly active stakeholder in workforce development initiatives. Training is done mostly on the job and is paid for by firms rather than individual employees. In the case of Chile, diverse set of stakeholders have been able to achieve a high level of coordination due to strong industry associations supported by the government.

The government's role in workforce development generally has been most successful as facilitator or catalyst. In the capacity of facilitator and coordinator, governments have been more effective in driving industry growth and upgrading through workforce development than through direct training initiatives. In Chile, the government offers tax breaks to companies that conduct training through certified training institutions, while at the same time, it has played a key role in coordinating the industry actors by creating a Public and Public Strategic Council, involving all the value chain stakeholders to drive the development of the sector. In other cases, like Kenya, the strong performance of the industry has been ascribed to private sector autonomy in production and marketing decisions, thus fostering significant local private initiatives and dynamism within the industry.

Foreign agencies have provided a significant portion of training related to the adoption of standards as a means to secure access to the GVC for developing countries to drive rural development. Chile is the exception, where the national government worked closely with the private sector both to develop standards and to educate the workforce on the Chile-GAP certification. A report regarding NGO-led training in Honduras indicates that the same methodology and content are used regardless of the experience level of the trainees. When training is provided in such a standard, undifferentiated format, its impact is reduced and, in some cases, it leads to the failure of many producers who were not able to apply standard technology packages (IICA, 2006). Demand-driven training—as provided by the agricultural consulting firm, Fintrac—appeared to be much more successful in Honduras. Although the interventions are funded by the U.S. Agency for International Development (USAID), the relationship between the firm and the client is managed as a professional consultancy.

I. Introduction

This report uses the global value chain (GVC) perspective to examine the role of workforce development initiatives in a number of developing countries that are participants in the global fruit and vegetable industry. Since the 1980s, international trade of fruit and vegetables has been characterized by tremendous growth, driven by rising incomes and the expansion of the middle class worldwide.⁴ At the beginning of the 21st century, the global industry accounted for US\$56.1 billion, and by 2008, exports reached more than twice that value at US\$139.6 billion (UNComtrade, 2011). Motivated by this growing global demand, developing countries have actively pursued the production and export of this high-value agricultural subsector and have successfully captured a large portion of the horticultural⁵ market.

This export industry offers an important source of employment for developing countries. Cultivation of fruit and vegetables is substantially more labor-intensive than growing traditional cereal crops and offers more post-harvest opportunities to add value (Joshi et al., 2004; Weinberger & Lumpkin, 2005; World Bank, 2009). Today, packing and processing services—such as washing, chopping, and mixing, as well as bagging, branding, and applying bar codes—are often carried out at the source rather than at the end-market destination. These processes, which were previously based in the developed world, have created considerable new employment opportunities in developing countries (Humphrey et al., 2004).

Despite the labor-intensive nature of the industry, workforce development for horticulture production has been underestimated in the past, as operations typically employed rural workers with a minimum level of education. However, with the increased complexity of the value chain, the enforcement of strict public and private industry standards and growing competition among developing country suppliers, workforce skills are becoming a more important factor for industry competitiveness. While the adoption of a professional approach to human capital development in the sector is relatively recent, certain strategic investments in workforce development by both the public and private sectors that have facilitated upgrading can be identified. This report uses case studies of selected developing countries to illustrate how national and subnational workforce development institutions and actors in developing countries can respond to globalization, work effectively with global “lead firms” to understand new skill requirements that globalization places on their workforces, and establish workable division of responsibilities in effective public-private partnerships (PPPs).

The paper is structured as follows. First, we provide an overview of the global organization of the industry and the global fruit and vegetables value chain. Second, we identify the entry points and

⁴ Fruit and vegetables consumption has been positively correlated with income levels, with per capita consumption being the highest in high-income countries (Wu Huang, 2004).

⁵ Generally, the term “horticulture” includes the production of cut flowers in addition to fruit and vegetables. Cut flowers, however, are not included in this study and references to horticulture in this paper refer to the fruit and vegetable sectors.

upgrading trajectories for developing countries in this industry. These early sections show how the global industry operates and provide a context to evaluate how workforce development components may contribute to the industry's success. Third, we provide an overview of the human capital required at each level of the value chain. Fourth, we present case studies of five developing countries—(1) Chile, (2) Honduras, (3) Kenya, (4) Jordan, and Morocco—and identify key workforce development practices pursued in each to drive upgrading in the industry. The final section provides a comparative analysis of these cases and highlights best practices that may be adopted by other developing countries in the future.

II. Global Organization of the Industry

The structure of the global fruit and vegetable industry has evolved substantially over the past 30 years.⁶ Strong lead firms have emerged in key markets, which now control shorter, more complex global supply chains, and many of the value-added functions within the industry have shifted from developed to developing countries as the latter have gained expertise.

Today, the fruit and vegetables sector operates as a buyer-driven value chain (Gereffi & Lee, 2009). Large supermarket chains are the leading actors both in key export markets, with controlling market shares across the European Union (EU) and the United States (Humphrey, 2005), as well as increasingly in emerging markets (Reardon & Berdegue, 2006). These buyers—including Sainsbury's, Marks and Spencer (M&S), and Walmart—seek enhanced cost competitiveness, consistency, and product differentiation, such as convenient, “ready to eat” products, from their global supply chains. Lead firms exert significant influence over the entire value chain and dictate how fruit and vegetables are produced, harvested, transported, processed, and stored. This control has been achieved by the introduction of private standards and codes of conduct that govern both the characteristics of the product including, quality, size, pesticide use, and the social and environmental conditions of cultivation and post-harvest handling.⁷ Large and small suppliers around the world are required to meet these demands in order to maintain their access to these markets (Barrientos et al., 2003; Dolan & Humphrey, 2004; Henson & Humphrey, 2009; Jaffee & Masakure, 2005; Lee et al., 2010; Reardon et al., 2009).

In addition to rigorous private standards, governments from developed countries also control access to their domestic markets through a number of public standards and protocols with which suppliers must comply. These public standards are primarily focused on preventing sanitary and phytosanitary (SPS)

⁶ The evolution of the horticultural industry and the emergence of supermarkets as dominant powers is well documented in the GVC literature. See Humphrey et al., 2004.

⁷ These standards include individual firm standards as well as those developed by nongovernmental organizations (NGOs) and industry associations.

problems and protecting consumers and domestic production from disease.⁸ These standards have been driven by several factors, which include greater global awareness of potential health risks related to foodstuffs, following a number of high profile food “scares” during the 1990s (Gulati et al., 2006); weak SPS regulatory systems in certain developing producer countries (Henson & Humphrey, 2009); and the emergence of more sophisticated testing and information technologies, which facilitate both the traceability⁹ of products and the enforcement of more rigorous standards throughout the chain (Henson & Humphrey, 2009).¹⁰ These measures have resulted in a complex system of multiple standards at national, regional, and international levels. These standards are characterized by a lack of harmonization, both in requirements and enforcement mechanisms, across countries and buyers that add a significant cost to compliance. *Table 1* below highlights some of the more prominent of these standards governing the horticulture industry today.

Table 1. Prominent Standards in the Horticulture Industry

| | Public | | Private | |
|----------------------|--|---|---|---|
| | Mandatory | Voluntary | Individual | Collective |
| National | <ul style="list-style-type: none"> • National legislation (pesticide use, labor regulations, sanitary inspections etc) • U.S. Department of Agriculture (USDA) standards | <ul style="list-style-type: none"> • Hazard Analysis Critical Control Point (HACCP) • USDA National organic program | <ul style="list-style-type: none"> • Nature’s Choice (Tesco) • Field-to-Fork (M&S) • Terre et Saveur (Casino) • Conad Percorso Qualità (Italy) • Albert Heijn BV: AH Excellent (Netherlands) | <ul style="list-style-type: none"> • British Retail Consortium (UK) • Assured Foods Standards (UK) |
| Regional | <ul style="list-style-type: none"> • EU Regulations | | <ul style="list-style-type: none"> • Filieres Qualite (Carrefour) | <ul style="list-style-type: none"> • EurepGap¹¹ • Dutch HACCP • Qualitat Sicherhiet (QS – Belgium, Holland, Austria) • International Food Standard (German, French, Italian) |
| International | <ul style="list-style-type: none"> • World Trade Organization SPS Agreement | <ul style="list-style-type: none"> • ISO 9000 • ISO 22000 | <ul style="list-style-type: none"> • SQF 1000/2000/3000 (U.S.) | <ul style="list-style-type: none"> • GlobalGap • Global Food Safety Initiative • SA 8000 • International Federation of Organic Agriculture Movements (IFOAM) Standard |

Sources: Gereffi & Lee, 2009; Henson & Humphrey, 2009; Jaffee & Masakure, 2005.

⁸ Under the World Trade Organization (WTO) SPS, individual countries are permitted to establish sanitary and phytosanitary regulations for imported foodstuffs to protect both their consumers and domestic agricultural industries from health risks and disease. In the United States, following the 2001 terrorist attacks, for example, the U.S. Food and Drug Administration (FDA) and USDA increased their control over products entering the country and began to audit the production facilities of suppliers in their home countries (Hernandez, 2011; Vergara, 2010).

⁹ “Traceability” has emerged as the industry term, referring to the ability to track the exact origin and handling of a product from the field to the fork. With new information technologies, small barcoded stickers on each piece of produce can provide the buyer with information regarding the exact location in which the product was cultivated, each and every chemical product that may have been applied to the product, and details of the packhouse and workers that handled the product prior to its shipment (Vergara, 2010).

¹⁰ There is an emerging global debate regarding the efficacy of public standards in the face of more stringent private standards and the role each should play in the regulation of agrifoods. Several authors argue that public standards are losing their relevance as the result of underinvestment. For an overview of this debate, see Henson & Humphrey, 2009 and Reardon, et al., 2009.

¹¹ GlobalGap, an outgrowth of EurepGap, is one of the most widely adopted standards. This standard was first developed in the EU in 1997 by an association of European fresh produce importers and retailers, and principally concerns pesticides and chemical use and application as well as the environmental impact of farming systems. Retailers in the United States began to adopt this standard for fresh produce in 2008 (GlobalGAP, 2008).

In addition to these non-tariff barriers, trade barriers designed to provide protection to local producers in industrial countries—such as seasonal tariffs, special duties, quotas, and subsidies to farmers in the importing countries—have also affected the global organization of the industry. Regional seasonal tariffs can be as high as 132% should preferential status not apply (Diop et al., 2005). Tariff escalation barriers provide domestic protection against processed fruit and vegetables and may directly impede important value-added activities from being carried out in developing countries by restricting access to markets. In many cases, these processed products are excluded from preferential agreements, and “restrictive rules for many processed products have severely limited the role of trade preferences in encouraging agricultural diversification in developing countries” (Brenton & Ikezuki, 2005).

Despite these significant challenges, attracted by growing global demand for fresh and processed fruit and vegetables, developing countries including Chile, Kenya, and South Africa have actively pursued horticultural production and export and have successfully captured a large portion of the market. Between 1980 and 2000, produce exports from low- and middle-income countries increased considerably more than those from developed countries, as did the share of horticultural products as a percentage of total agricultural exports (Shah, 2008; Weinberger & Lumpkin, 2005).

This rapidly expanding global footprint of the fruit and vegetables industry has had important consequences for production systems in developing countries. In the past, individual farmers determined varieties grown, quality levels, and production processes employed, and traders bought the product at the farm gate or from wholesalers (Dolan & Humphrey, 2004). Today, the horticulture industry is increasingly organized by long-term relationships and closer linkages between a range of different-sized producer and exporter firms (Humphrey, 2005; Reardon et al., 2009). In particular, the need to increase traceability, provide consistent and reliable supply, meet a wide range of demanding public and private standards, and follow strict management processes to become certified suppliers has led to a significant degree of top-down consolidation of the supply chain (Reardon et al., 2009).¹² Exporter firms consist of a few large multinational fruit and vegetable companies with operations that span several developing countries, combined with a large number of medium-sized domestic firms.¹³ These exporter firms may also own their own production operations (producer-exporter), or they may source from a variety of large-, medium-, and small-sized farms, referred to as independent outgrowers. The relationship with these outgrowers is often managed by seasonal contracts in which the exporter provides the outgrower with certain resources, in exchange for guaranteed supply (Reardon et al., 2009).

¹² Consolidation is also occurring in among firms that provide inputs, such as fertilizers and pesticides for the supply chain, as the buyers limit acceptable processes and products (Humphrey, 2005).

¹³ In some cases, these developing country firms have also expanded into other countries, simultaneously vertically integrating along the value chain.

This consolidated system has also created new opportunities for developing countries (Humphrey, 2005). Over the past 15 years, many retailers have shifted much of the packing work back to their suppliers in developing countries, and a number of them have upgraded along the value chain, moving from being simple producers to providing sophisticated packing services and, in some instances, processing of fruit and vegetables (Humphrey, 2005). A wide variety of fruit and vegetables now sold to in developed markets are pre-washed, chopped, mixed, and packaged in ready-to-eat convenience packs before leaving the developing world.¹⁴ Even product development and innovation responsibilities have been transferred the supplier firms (Humphrey, 2005). These shifts offer significant employment opportunities in producer countries.

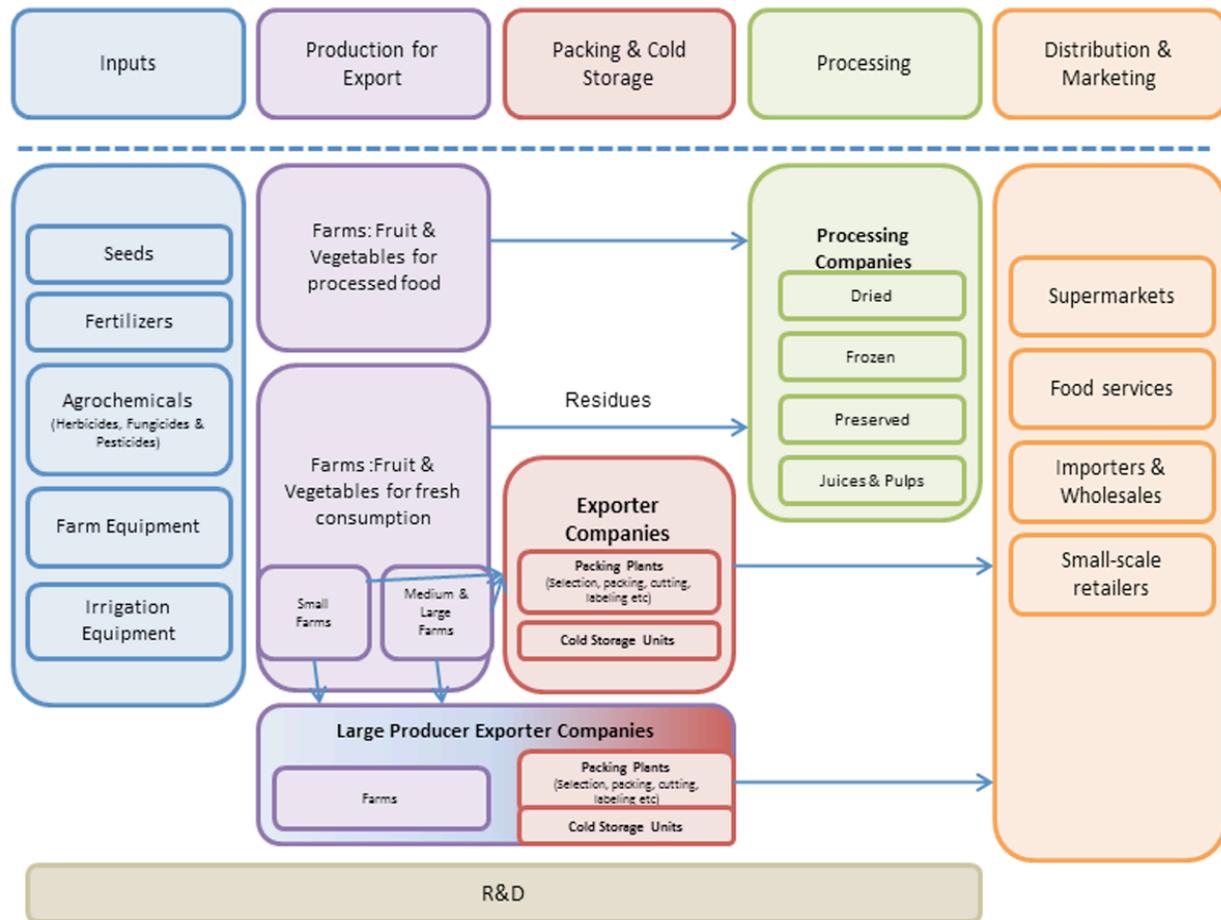
In the past, training was not a significant issue in this industry, and labor was largely drawn from unskilled workers. However, with increased global trade, the sector has become increasingly complex and competitive, and strict mandatory, as well as voluntary, guidelines must now be followed. Suppliers have been forced to introduce initiatives to ensure that their labor force can meet these changing demands, including hiring staff with more formal education and providing training for existing employees. The country cases presented in Section VI offer insight into how the sector has responded to this challenge in selected developing countries. Specifically the cases examine if and how workforce development initiatives are being adopted on the farm, in the packhouses, and in processing operations to improve the preparation and mobility of their workforce to help them to remain competitive in the global industry.

III. The Fruit and Vegetables Global Value Chain

The fresh and processed fruit and vegetables value chain is presented in *Figure 1*. This value chain includes several segments: inputs, production, packing and storage, processing and distribution and marketing.

The most important **inputs** for production in this industry are seeds, fertilizers, agrochemicals (herbicides, fungicides and pesticides), farm equipment, and irrigation equipment. Logistics and transportation fulfill key supporting functions, while government regulatory bodies are required to approve the sanitary and phytosanitary conditions of outbound products. Due to the fragile and perishable nature of the product, a high degree of coordination between the different actors along the chain is required. This ensures that the perishable product reaches its destination in good condition. Cold storage units are used throughout the chain to keep the produce fresh, and both air and sea freighting supported by the cold chain are key elements to ensure timely delivery.

¹⁴ In Kenya, for example, the average compound annual growth of vegetable exports between 1995 and 1999, unprepared vegetable exports increased by 3.7% but 11.2 % for prepared vegetables (McCulloch & Ota, 2002). Also see Humphrey et al., (2004) for further examples of prepared vegetables from Kenya and other developing countries.

Figure 1. The Fruit and Vegetables Global Value Chain

Source: Duke CGGC.

Following this, the key segment of the value chain for developing countries, **production for export**, is divided between production for fresh consumption and production for processed fruit and vegetables. In some cases, the fresh fruit and vegetables that are not accepted for sale as fresh produce are used as inputs for the processing stage, but in other cases, such as orange juice or preserved peaches, a specific variety and grade quality is required and production occurs separately. Production is organized in small, medium, and large farms that supply exporter companies and/or producer-exporter companies that own farms, but they may also supplement their supply by buying from other farms. Industry associations often play important supporting roles at this stage in disseminating information about new products, processes and best practices.

The next segment is **packing and cold storage**. The first stage of the packing segment is grading. Unacceptable low-grade produce will be redirected to processing plants or the domestic market.¹⁵ Washing, trimming, chopping, mixing, packing, and labeling are other processes that may occur in this stage of the value chain. Once the produce is ready for transport, it is blast chilled and placed in cold storage units ready for export. Packing usually requires economies of scale due to the high costs of cold storage and other capital investments necessary at this stage; thus, this is usually carried out by large producer-exporter and exporter companies that buy the fresh fruit and vegetables and package, store, and export them.

Processed fruit and vegetables include dried, frozen, and preserved produce, as well as juices and pulps. Many of these processes add value to the raw product by increasing the shelf life of the fruit and vegetables. Processing plants purchase fruits and vegetable inputs from the producers. These firms may export their products under their own brand, as well as under the buyer's brand. The last stage of the value chain before consumption is **distribution and marketing**. In this final stage, the produce is distributed to different channels including supermarkets, small-scale retailers, wholesalers, and food services.

IV. Economic Upgrading in the Fruit and Vegetables Global Value Chain

Whilst developing countries have faced considerable challenges due to the changing nature of the value chain, a number of developing countries have achieved significant upgrading over the past two decades. This upgrading has been fostered by improved knowledge in production, advancements in logistics and shipping technologies, increased access to information about market demand and trends, and the capacity to comply with stringent standards. Today, in addition to providing off-season and year-round supplies of fruit and vegetables to key markets, many developing countries perform value-added activities that were previously carried out in developed nations.

Functional upgrading or the shift into higher-value segments of the value chain¹⁶ in this industry has been largely characterized by its linear nature, moving from production to packing, then to processing, and finally to greater control over distribution and marketing.¹⁷ While these shifts into higher-value segments represent important gains in revenue, evidence suggests countries only upgrade after they have successfully consolidated their position in lower segments of the value chain. For example, upgrading into processing typically fails when production levels cannot be sustained consistently over time to provide

¹⁵ In some cases, where no local demand exists for the product, such as Asian vegetables in Honduras, rejected product will simply be destroyed.

¹⁶ "Functional upgrading: Acquiring new functions (or abandoning existing functions) to increase the overall skill content of activities" (Humphrey & Schmitz, 2002, p. 1020).

¹⁷ Lee et al. (2010) suggest that the rise of the fresh fruit and vegetable exporters may indeed shift the governance of the chain with powerful suppliers challenging the large retail houses.

sufficient raw materials to leverage the capital investments made in processing infrastructure (Mungai, 2000).¹⁸

The main stages of functional upgrading in the horticulture value chain are described as follows:

- **Entry into the GVC through the production of fresh fruit and vegetables for the export market.** The globalization of fruit and vegetable markets has increased demand for these products in developed countries and requires improvements to logistics and transportation—such as the introduction of airfreighting for horticultural products and more sophisticated cold storage technologies—and changes to trade agreements to allow new producer countries with appropriate environmental conditions to enter the market. In several cases, this diversification into nontraditional agricultural products for export has been actively fostered by governments and donor agencies in countries looking to drive export growth through higher value, nontraditional agricultural products (Challies & Murray, 2010).
- Once the production function is attained, countries can begin to offer services in the **packing and storage** segment of the value chain in order to increase their access to key markets and avoid competition from new countries entering the bulk produce market (Jaffee & Masakure, 2005). By adopting new packing and storage techniques, producers can quickly add value to fresh fruit and vegetables. Today, sophisticated packaging systems to maintain freshness and product quality can be observed in many developing countries. In addition, these countries produce “ready to eat” products that are pre-washed, chopped, and bagged. This upgrading is driven both by supply and demand: Producers must meet minimum packing requirements to enter key high-value markets, while buyers reward suppliers that innovate and provide new prepared products that appeal to their consumers with preferred status and stable contracts (Humphrey, 2005).
- Upgrading into the **processing segment for export** has been mastered by only a few developing countries. While many developing countries successfully process produce for their domestic markets, they have yet to make the transition to processing for developed markets. Acquiring this function in developing countries requires previous success in the production stage of the value chain, due to the large quantities of produce required year round to provide these operations with adequate supplies of raw material to finance the important capital investments required. Upgrading into this stage requires both sophisticated infrastructure, as well as a prepared workforce to perform manufacturing rather than agricultural tasks.
- The final stage of the value chain refers to the **distribution and marketing** of the product. The United States and the EU are the principal markets in this chain. However, demand from developing countries

¹⁸ In Kenya in the 1990s, a number of initiatives in canning, jarring, and freezing were set up for the horticultural industry. However, a large number of them complained about the shortage of raw materials for the factories and operated with underutilized capacity for most of the decade (Mungai, 2000).

for fruit and vegetables is also increasing as their income rises, offering important new opportunities for upgrading for developing countries.¹⁹ While, in the past, these functions have been carried out by buyers or importer firms from developed countries, ownership and control of this function is gaining ground in some of the larger and more capable developing countries.

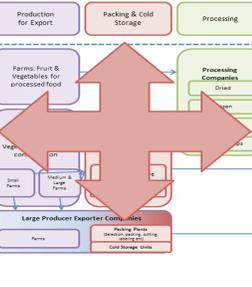
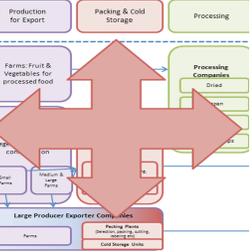
Product and process upgrading, that is, moving into more sophisticated product lines and increasing efficiency by reorganizing production or introducing superior technology, also play an essential role in this industry, and their impact should not be overlooked. Process upgrading, for example, has been essential to help developing countries meet the growing number of public and private standards. The introduction of new technologies, such as greenhouse production and health protocols in packhouses, have been key factors in protecting crops from disease both pre- and post-harvest and meeting safety standards around the world. Other key examples include product and process upgrading to cultivate and handle increasingly fragile and perishable product varieties that offer greater financial returns than more commodified fruit and vegetables, while the adoption of new shipping and cold storage technologies can allow suppliers to adapt to geographic constraints, such as size and distance from market.²⁰

Table 2 presents examples of these upgrading trajectories in developing countries.

¹⁹ Emerging nations such as India and China will continue to increase their demand of fruit and vegetables in the coming years due to their rising income level. China's fresh fruit and vegetables imports account for over half of total food imports, increasing from under US\$100 million in 1992 to over US\$600 million in 2001 (Wu Huang, 2004). India's demand for fruit and vegetables is also poised to undergo significant growth over the next five years. By 2015, India's middle class is projected to grow by about 300%, further impacting demand for foodstuffs which has seen per capita consumption of food increase in 20% in the last five years (Malik, 2009).

²⁰ In the horticulture sector, product and process upgrading opportunities are vast. The examples listed here are just a few of a large number of initiatives that can be undertaken by suppliers in the industry to increase their competitiveness.

Table 2. Upgrading Trajectories in the Fruit and Vegetables Global Value Chain

| | Diagram | Description |
|--|---|---|
| Production (Entry in the value chain) |  | <ul style="list-style-type: none"> • Entry point for the fresh and processed fruit and vegetable value chain. • Opportunity for low-income countries to export higher value added agro products. |
| Packing & Cold Storage (Functional Upgrading) |  | <ul style="list-style-type: none"> • Countries looking to increase the value of their exports and to improve supply for their clients will improve their packing and cold storage systems. • This can include sophisticated packing for fresh fruit and vegetables, such as ready-to-eat products, that are pre-washed, cut, and bagged. |
| Processed Fruit & Vegetables (Functional Upgrading) |  | <ul style="list-style-type: none"> • To enter in this segment, countries have to master the production stage. • Countries need new infrastructure and a workforce prepared to engage in this activity. |
| Product Upgrading |  | <ul style="list-style-type: none"> • Improve the product characteristics. This can happen in all the stages of the value chain—production, packing and storage, and processing. • Some of the standards that have been adopted by the industry, such as GAP standards, focus on product upgrading, as well as ensuring that the sanitary and phytosanitary conditions of the product are met. |
| Process Upgrading |  | <ul style="list-style-type: none"> • Introduction of new technologies in the production system or the restructuring of the existing system to generate services more efficiently. • Companies implement more efficient systems in the search to improve productivity and remain competitive. |

Source: Duke CGGC.

V. Workforce Development in the Fruit and Vegetables Global Value Chain

Cultivation of fruit and vegetables is substantially more labor-intensive than growing cereal crops (Joshi et al., 2004; World Bank, 2009), and the upgrading stages described in the previous section create a wide range of both production and post-harvest jobs that vary in skills and specializations.²¹ Increased production has incorporated new laborers into the value chain, while the shift of packing functions to less expensive, developing nation locations has required additional hands in the packhouses to provide washing, cutting, trimming, and mixing procedures (Weinberger & Lumpkin, 2007). The industry draws principally on a young, uneducated and flexible labor force, combined with a very small percentage of skilled labor (Achterbosch et al., 2007; Best & Mamic, 2008).²² Formal education is not a requisite for most positions in low levels of the value chain; typically semiskilled (e.g., mechanics, sprayers, drivers, information technology [IT] systems operators, etc.) and skilled labor (agronomists, nutritionists, etc.) accounts for 10% or less of the labor force in horticultural operations (Dolan, 2004). Given this, the industry is an attractive source of employment for a large segment of the population whose employment alternatives are limited due to a lack of formal education.

Table 3 provides an overview of the most important job profiles in each segment of the value chain.

²¹ Reliable data on exact increases in employment rates are hard to obtain, partly because of the high numbers of unrecorded casual, temporary, seasonal or contract workers. See Humphrey et al., (2004) for a discussion of employment effects in this industry.

²² In some countries, such as Chile, there is a strong focus on migrant labor to fulfill the tasks required for the industry. In others, however, such as Kenya and Zimbabwe, the industry relies on on-farm labor (Best & Mamic, 2008).

Table 3. Job Profiles in the Fruit and Vegetables Global Value Chain

| Position | Job Description | Formal Education Requirements | Training/ Experience | Skill Level |
|-----------------------------------|--|---|--|---|
| Production for Export | | | | |
| Harvest Worker | Manually plant, cultivate, and harvest fresh fruits and vegetables. Duties may include tilling soil and applying fertilizers; transplanting, weeding, thinning, or pruning crops; cleaning, packing, and loading harvested products. | No formal education required | Experience/training |  |
| Tractor/ Truck Operator | Responsible for bin placement for pickers and removal of bins ready to be stacked in trucks. Must be able to operate machinery safely, and without damaging the harvested product. | License/ certification | Technical training |  |
| Pesticide Handler | Prepare and apply pesticides, herbicides, fungicides, or insecticides. Pesticide handlers must be thoroughly knowledgeable of the chemicals as well as proper application and disposal procedures. | Technical education | Experience/ technical training/ certification |  |
| Irrigation Technician | Install, maintain, alter, repair, and service irrigation system. | Technical education / Bachelor's degree | Experience |  |
| Quality Control | Work in the field and are responsible for the quality of the harvested crop. Random samples are taken from each bin and checked for quality, size, color and maturity. | Technical education / Bachelors degree | Experience |  |
| Packing and Cold Storage | | | | |
| Packing Worker | Fills trays, wraps fruit, and packs boxes. Looks for defects in the fresh fruit and vegetables and makes sure the packed fresh fruit and vegetables are well presented. | No formal education required | Training |  |
| Labelers | Labels packed fresh fruit and vegetables for shipment. Using computer-controlled equipment ensures traceability of produce. | Literacy and numeracy skills | Training |  |
| Transport Driver | Transport fresh fruit and vegetables between fields and packhouses and shippers. Delivers product safely and in good condition. Manage logistical delivery and dispatch paperwork. May need heavy truck license. | Literacy and numeracy skills | Technical training/ experience |  |
| Managers (Line/Shift) | Ensures quality of the fresh fruit and vegetables complies with industry standards. Shift managers are responsible for workflow. They solve workflow problems by people management, and liaise with the line manager. | Technical education | Management skills/ experience |  |
| Inspector | Works at port of export, monitoring shipments to ensure they meet international standards. This position can require export certifications. | Technical education | Technical training |  |
| Packing Manager | Responsible for the day-to-day packhouse operations, including staff management, budgeting, administration, and planning. | Bachelor's degree | Management skills/ experience |  |
| Quality Assurance Manager | Ensures all handling of fresh fruit and vegetables is carried out according to health and safety protocols of buyers and export markets. Responsible for sampling and testing of fresh fruit and vegetables for diseases. | Bachelor's/ Master's degree | Significant experience |  |
| Processing | | | | |
| Line Workers | Transports raw materials, finished products, and packaging materials; feeds and unloads processing machines or mobile tank trucks; checks products and packaging for basic quality defects. | Literacy and numeracy skills | Technical training/experience |  |
| Mechanics & Machinery Maintenance | Repairs, installs, and maintains industrial production and processing machinery. | Technical education | Technical training |  |
| Production Supervisor | Instructs and trains operators; ensures good manufacturing practices (GMPs) and standard operating procedures (SOPs) are used. Monitors and verifies performance of equipment and processes, maintains logs on process and product data. | Bachelor's degree | Specialization degree production/ Management skills / experience |  |

Source: Duke CGGC.

| Skill Level | Low | Low-Medium | Medium | Medium-High | High |
|-------------|---|---|---|---|---|
| |  |  |  |  |  |
| | No formal education; experience | Literacy and numeracy skills; experience | Technical education/ certification | Technical education / undergraduate degree | University degree and higher |

As can be seen in **Table 3**, different stages of the value chain require different types of skills. The skills in the production segment are those related to the agriculture sector, and the most important job profiles include harvest workers, irrigation operators and pesticide handlers. The entry-level skills tend to be low and no formal education is required for the majority of workers. Workers responsible for irrigation systems and pesticide application, however, require a degree of technical education. The most common job profile in the packing segment is the packing worker, who selects, wraps, and places the fruit and vegetables in a tray. In other cases, they also wash, trim, chop, and pack the products. These additional handling processes often require that workers be trained in the job function. Jobs in this segment are mostly directed at women, who have come to dominate the horticulture labor force in many developing countries.²³ The skills required in the **processing stage**, by contrast, are manufacturing abilities for positions, including line workers and machine operators. In this stage, production task automation increases and there is a growing number of workers operating machines. Many of the workers need special knowledge, and as in the packing segment, in some cases may need to be certified in a job function, especially if they handle the food in some way. Other important job profiles in this segment include mechanics and other machinery maintenance positions that are essential to keep food manufacturing plants and equipment in good working order.

The importance of improving the skills of the existing horticulture workforce has been highlighted within the past two decades. These include increased complexity through strict buyers' requirements, as well as a growing participation in the production of highly fragile and niche products, rigorous enforcement of standards, and increased competition among developing countries. In production, there is growing evidence that simple training focused on maximizing productivity and minimizing losses for harvesting staff can significantly improve financial outcomes (Labarca, 1999). A clear example of this is skills training in handling fruit and vegetables. Productivity problems can be rapidly overcome by short training sessions and/or on-the-job training, with respect to manipulation techniques that do not require large investments and are relatively simple and easy to learn (Neid et al., 2010).

Extensive training for appropriate pest control, including pesticide handling and use, has also become increasingly important for producers due to restrictions on both the quantity and type of pesticide that can be used in the cultivation of fresh produce (Smith et al., 2004).²⁴ In the packing and processing segments, both public and private standards have led to an emphasis on health and food safety training, as well as quality food presentation in packhouses that provide ready-to-eat products. This job leverages

²³ Women make up at least 50% of the total horticultural workforce in Chile, Ecuador, Guatemala, Kenya, Mexico, South Africa, and Zimbabwe, and an estimated 70%–80% of workers in higher paying value-added activities, such as packing, labeling, and bar-coding produce (Dolan, 2005). Wages in value-added activities, such as packing are higher than farm work (Dolan & Sorby, 2003), although in general female workers continue to receive lower wages than their male peers (Dolan, 2004).

²⁴ These restrictions are usually included in buyer codes of conduct and are the result of increased concern for consumers ingesting pesticides, as well as the workers exposed to chemicals in the cultivation process.

“life-long training” of the predominantly female workforce that has been involved in food preparation for most of its life (Bamber & Fernandez-Stark, 2011).

As the industry continues to evolve, diverse models of workforce development across different stages of the value chain are likely to emerge, shaped both by the nature of the participating firms and the particular training and institutional frameworks of the host nation. Country cases in the remainder of this report explore the variety of private, public, and multisector workforce development strategies that have been undertaken in five developing countries to support these market-entry or upgrading efforts of firms and countries in the horticulture value chain.

VI. Developing Country Case Studies

In this section, we analyze the horticultural industry of five developing countries, representing both low- and middle-income economies. As shown in the *Table 4*, Chile is the country that has achieved the greatest value chain advancement in the sector. In 2008, Chile exported US\$2.6 billion in fruit and vegetables and upgraded into the processing segment. Kenya and Morocco exported close to US\$1 billion each. Of the two, Kenya has been more successful in its upgrading initiatives, taking on an important role in providing packing services for major supermarket chains in the EU. Morocco currently exports more than Kenya, electing to diversify its export market rather than upgrading or adopting higher standards to serve European demand. Jordan and Honduras offer two examples of smaller countries that are entering the value chain; in 2008, Jordan exported US\$440 million and Honduras US\$250 million of horticultural products. These two countries continue to operate in the lower segments of the value chain, exporting loosely packed products primarily to regional markets. These cases reveal distinct workforce development initiatives that were engaged to help drive upgrading.

Table 4. Selected Economic and Industry Country Indicators, 2008

| | Chile | Kenya | Morocco | Jordan | Honduras |
|---|------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Gross Domestic Product (GDP) (current US\$) (bn) | 170 | 30 | 89 | 21 | 14 |
| GDP per capita (at PPP; \$US) | 13,390 | 1,432 | 3,938 | 5,137 | 3,633 |
| Agriculture % of GDP | 3.9 | 27 | 14.6 | 2.9 | 13.6 |
| Horticulture exports^a (\$US million) | 2,580 | 921 ^c | 1,060 | 442 | 252 ^d |
| Fruit and vegetables processed products exports | 1,500 ^b | 136 | 151 | 33 | 25 |
| Exports fresh and processed fruit and vegetables as % of total exports | 6.1 | 21.1 | 6.0 | 6.1 | 11.6 |
| Total labor force (thousand) | 7.1 | 18.2 | 11.8 | 1.9 | 2.8 |
| Employment in agriculture (% of total labor force) 2005 | 13.2 | 18.6 (1999) | 47 | 3.6 (2006) | 39.2 |
| Employment in horticulture | 450,000 | 500,000 | 400,000 | 67,000 | 15,000 |
| Employment in processed fruit and vegetables | 24,000 | NA | NA | NA | NA |
| Entry year | Early 1980s | Late 1970s | Late 1970s | 1980s | Mid-1980s |
| Entry point | Fruit farming | Vegetable farming | Fruit & vegetable farming | Vegetable farming | Vegetable farming |
| Highest value activity | Processed fruit & vegetables | Prepared fruit & vegetables | Packaged fruit & vegetables | Packaged fruit & vegetables | Packaged fruit & vegetables |
| Export market | Global | EU | EU & Russia | Regional and (some to EU) | U.S. and Regional |

Notes: ^a: This includes only fresh fruit and vegetables (not processed fruit & vegetables); ^b: This data does not include wine. The wine industry exported US\$1,400 mil. in 2009; ^c Figure includes income for cut flowers (Dolan, 2004); ^d2007.

Sources: Foreign Investment Committee-Chile, IMF, Instituto Nacional de Estadística (2003), Honduras; Jordan's Department of Statistics, Kenya National Bureau of Statistics, 2009; ODEPA-Chile; UNComtrade; WDI.

The case studies are structured as follows: First, each case presents an overview of the current state of the industry, highlighting the principal features of the workforce and related development initiatives in the country. This is followed by an examination of key stages of industry development, followed by the identification of the most important workforce development strategies implemented to foster upgrading during each stage. Particular attention is paid to identifying the composition of the firms in the industry and the institutions involved in workforce development to identify best practices.

A. Chile²⁵

The horticulture sector in Chile has rapidly expanded, and it continues to add value to fruit and vegetables production through the growing incorporation of processing (OECD, 2008b; Portilla, 2000). In 2009, Chile exported US\$3 billion in fresh fruit and more than US\$1.5 billion in processed fruit and vegetables in 2008. Today, more than 65% of the country's horticulture production is exported (López, 2009), and Chile accounts for 50% of the fruit exported from the Southern Hemisphere. In 1990, this share was only 25%. Its major export markets are the United States and Canada (35%), EU (35%), and Latin America (16%) (ASOEX, 2009). Fruit farming and agribusiness are prioritized economic sectors within the country and actively supported by the government (Foreign Investment Committee-Chile, 2009). Key produce exports include, in decreasing order, grapes, apples, cranberries, cherries, kiwifruit, avocados, pears, peaches, and plums (UNComtrade, 2011). The export of fresh vegetables represents only a small portion of the sector, with total exports in 2008 reaching US\$43 million (UNComtrade, 2011).²⁶ Chile's fruit and vegetable industry has expanded due to several factors that include excellent climate, economic openness, political stability, and concerted efforts by both the private and public sectors to improve competitiveness by increasing coordination between different stakeholders (ODEPA, 2005).

Industrial Organization

The industry has over 7,800 fruit producers and 518 exporting companies. It includes a mix of both foreign and local producer-exporter companies. Large foreign producer-exporter companies include Dole, Unifruitti, and Del Monte, although large domestic companies including Rio Blanco, David del Curto, and Frusan significantly contribute to both production and exports (Gwynne, 1999; Moraga, 2010). Approximately 50% of exports are controlled by the producer-exporter companies and the remaining 50% by exporters that buy the products from farms. Leading companies in the processing stage are also a mix of foreign and domestic firms, including Hortifruti, Vital Berry, Invertec, Aconcagua Fruit, Agro Food Central Valley, and Frutos del Maipo. These processing companies export their name brand products and also produce private label products for foreign supermarkets (Lopez, 2010).

Workforce Development

Qualified labor is important to remain competitive and meet the strict global public and private standards (ODEPA, 2005). Human capital has been identified as the only controllable factor in the industry (Lopez, 2010). Horticulture draws on a relatively well-educated workforce compared with other developing countries, and the literacy rate in Chile of 96% facilitates training and development (Vergara,

²⁵ The Chile country case was developed by Karina Fernandez-Stark.

²⁶ Given the limited relative size of vegetable production in Chile, the discussion in this section draws principally on fruit production.

2010). Building on this foundation, the government, together with industry associations, has established sophisticated evaluation and training initiatives to professionalize the sector. Importantly, the government has organized a system of training, including a labor skill certification system (see *Box 1* in Section VII). In addition, at the higher level of the chain, local universities graduate over 7,000 undergraduate and 700 master-level students in agronomy per year (Ministerio de Educación, 2008). In addition, technical schools offer courses in agricultural engineering, and leading universities offer undergraduate, graduate, and doctoral programs in foods engineering.

Stage 1. Production (export of fresh fruit and vegetables): 1980–Present

Chile entered the global fresh fruit and vegetables chain as a producer country during the 1980s.²⁷ Export growth was facilitated by a series of government-led economic changes that featured an export-oriented policy, reduced trade barriers, privatization of state-owned firms, and attracting Foreign Direct Investment (FDI). During this early period, Chilean producers specialized in the export of fresh fruit, such as grapes and apples, but later they developed new fruit varieties, including kiwi fruit, raspberries, and blueberries. The Chilean Fresh Fruit Association actively courted buyers in key markets in the United States and the EU, organizing visits to the country and hosting events at promotional conferences in both destinations.

During the 1990s, the industry began to consolidate. Many small-scale farmers sold their land to large fruit-exporting companies and exited the industry. Some of that land was later sold to large-scale farmers, as well (Portilla, 2000). In the mid-1990s, producers came under pressure with the introduction of new safety and quality standards imposed by global buyers and SPS regulators in key markets. In response to this, the government and the private sector worked together to proactively create Chile's safety and quality standards (Government of Chile, 2002; ODEPA, 2005). In 2003, ChileGAP was created as a private GAP certification program that harmonizes the most widely accepted requirements of the international market and offers Chilean growers and exporters the tools to implement these GAP requirements at the lowest possible cost.²⁸ This was recognized and accredited by GlobalGAP in 2008 (ChileGap, 2003, 2010). In addition, in 2004, a Public-Private Strategic Council was created to foster further development of this sector. This council has created a series of programs that include fruit genetic improvement, transfer of knowledge, improvement of worker productivity, and fruit safety among others (CORFO, 2010).

Workforce Development. During this period, temporary work became increasingly popular due to the cyclical nature of fruit production and women became a key part of the temporary labor force

²⁷ In 1980, Chile exported less than US\$150,000 in fresh fruits (Guerra, 2010).

²⁸ ChileGAP was created by Fundación para el Desarrollo Frutícola, a nonprofit research organization founded in 1992 by exporters in the fruit industry. In 1998, membership was expanded to include vegetable exporters.

(Gwynne, 1999). Today the sector employs around 450,000 people in production, packing, and processing, equivalent to 5% of the country's total labor force (CORFO, 2010; Lopez, 2010).²⁹

In 1999, the first organization specifically focused on developing training programs for the sector, AGROCAP, was created with sponsorship from the Association for Fruit Exporters (ASOEX). This organization acts as an intermediary between producers, private training institutions, and the state employment and training agency, Servicio Nacional de Capacitación y Empleo (SENCE). Specifically, AGROCAP ensures that training meets the industry's human capital needs in addition to disseminating good workforce development practices (Vergara, 2010). By 2010, the organization had facilitated training for over 100,000 workers. In addition, at the end of the 1990s, the National Labor Skills Certification System (NLSCS) (see **Box 1**, Section VII) was established as a joint initiative between the Ministries of Economy, Education, Labor and Social Security, and Horticulture was included as one of 15 key industries in the country.

Skills and competencies for every job in the sector were profiled and compiled with the help of the private sector. These results were shared with technical training institutions to ensure that educational programs met industry needs. In addition, practical examinations were made available for workers already in the industry to certify their competencies regardless of how these were acquired. More than 9,000 workers in the fruit and vegetable sector have been certified to date. Through its economic development agency, Corporación de Fomento de la Producción (CORFO), the government made financing available for training to facilitate the adoption of private quality standards (ASOEX, 2007).³⁰

Stage 2. Packing and cold storage: 1985–Present

By the mid-1980s, producers and exporters in Chile were looking for new opportunities to maximize on their success in the cultivation of fresh fruit products. Several firms developed creative and effective solutions to pack fresh fruit shipped to the United States and also to Europe, while buyers in these markets were beginning to look for improved presentation and packaging. By this time, “Plan Frutícola,” launched by CORFO in the late 1970s to study the behavior of different fruits in the cold chain, was beginning to yield results; the first packing and cold storage units were established throughout Chile (Portilla, 2000). Extensive infrastructure improvements were made to highways and ports during the 1990s, reducing transportation times. In addition, the Ministry of Agriculture (MOA) streamlined SPS processes and protocols for packhouses with the establishment of two key certifications. In 1982, the Servicio de Agricultura y Ganadero (SAG), under the MOA, collaborated with ASOEX and the USDA Animal and Plant Health Inspection Service (APHIS) to develop a specific protocol (SAG USDA) for

²⁹ 150,000 are permanent workers and 300,000 temporary workers.

³⁰ GlobalGAP, Nature's Choices (Tesco private standard), ISO 9001 and HACCP among others.

shipping fresh fruit and vegetables to the United States. SAG origin was also created for export certification for all other countries (Servicio Agrícola y Ganadero (SAG)- Ministerio de Agricultura de Chile, 2011a). These certifications cover the entire cold chain (Servicio Agrícola y Ganadero (SAG)- Ministerio de Agricultura de Chile, 2011b).

The private sector has played a clear role in this stage, adding state of the art infrastructure (Portilla, 2000) and packing techniques in order to reach new markets and guarantee freshness. For example, one Chilean fruit company created special packaging that allows fresh cherries to be shipped to China. As a result of this new technology, cherries can now be sent by sea instead of airfreight, maintaining quality and increasing price competitiveness (Moraga, 2010).

Workforce Development. To facilitate upgrading in the packing segment, exporters began to recruit and train workers for their packhouses. Women were employed principally for the selection of fruit and packing and men in technical jobs, such as controlling the equipment (Portilla, 2000). The incorporation of childcare facilities in the sector played an important role in attracting women into the labor force (Collins, 1995). SAG provided training for the new USDA and Origin protocols for packhouse, storage, and transportation workers (Vergara, 2010). The NLSCS also provided certifications for packhouse workers. Firms installing packhouse equipment, such as sorting machines, provide workers with training on how to use them.

Additionally, training has focused on the administrative work required to track the movement of fruit and vegetables from the farm to the final destination. On-the-job training has been essential to learn the paperwork required to export fresh fruit and vegetables to the world. The content of this training is based on current export procedures around the world, such as SPS and customs procedures.

Stage 3. Processed fruit and vegetables: Mid-1990s–Present

In 2009, Chile exported more than US\$1.5 billion in processed fruit and vegetables, compared to US\$100 million in 1990. Between 2000–2006, processing plants absorbed 52% of total fresh fruit and vegetables produced by the country (Chilealimentos, 2010a; ODEPA, 2010). The sector goal is to reach an annual growth rate of 10% in processed fruit and vegetables exports by 2017 (CORFO, 2010). Several actors have been involved in this industry upgrading process. The private sector has played a central role, investing in capital goods to be competitive in the global market (Portilla, 2000), training workers, and also innovating in products and processes.

Workforce Development. By 2010, the processed fruit and vegetables industry had created around 24,000 direct jobs and 225,000 indirect jobs (CORFO, 2010). Different programs have been established in conjunction with the private sector to train workers, particularly with respect to use of processing machinery. These include the extension of Chile's FDI High Tech Investment program to

processing operations and finance skills upgrading for both semi-skilled and skilled workers, access to CORFO grants, and SENCE programs through tax incentives. Leading universities also began to offer undergraduate, graduate, and doctoral programs in foods engineering.

Table 5 shows the most important workforce development initiatives in the different segments of the value chain. Many of these initiatives are transversal to all three stages.

Table 5. Chile: GVC Upgrading and Workforce Development Initiatives

| Stage 1: Production for Export 1980s–Present | Stage 2: Packing and Storage 1985–Present | Stage 3: Processed Fruit and Vegetables Mid-1990s–Present |
|---|---|---|
|  |  |  |
| Private Sector Workforce Initiatives | | |
| <ul style="list-style-type: none"> The private sector created internal programs to train their workers. These skills are in line with the needs of the international markets. Worker training is a popular practice, especially with the top companies of the sector. Fruit export companies create training systems to improve quality and safety. Large exporters train small and medium farmers to meet global standards. | | <ul style="list-style-type: none"> Training to meet HACCP standards. |
| Public Sector Workforce Initiatives | | |
| <ul style="list-style-type: none"> Government Scholarships for Chileans to study in universities in California (Cepal). CORFO created “Plan Fruticola” in which Universidad de Chile and INIA partnered to prepare skills for people to advance in technical areas. The government created a subsidy for plantations that granted more than US\$ 60 million, including a training component. | | |
| <ul style="list-style-type: none"> In the last two decades, education levels in the country rose, providing important human capital for the industry, which was in need of better educated workers due to the increased complexity of the tasks. The Chilean government offers tax incentives for foreign investors through the High Tech Program. One of these tax incentives is the personnel training (25% of employee’s gross annual wage) and a program for hiring experts (up to 50% of the cost of training or hiring). CORFO created two programs to enhance the workforce in the sector. One refers to supplier development and the second is the program of technical transfer | | |
| Multisector Workforce Initiatives | | |
| <ul style="list-style-type: none"> OTIC-AGROCAP started in 1999 training workers in the agro sector and, to date, has trained more than 100,000 workers. In 2009, they trained an additional 17,128 workers from 1,590 companies. They have made an annual investment of US\$ 2 million. OTIC AGROCAP has entered into a number of agreements with public and private institutions to further develop human resources in the industry. These include agreements with the Ministry of Agriculture, FUCOA, PRODEMU, Fundación Chile, ChileAlimentos, the College of Agronomical Engineers, and a number of trade associations formed by regional growers. In 2002, the government, private sectors, and other stakeholders created “Buenas Practicas Agricolas” (Good Agricultural Practices), as well as training programs to accompany this standard. During 2006, nearly 12,000 workers received training—4,262 on management topics, 2,827 on quality and hygiene, 2,644 on production techniques, and 2,267 on other topics. Training was covered under SENCE. A number of industry actors created the program focused on skills certification. Over 9,000 workers in the sector have been certified. This program has also a training component for the workers that present specific skill gaps (see Box 1). The certification includes jobs in the production, packing, and processing stages of the value chain. In an effort to promote education as a means of overcoming poverty, ASOEX, together with OTIC AGROCAP and the Study, Consulting and Training Institute (IEAC) has conducted a number of academic equivalency courses for workers in the industry. For this purpose, resources from the ChileCalifica program and the SENCE 2006 Tax Franchise for Academic Equivalency have been used. | | |

Source: Duke CGGC.

B. Kenya³¹

The Kenyan horticulture sector today accounts for approximately US\$1 billion³² in export revenue, and the industry is the country's key source of foreign exchange, accounting for 21% of total country exports in 2008 (Kenya National Bureau of Statistics, 2009; UNComtrade, 2011). The country's leading export markets include France, the Netherlands, Spain, the United Kingdom; major products include French beans, Asian vegetables, avocados, passion fruit, and mangos, among others.³³ The horticulture industry has continued to evolve and upgrade over the past three decades and has become a highly sophisticated supplier of pre-packaged, unprocessed fruit and vegetables. The sector focuses on high-value, lightweight fruit and vegetables that cost less to transport, thus exports are dominated by airfreighted products. A significant proportion of Kenya suppliers currently export "ready to eat" (chopped/trimmed, washed, and mixed) fruit and vegetables. Some exporters also provide store labeling to ensure the product goes directly to the supermarket shelf (Fresh Produce Exporters Association of Kenya, 2010).

Industrial Organization

The industry's growth was based on a high involvement of smallholder producers, which in 2004, accounted for approximately 60% of exported fruit and vegetables; however, this share has declined considerably since the implementation of private standards. Although they have become more organized through farmers' groups to increase their bargaining power with exporters and reduce individual risk in face of changing demand for products, smallholders now account for just 30% of production. At the higher end of the chain are a small group of approximately 12 Kenyan producer-exporters with their own production farms and extensive packing installations (S. Ouma, 2010). These exporters are well organized, with advanced technologies in cold chains and logistics, and their final products include fully packaged "ready to eat" convenience fruit and vegetables. The largest of these firms, Flamingo Group, also owns a distribution and marketing agency in the United Kingdom (Flamingo Holdings, 2010). These exporters have begun to expand geographically, establishing operations in Guatemala, Peru, and South Africa that are used to help smooth supply. Foreign firms have played a more limited role, such as Del Monte, which has focused on pineapple production and processing.

³¹ The Kenya country case was developed by Penny Bamber.

³² Figure includes income for cut flowers. In 2001, cut flowers and fresh vegetables accounted for 53% and 40% of total horticultural exports respectively, Gachanga 2002, cited in (Dolan, 2004).

³³ Others include artichokes, sweet corn, snowpeas, courgettes, baby carrots, and asparagus.

Workforce Development

The horticultural sector provides considerable employment in both rural and urban Kenya (Fresh Produce Exporters Association of Kenya, 2010).³⁴ This growing workforce can be divided between two key segments: (1) farm workers, and (2) packhouse labor. Farm labor is typically rural, while employees in packhouses are based in urban centers close to Kenya's international airport. Employment in these segments is gender-biased, with women playing an important role in packhouses, in particular.

Prior to the introduction of standards during the mid-2000s, workforce development was focused mainly on increasing productivity on farms, although external training was carried out on an irregular basis, and the private sector provided on-the-job training for many of their staff in both production and packhouse segments of the value chain. The introduction of global quality and safety standards led to a widespread increase in training to help maintain Kenya's competitiveness and prevent the large number of smallholders from being forced out of the industry. This included training carried out or financed by foreign governments and NGOs. The Kenyan government did not play an active role in workforce development until recently, approaching the industry with a "laissez-faire" attitude (Steglich et al., 2009).³⁵ In 2010, the government committed to revamping the public technical and vocational training in the country, with plans to open 13 new polytechnic institutes (Nganga, 2010).³⁶ Key lines of study will focus on refrigeration and food technology. In the past, educational institutions—including the Jomo Kenyatta University of Agriculture and Technology—focused principally on agricultural activities, although as more packing functions were adopted by the industry, new degree and diploma programs have been offered in post-harvest management, nutrition and food technologies.

Two key upgrading stages can be identified in the evolution of Kenya's horticultural industry:³⁷

³⁴ FPEAK reports that 4.5 million people are directly employed by the sector, including employment in the production of cut flowers and informal laborers. This number, however, is questionable. A 2005 simulation of employment effects of the changes to industry structure following the introduction of standards and functional upgrading in Kenya indicate a positive correlation with employment growth, yet it is unlikely that since 2000, employment figures have grown from 500,000 employees to 4.5 million (Humphrey et al., 2004).

³⁵ Schapiro & Wainana (1991) note that the Kenyan government played a supporting role in the 1960s in providing training resources through the Horticultural Crops Development Authority (HCDA), but this institution was not sufficiently funded or staffed to meet the demands of the industry. They attribute the success of the industry to a lack of government interference with the exception of providing the required infrastructure.

³⁶ This is being carried out with funds from donor agencies together with the African Development Bank.

³⁷ While Kenyan suppliers have seen tremendous success in increasing the value added to their produce within the packaging stage, they have been less successful in upgrading into the processing segment of the value chain. Processing in Kenya is still largely limited to the production of fruit juice and canned pineapples. Both of these operations have been significant exporters since the early 1970s (Minot & Ngigi, 2004). However, there has been little application of this experience in the rest of the horticultural industry, indicating difficulties in knowledge transfer, which has limited upgrading into the processing segment in the country as a whole. The major losses of fruit and vegetables during the Icelandic volcano episode in April 2010 further highlighted the lack of both processing capacity within the country, as well as shipping alternatives. Once cold storage units were full, there were no alternative uses for the produce (Ross, 2010).

Stage 1. Production (export of fresh fruit and vegetables): Late 1970s–Present

Kenya has been actively involved in horticulture production for over half a century. In the 1970s and 1980s, the country entered into the GVC, exporting fresh fruit, vegetables, and cut flowers to Europe (Minot & Ngigi, 2004). Strong growth continued through the 1990s and the sector expanded substantially within the country. Between 1993 and 1999, exports grew by 206% in value and 53% in volume. By 2008, horticultural products for export had reached US\$916 million (Kenya National Bureau of Statistics, 2009). As growth continued, producers concentrated further on higher-value produce, with French beans and chilis being favored over tomato and potato production.

Early growth was facilitated by a number of factors. As the import market in Europe began to grow, Kenya was well positioned to become a leading provider. The Kenyan climate, facilitated by greenhouses and improved technologies in irrigation and water management, allows for almost year-long production of most fruit and vegetables. The land ownership structure in Kenya was well suited for horticulture rather than other agricultural use, following the land redistribution policies of the early independence years that favored small family-owned plots over commercial plantations. Production in Kenya was linked with the wholesaler markets in the United Kingdom through an extensive network of South Asian families living in both countries (Dijkstra, 1997). The growth of tourism to the region also increased the frequency of flights to and from Kenya and expanded the possibilities for air freighting produce to key markets (Minot & Ngigi, 2004).

This expansion, however, was complicated in the late 1990s by the entry of the U.K. supermarket chains into the fresh fruit and vegetable markets (Dolan & Humphrey, 2004). As these supermarkets gained market share, they forced substantial changes along their supply chains, increasing the demand for quality, consistency, reliability of supply, efficiency, conformity with external standards, and value-added processing from their Kenyan suppliers (Dolan & Humphrey, 2004). In addition to these rigorous individual private standards, new collective standards—EurepGap and subsequently GlobalGap—were also introduced in the horticultural sector. The expense of this process upgrading was beyond the reach of many smallholders, which resulted in a reorganization of the industry and a consolidation of large exporters.³⁸

Workforce Development. Two separate workforce trends can be identified: first, initiatives associated with the growth of the industry and expansion of production; and second, those initiatives that were associated with the introduction of standards in the GVC, which required widespread training to maintain Kenya's position within the chain.

³⁸ There is some debate in the literature with respect to the impact of GlobalGap standards on smallholders in Kenya (Dolan, 2004; Humphrey, 2009; S. Ouma, 2010; Reardon et al., 2009). Jaffee (2005) notes that exporter firms responded by segmenting products, using in-house or trusted suppliers, where the most stringent standards are enforced for highly demanding clients, and outsourcing more broadly, where these standards are more limited (Jaffee & Masakure, 2005).

First, expansion of supply, as well as the addition of new higher-value vegetables, required internal workforce training initiatives in the private sector.³⁹ Given that formal education is not a requirement in this sector, the country initially drew on a semi- and unskilled labor force (Dolan, 2004), leveraging Kenya's long agricultural tradition, where there was a supply of trained labor for certain functions, such as irrigation and pest control. A number of educational institutions, including the National Horticultural Research Station at Thika, provided training and degree programs in agriculture and horticulture, helping to provide an adequate supply of agronomists and management talent needed to expand production and engage in product innovation. Agronomists on producer-exporter farms also experimented with new varieties, and subsequently ran training programs for the company's outgrowers (Jaffee & Masakure, 2005).

More significant training, however, occurred in response to the implementation of the GlobalGap standards in the country. These initiatives were driven by the private sector, on the one hand, and multiple stakeholders led by foreign aid agencies, on the other, and were mostly directed at training Kenya's large smallholder farming community in traceability and pesticide use. Private export firms had long relied on the supplemental output from smallholder farmers to meet export demand and thus needed to ensure these farmers could help meet the new requirements. Where contractual arrangements were in place between private exporters and smallholders, farmers were trained in the exporter's production guidelines for the core export crops, dealing with quality, safety, and pre-planting environmental impact (Dolan, 2004; Jaffee & Masakure, 2005).⁴⁰ Their agronomists worked with farmers, often attending farmer meetings to ensure that lessons were reinforced across the group. In addition, the private sector represented by industry associations played an active role in disseminating GAPs among all outgrowers (even where there were no contractual arrangements in place) and helped develop a Kenyan Code of Conduct for the production of fresh fruit, vegetables, and cut flowers (Humphrey, 2009). In 2010, this code was rolled out for the domestic market, as well as KenyaGap. Both FPEAK and Kenyan supermarkets provided training programs for local producers (Fresh Produce Exporters Association of Kenya, 2010).

Multiple aid agencies and foreign governments⁴¹ funded training programs focused on smallholders to ensure that they were not eliminated from the value chain (see **Table 6** for further details). These organizations worked together with numerous local Kenyan institutions and the private sector to provide both training and technical assistance to the smallholder community. In May 2010, in a key collaborative initiative, the industry association, FPEAK, together with several public and private educational and training organizations, began recruiting trainers for a new Horticulture Practical Training

³⁹ These initiatives correspond to both the pre- and post-implementation of quality standards in the GVC. It should be noted that the different standards introduced provide protocols for controlling different aspects of production and post harvest handling, but they do not provide instruction as to how to produce a new product given its particular characteristics.

⁴⁰ Exact details of this training are not available, although in most cases farmers receive handouts and protocols and verbal instructions.

⁴¹ Including the EU, Germany, Japan, the Netherlands, the United Kingdom, and the United States.

Center partly funded by the Government of the Netherlands. This center is focused on capacity building for employees of large commercial farms, smallholders and extension staff in all stages of Kenya's horticulture value chain (M. Ouma, 2010).

Stage 2. Packing and cold storage: Late 1990s–Present

Kenya began to upgrade into the provision of pre-packaged fruit and vegetables in the late 1990s. When exports focused on the wholesale market, little packaging was required and much of the produce was shipped in bulk. However, as the supermarkets gained market share and competition between different chains such as Tesco, Sainsbury's, and M&S increased, these firms sought to lower costs, pushing much of the packaging back to developing countries.

In response, Kenyan exporters began to offer pre-washed and packaged fruit and vegetables, which would then be prepared for sale in additional packing centers in the United Kingdom. These firms made significant investments to upgrade their packhouses from relatively simple structures to more sophisticated operations (Jaffee & Masakure, 2005). Major investments went into air-conditioning and ventilation systems, water purification, blast coolers, and a wide variety of equipment to attain very high standards of hygiene within the packhouse operations. A few companies also invested in their own onsite laboratories for product and staff health tests (Jaffee & Masakure, 2005). As a result of this progress, many export firms began to take on more packaging functions, including washing, trimming, slicing, mixing, packaging, and labeling. Recently, packing fresh fruit and vegetables to offer "ready to cook/eat" alternatives has become an important part of the Kenyan horticultural business.

Today, almost all exporters have large packing facilities within the Kenyan International Airport complex, where the produce is processed for delivery to the EU within 24–48 hours. Continued growth and expansion are supported by constant engagement with buyers through trade missions to principal markets. In 2010, in response to growing demand for packaging products, a leading packaging manufacturer from the United Kingdom established operations in Kenya to provide a full range of packaging products and services in-country for firms exporting products to the United Kingdom (Paragon Print & Packaging, 2010).

Workforce Development. The shift toward increased packaging in the country of origin has also led to increased employment for Kenya (Dolan, 2004). While this employment, like that on the farms, continues to rely on largely unskilled labor with basic training in specific job functions (Dolan, 2004), packhouse operations must employ highly qualified personnel for quality control and supervisors who can guarantee that the exported product meets the wide variety of safety and quality standards (Jaffee & Masakure, 2005). As noted in Section V, this position requires high levels of skills, along with formal education in addition to HACCP and ISO training certifications. Two universities and three higher

education institutes in Kenya launched diploma and degree programs in Food Science and Processing Technology, focused on developing these skills for horticulture.⁴² Graduates of the diploma programs enter the industry as first line supervisors in the packhouses. The University of Nairobi has had a well-established program offering a Master's degree in Food Sciences and Technology and Nutrition since 1985.

First-line managers and supervisors also receive training in sexual harassment and discrimination to improve their management techniques (Sixsmith, 2010).⁴³ This is key, since packhouses tend to employ a high proportion of female workers compared to males (Dolan, 2004). Senior staff within the packhouses typically require significant experience (generally five years or more in managerial positions), in addition to undergraduate degrees in agriculture or related fields. Senior, mid-level, and clerical staff are trained in the use of new technologies for labeling, bar codes, and traceability. Most training for the use of these systems is conducted onsite by the provider.

Supervisors and quality control staff are often responsible for providing training for the “unskilled” labor at this stage. This training is typically “on-the-job” and oriented to maintaining the high standards required for sale in the EU, such as quality and hygiene requirements. Workers are often trained in multiple operations, including packing, grading, trimming, and bar-coding, allowing them to be easily moved across job functions to meet fluctuating demand (Dolan, 2004). Furthermore, in some packhouses, productivity is measured at the team level, reducing the need for further supervision staff (Wambalaba & K’Ahol, 2006).

Finally, in the face of more stringent global standards, and as the Kenyan industry upgraded into additional packaging functions, labor hiring began to move from predominantly temporary labor in the packhouses to a contract basis (Jaffee & Masakure, 2005). This allows firms to capture the returns of training by locking in employees for longer duration, as well as to monitor the health of the staff to prevent contamination. Indeed, firms began to use healthcare professionals to manage the health of the staff working in the packhouse (Jaffee & Masakure, 2005). In addition, some firms provide on-farm training facilities focused on improving adult literacy and computer skills (Fairtrade Foundation, 2010).

Table 6 provides an overview of the corresponding workforce initiatives that were carried out in Kenya as the country's fruit and vegetable sector upgraded along the value chain.

⁴² These include Mount Kenya University, University of Nairobi, Jomo Kenyatta University of Agricultural and Technology, and the Nairobi Institute of Technology. (Mount Kenya University, 2010).

⁴³ In 2010, Flamingo Kenya had trained 40 trainers to continue to provide this Ethical Trading Initiative training program that is also being rolled out in South Africa (Sixsmith, 2010).

Table 6. Kenya: GVC Upgrading and Workforce Development Initiatives

| Stage 1: Production for Export Late 1970s | Stage 2: Packing and Storage Late 1990s |
|---|---|
|  |  |
| Private Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> Formal education is not relevant for unskilled labor. Training relevant for the limited semi-skilled and skilled labor, such as irrigation and pest-control roles. Private sector firms provide training in new techniques for smallholder suppliers. Large exporters hired a longer-term labor force and provide training to ensure high European standards are met. Small growers are trained in the exporter production guidelines for the core export crops, dealing with quality, safety, and pre-planing environmental impact. Agronomists working for the exporters provide training and monitoring of smallholder groups to ensure quality of supplemental supply. | <ul style="list-style-type: none"> As companies increase their packaging processes, hiring is expanded to include health specialists and food technologists to ensure that high level sanitary and health standards are met (Jaffee & Masakure, 2005). Exporters principally responsible for innovation and thus are motivated to provide training to support experimentation and improvement (Steglich et al., 2009). <p>Two Kenyan universities and three higher education institutes launch 3- and 4-year degree and diploma programs in Food Science and Processing Technology to train first-line supervisors for packhouses.</p> |
| Public Sector Workforce Initiatives | |
| | <ul style="list-style-type: none"> KIRDI involved in the training and development initiatives in the limited processing sector. |
| Multisector Workforce Initiatives | |
| <ul style="list-style-type: none"> USAID funds project to provide technical assistance and overseas training in production, post-harvest handling, agro-processing technologies, institutional development, and export marketing to Kenyan companies. Through the KHDC program, several USAID-funded training initiatives have focused specifically on smallholders and continued through 2010. KHDC also offers managerial and institutional training through its partners. Farmers trained in nursery techniques to improve the quality of the seeds provided. As the sector adopted the GlobalGap-EurepGap standards, there was significant support from multinational organizations—including government agencies from the EU, Germany, Japan, the Netherlands, the United Kingdom and the United States, as well as NGOs, the Kenyan government, and private sector companies—to provide education and know-how to both large and smallholder providers. Particular focus on integrated pest-management training that helps to reduce pesticide use, increasing quality, and lowering health risks. The industry association, FPEAK, developed a Code of Conduct to help both exporters and outgrowers to meet the high standards of European market. In 2010, this code was renamed KenyaGap, with new standards being introduced for the domestic market. FPEAK, along with supermarkets, provided training in the standards to smallholders. | <ul style="list-style-type: none"> Funded by the Rockefeller Foundation and the Gatsby Charitable Foundation, Africa Now, Honey Care Africa, Kenya Agricultural Research Institute (KARI), and MOA established a training program to help smallholder fresh fruit producers learn how to dry their fruit using solar panels to ensure they can sell their processed fruit on the market. Six universities and colleges in Kenya offer degrees and diplomas related to horticulture, while a number of other institutions offer degrees in food sciences and processing technologies. The University of Nairobi also offers a doctoral program in this area. |
| <ul style="list-style-type: none"> In May 2010, FPEAK—together with KARI, the Kenya Flower Council, and HCDA—began recruiting trainers for a new Horticulture Practical Training Center, partly funded by the Government of the Netherlands. This center is focused on capacity building in all aspects of the horticulture value chain in Kenya. Courses will be focused on employees of large commercial farms, smallholders and extension staff. | |

Source: Duke CGGC.

C. Morocco⁴⁴

In 2008, Morocco exported US\$1.06 billion in fresh fruit and vegetables (UNComtrade, 2011). The country's two leading export markets are France and Russia.⁴⁵ Tomatoes are the largest single export item at nearly a quarter of total earnings, while a variety of citrus fruits accounted for nearly 40% of the earnings. Processed horticulture exports amounted to US\$151 million in 2008, with frozen strawberries accounting for over half of this total. Other important horticultural exports include melons, peppers and potatoes. Morocco's horticulture sector benefits from a number of natural advantages. Its temperate climate allows year-round production, including in Europe's winter, when prices are higher, and its historic relationship with France gave the country access to one of Europe's biggest markets.

Industrial Organization

The export horticultural sector in Morocco has become increasingly consolidated over the past three decades following the withdrawal of the government from the industry during the economic liberalization programs of the 1980s. Consolidation occurred to a large degree in response to changes to European trade regulations (Aloui, 2001), and the introduction of SPS and quality standards to implement improved information transfer to ensure traceability of supply. Since the early 1990s, exporters have dominated the value chain in Morocco, controlling networks of packing facilities and managed their own farms or relied on large farms for their supply (Aloui, 2001; Aloui & Kenny, 2005; Hadad, 1995). By 2007, just seven exporters accounted for 70% of Morocco's fresh fruit and vegetable exports (Aloui, 2001; Benhaddou, 2007).⁴⁶ The top five firms are ROSAFLORE, ARMONA, MARISSA, AVRYL, and GED; these firms are vertically integrated throughout the chain in production, shipping, and marketing. Due in part to legal restrictions on foreign ownership of land, locally owned firms are important players in the production segment of the value chain.⁴⁷

Workforce Development

The Moroccan horticulture sector employs 400,000 people, slightly more than 3% of Morocco's workforce.⁴⁸ Employment in packhouses is mostly seasonal, ranging from 150 to 300 employees per establishment (Ait-Oubahou, 2006; Aloui, 2001; Aloui & Kenny, 2005), and in the case of citrus packing, employees work up to eight months a year. Employees are often paid on an hourly basis and are mostly

⁴⁴ The Morocco country case was developed by Christopher Root.

⁴⁵ France purchases 76% of Morocco's tomato exports and about half of its bean exports. Russia is an important target-market as the largest consumer of Moroccan citrus. In 2008, it purchased nearly half of the country's exports. Other significant buyers of Moroccan citrus include France and the Netherlands, each of which imported about 13% of Morocco's exports in 2008.

⁴⁶ These firms are shareholders of the Maroc Fruit Board, a large marketing platform. Together they have 25 packing stations and jointly supply international markets under the label "Morocco," some 350,000 tons of citrus fruits and 150,000 tons of early produce (Kalaitzis et al., 2007).

⁴⁷ This may shift under Green Morocco which will lease 21,000 hectares of farmland to foreign investors.

⁴⁸ Most of these workers are in either tomato or citrus production and packing.

female. In general, workforce development is weakest in rural areas where primary school enrolment and literacy are also lowest (Agropolis International, 2010). Insufficient “education and technical know-how in various segments of the supply chain” has been identified a key challenge for the continued development of the horticulture industry (El-Otmani, 2007). Due to its heavy involvement during the early years of the industry’s development, the government traditionally carried out workforce initiatives through the Office for Professional Training and Labor Promotion (OFPPT) (OECD, 2008a). However, this training suffered from limited resources and focused only on the production stage. In fact, just 2% of the country’s professional training budget goes to agriculture, despite the sector accounting for 33% of the labor force and 19% of Morocco’s GDP (Agropolis International, 2010).

As the private sector has assumed more control over the industry’s development, private training initiatives have flourished, specifically with respect to meeting the strict public and private standards in the European market.

Stage 1. Production (export of fresh fruit & vegetables): Late 1970s–Present

Prior to 1975, Moroccan horticulture was weak. Limited irrigation systems left the sector vulnerable to rainfall shortages and created instability of annual production. Horticulture exports were highly centralized through the Office de Commercialisation et d’Exportation, which controlled all aspects of export-oriented horticulture including marketing, quality control, and production-related issues; it was solely responsible for contact with buyers.⁴⁹ The withdrawal of public sector control over the sector following structural adjustment programs of the 1980s gave way for private firms to take the lead roles in marketing the country’s horticultural exports. At this time, the government shifted its involvement in horticulture to support investments in capital goods, providing subsidies as high as 60% in the citrus sector (El-Otmani, 2007).

Producers were also facing difficulties in maintaining the competitiveness of Moroccan fruit and vegetable exports in the European market, following the introduction of seasonal tariffs in the 1970s to protect European producers. Moroccan producers were forced to introduce greenhouse technology to facilitate off-season production in order to maintain access to the European market. The capital investments required for this were beyond the reach of many small producers, who were forced out of the market. Large producers and new investors, however, used their financial resources to secure access to the upscale European market (Aloui, 2001). Exports of tomatoes, the country’s key product, increased from 70,000 tons in 1983–1984 to an average of over 175,000 tons from 1998 to 2001 (Aloui, 2001).

⁴⁹ By 1985, the level of Moroccan government intervention in agriculture was among the highest in the world. Agricultural subsidies accounted for 15% of government expenditures. This heavy-handed government control in agriculture was blamed for excessive rigidity in the sector.

The Moroccan supply chains faced yet another challenge with the implementation of global SPS and quality standards at the end of the 20th century. In particular, meeting pesticide requirements for buyer quality standards and health regulations became an important impediment to advancing trade in the EU. This was due to the inflexibility of Moroccan pesticide regulations and the lack of approved pesticides in the local market (Aloui & Kenny, 2005). In citrus fruits, rather than improve compliance efforts, Moroccan citrus exporters turned to markets with less rigorous entry standards, downgrading from its key export markets and directing much of its harvest to Russia in order to maintain and grow production and export levels (Louali, 2003). Since 1999, exports from Morocco to Russia have increased in real value by 82%, whereas exports of citrus to all other destinations has decreased by 36 percent (UNComtrade, 2011).

Government involvement may increase once again through the Green Morocco Plan that was introduced in 2009 to improve economies of scale and vertical integration along the supply chain. The government will facilitate this by identifying opportunities for buyers and providing those that commit to working closely with producers preferential access to credit and land. The plan also aims to increase the share of agriculture in Morocco's GDP by incentivizing conversion from cereal crops to higher value crops, especially olives (Agency for Agricultural Development, 2009).

Workforce Development. Government control during the early stages of the horticulture industry's evolution extended to workforce development. As of 2003, there were still no privately run workforce training institutes in agriculture (Agropolis International, 2010; Salinger et al., 2003), and most training was offered through the MOA. The government's workforce training program focused on providing introductory agricultural skills to meet the needs of agricultural businesses and farms; providing technical training to young people enabling them to pursue graduate studies in agronomy; offering apprenticeships for rural youth who have recently graduated, including entrepreneurial training; and increasing the capacity of existing agricultural labor. Technical training and apprenticeships aimed to mix classroom and practical experience.⁵⁰ Part of the program is aimed at training the children of farmers interested in taking over their parents' farms (Agropolis International, 2010). The quality of government workforce training, however, was viewed as subpar. Operational budgets decreased despite an increase in the number of trainees, which led to understaffing. Many trainers lacked professional experience, and there was a shortage of quality training materials and inadequate information about career options. The private sector was reluctant to participate in these training initiatives because of what they see as slow response times and inadequate attention to defining skill and job competencies (Agropolis International, 2010).

In the 1990s, the World Bank funded and supported the establishment of a nonprofit professional analysis and consulting group (GIAC AGRO)⁵¹ for the sector to build inter-firm cooperation and public-

⁵⁰ Some 50%-80% of the trainees' time to be spent on practical activities.

⁵¹ Groupement Interprofessionnelle d'Aide au Conseil.

private dialogue on workforce training needs. This group brought together eight industry associations and 165 member companies, helping to establish a common voice to articulate agricultural workforce needs, which had been absent following the government's withdrawal from the sector (Salinger et al., 2003). GIAC AGRO funded studies to devise a development strategy and to identify the skills needed to fulfill that strategy (GIAC Agroalimentarie, 2010). In addition to GIAC AGRO, several donor-funded development projects sought to increase workforce capacity throughout the export value chain. USAID funded and implemented several projects to strengthen workforce development capacity in Morocco, including the Dryland Agriculture Applied Research Project (DAARP) and the Moroccan Economic Competitiveness (MEC) Project (2009–2013). While DAARP was focused on applied research for the agricultural industry, MEC sought to strengthen the capacity of trainers in export-oriented horticulture value chains. MEC supports the National Agency for Promotion of Jobs and Skills (ANAPEC) and private training institutes to upgrade and expand their training offerings (USAID, 2009). Other initiatives were also carried out by the EU and member countries to strengthen vocational training programs for agriculture (see *Table 7* for further details).

Stage 2. Packaging and Logistics: Mid-1980s–Present

Large producers focused on sales to the European market and also upgraded into the packing segment of the value chain. Increased global competition meant that these markets required suppliers to make improvements in packing and presentation as well as cold chain management of fresh produce in order to maintain market access.

Large producers and exporters were forced to increase the sophistication of their packhouses as product could no longer be shipped in bulk. Prior to the mid-1980s, bulk produce had been shipped long distances in unrefrigerated boats. Quality loss and product wastage were key problems, and the product had to be re-graded upon arrival (Aloui, 2001). New measures had to be taken to improve transportation alternatives, as well to ensure the product could be shipped ready for market. The entry of Spain to the EU in 1986 facilitated this change considerably, as it enabled refrigerated trucks carrying Moroccan products to pass directly to European markets, such as France, without additional customs delays. By 1991, 62% percent of tomato exports were transported by refrigerated trucks. By reducing the minimum volume required for shipping, pre-export grading became more selective and the buyer received a higher quality product (Aloui, 2001). However, the use of these trucks was not adopted as quickly in citrus, and in the early 1990s, only 10% of citrus exports were shipped by truck (Hadad, 1995).

While Morocco downgraded to supply other less stringent markets for its citrus exports in response to both public and private standards, there were improved procedures for other products, such as melons and strawberries, that were destined almost entirely for European markets. These changes required

further upgrading of human and infrastructure capacity in Morocco's horticultural export packhouses. The government-run Etablissement Autonome du Contrôle et de Coordination des Exportations (EACCE) became the primary body responsible for assisting producers in meeting export quality and bio-safety standards (Aloui & Kenny, 2005; Chemnitz, 2007).⁵² In 2006, GTZ implemented the Integrated Program for Quality Improvement in Morocco to build the capacity of Moroccan institutions to strengthen the competitiveness of its fresh and processed fruit and vegetables by simplifying domestic regulation, promoting International Organization for Standardization (ISO) 9001 certification and HACCP compliance and improving collaboration between the private and public sectors.

Workforce Development. Most training in packaging and logistics is carried out by exporting firms, although there were also initiatives carried out by donor agencies, such as USAID. Firms train workers to ensure compliance to international and local standards, and workers are provided on-the-job training in areas such as packing, sorting, grading, and labeling (Mohammed, 2011). Informal training is often based on explanation and demonstration, as a large number of the workers are illiterate. Some firms organize classes for workers to learn how to read and write and become versed in quality control basics (Briz et al.). Firms prefer to invest in training on management, marketing, quality control and food safety (Ismaili et al., 2007). Most firms in the sector perceive continuous education and training learning as major needs (Ismaili et al., 2007).

In order to meet food safety and buyer and global standards, some packing firms hire local trainers from regional institutes and international consultants to train workers (Mohammed, 2011; Zohour, 2011). ISO certification requirements have also necessitated the hiring of employees with higher skill levels to comply with record keeping and risk assessment requirements of these certifications (Aloui & Kenny, 2005).

Table 7 summarizes the most important workforce development initiatives in this industry.

⁵² EACCE operates under the MOA but is financially autonomous. In 2002, EACCE received EU accreditation to control agricultural produce exports to the EU under the Program of Delocalization of Official Control in Third Countries set up by L'Organisation Mondiale du Commerce (OMC). Morocco is the first non-European country to obtain this approval. The accreditation is intended to simplify export procedures and processes. EACCE also manages preferential quota of Morocco and partnerships on horticulture exports.

Table 7. Morocco: GVC Upgrading and Workforce Development Initiatives

| Stage 1: Production for Export Late 1970s | Stage 2: Packaging and Logistics Mid-1980s |
|--|---|
| Production for Export | Packing & Cold Storage |
| Private Sector Workforce Initiatives | |
| | <ul style="list-style-type: none"> • Meet market entry standards; exporters, packing houses, and farms invest in workforce training. • Packing workers are trained principally on the job in order to meet international standards. • Some packing firms hire international experts to train workers on food safety and international standards. |
| Public Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> • There are two universities with programs in horticulture: (1) HASSAN II Agronomy and Veterinarian Institute at Rabat, and (2) Meknes National School of Agriculture • Government provides workforce development training in agriculture through the Office of Vocational Training and Labor Promotion (OFPT). This focuses on young people and on farm training. | <ul style="list-style-type: none"> • The MOA carries out vocational training and facilitates apprenticeships in non-farm agricultural businesses. • Workers in higher positions such as supervisors and managers usually attend universities in Rabat, Meknes and Agadir. |
| Multisector Workforce Initiatives | |
| <ul style="list-style-type: none"> • In 1991, Chemonics implemented a USAID-funded DAARP program. The program developed a cadre of Moroccan agricultural scientists under the project participant training component. The program also provided English language training; courses averaging one month in duration have covered such skills as basic and more advanced computer training, in vitro breeding methods, forage analysis, and soil testing laboratory techniques (Eriksen et al., 1991). • The non-profit GIAC AGRO, with 165 member companies, provides funding for workforce development strategy and planning in agriculture • Chemonics International implemented a USAID-funded project (2005–2009) to improve the skills of Moroccan farmers and agro-processors to become more competitive by helping them improve production, processing, marketing, and logistics and to better integrate various value chains. • The USAID-funded MEC Project (2009–2013) works in part to strengthen the capacity of existing trainers in export-oriented horticulture value chains. MEC will support ANAPEC and private training institutes to upgrade and expand its training offerings. Working with selected agricultural and export-oriented value chains, MEC will connect master trainers to global worldwide experts and trainers, building a sustainable system that will provide access to new training and adult education resources (USAID, 2009). • The USAID-funded Advanced Learning and Employability for a Better Future project worked to strengthen the government's vocational training in agriculture and link it to the private sector. • In 2006 GIZ implemented the Integrated Programme for Quality Improvement in Morocco to build the capacity of Moroccan institutions to strengthen the competitiveness of its fresh and processed fruit and vegetables by simplifying domestic regulation, promoting ISO 9001 certification and HACCP compliance, and improving collaboration between the private and public sectors. • The EU 2007–20013 projects in Morocco have included strengthening of vocational training and modernization of industry, agriculture, and fisheries. The EU's strategy entails providing financial and technical assistance for education reform and vocational training systems. It also embraces the fight against the illiteracy of young people and adults, in particular women (European Union, 2007). | |

Source: Duke CGGC.

D. Jordan⁵³

In 2008, Jordan exported US\$440 million in fresh fruit and vegetables. Horticulture is an important subsector and is a significant source of foreign currency, accounting for six percent of the country's total exports (UNComtrade, 2011; World Trade Organization, 2008). Primary export products are tomatoes, cucumbers, and eggplants, accounting for about 90% of Jordan's vegetable exports in volume (Oxford Business Group, 2009).⁵⁴ In addition, date production and exports grew rapidly during the 2000s, and, in 2009, the MOA launched a key investment program to further drive the growth of this high-value product (Hazaimeh, 2009). Jordan principally exports to regional markets; in 2005, 90% of its fresh fruit and vegetable exports were destined to Pan-Arab Free Trade Area (PAFTA) countries, primarily Iraq, Syria, and the United Arab Emirates (UAE), with limited exports reaching the European market (Central Bank of Jordan, 2010). The country's success in export promotion has been mixed, however, largely due to limitations in water, human resources, product quality, packaging, and marketing. Significant support and capacity building efforts by international donor organizations have aided the growth of the sector.⁵⁵

Industrial Organization

Jordan has only a small number of large domestic producer-exporters that produce, pack, store, and export their product,⁵⁶ and fruit and vegetables continue to be exported directly by wholesalers and export firms located in Amman, which source their produce principally from large farms. The most important suppliers are Jordan River Company (JORICO), Raja Farms, AlBaraka Farms Co., Developed Agricultural Marketing Company, Progressive Agricultural Investment Company, and Dr. Fayez Sabri Jaber Farms. These firms are either certified or are in the process of obtaining certification in Global-GAP.

Workforce Development

The horticultural labor force draws significantly on foreign labor, primarily agricultural workers from Egypt (Jordan Department of Statistics, 2010).⁵⁷ Many older Jordanian farmers have left the sector to seek employment in the Arabian Gulf, and many younger Jordanians avoid employment in what is often perceived as menial manual labor (USAID et al., 2010).

The transient nature of the workforce limits incentives for private sector investments in skill development. Several other actors have been involved in workforce development initiatives, including

⁵³ The Jordan country case was developed by Ghada Ahmed.

⁵⁴ Jordan also exports fruits such as citrus, peaches, and apricots, but volume remains well below its vegetables production and exports

⁵⁵ US Foreign assistance to Jordan increased significantly between 2000 and 2010 and total U.S. aid to through FY2010 amounted to approximately \$11.38 billion. Events such as the first Gulf Crisis in 1991, the 1994–1995 peace treaty with Israel, and the second Gulf war in 2003 made Jordan a strategic partner to the U.S. Government in the Middle East Region. Agriculture is seen as an important sector for food security.

⁵⁶ High export tariffs limit participation to more established firms as they require important economies of scale to remain competitive.

⁵⁷ Egyptian workers account for 73% of Jordan's agricultural workforce.

government agencies,⁵⁸ NGOs, and multilateral and bilateral donors (Magnani et al., 2004). Donor agencies continue to work with the Jordan Institute for Standards and Metrology (JISM) to provide technical capacity building and training to harmonize Jordanian standards with GlobalGap, which was adopted in 2008.

Stage 1. Production (export of fresh fruit and vegetables): 1980–Present

Prior to 1980, horticulture production was very limited and targeted to the local market. However, the introduction of new horticulture production technology in irrigation, crop production, handling, and export allowed the country to enter the fruit and vegetable GVC (Qrunfleh, 2009). The main production system today continues to be field cultivation with drip irrigation, and plastic tunnels and greenhouses with drip systems.

While production was initially focused on vegetable varieties, specifically tomatoes, cucumbers, and eggplant, in 2005, date production began to emerge as an important new subsector. In 2009, the MOA launched a key investment program to further drive the growth of this high-value product, and by 2010, dates had become a priority among horticultural exports due to its low water consumption during production and net higher returns than traditional products (Hazaimah, 2009).

The Arabian Gulf has long been Jordan’s primary export market (Borg, 1986; Central Bank of Jordan, 2010). Advantages of exporting to Gulf countries include proximity, lower shipping costs, established networks, and lower quality demands. While European markets offer higher value, they only account for a small portion of Jordan’s horticultural exports (Central Bank of Jordan, 2010). Some of the institutional shortcomings preventing the private sector from increasing exports to the EU include organizing farmers to achieve “critical mass” or “bulk volumes”; market intelligence; technology transfer; quality control; and managerial and technical education (Magnani et al., 2004; World Bank, 2008).

Workforce Development. Training and certification are overseen by Jordan’s National Center for Agricultural Research and Extension (NCARE). Initial training focused on crop production; as new production methods were introduced and handling protocols were established, training evolved to include quality, mechanization, fertilization, farm management, marketing, and global standards. By 2007, with the exception of mechanization and fertilization, these areas continued to be identified as key knowledge gaps in the sector (Haddadin, 2007). Water management, in particular, became a focus of training, skills development and recruitment due to the rising cost of water use (Qrunfleh, 2009). In 2009, the Jordan Valley Authority entered into a cooperation agreement with four farmers’ societies to raise awareness about

⁵⁸ MOA and Plant Protection Department; Jordan Export Development and Commercial Centers now Jordan Enterprise; NCARE; Jordan Exporters and Producers Association (JEPA); and JISM.

water management, and train and advise farmers on irrigation practices (Oxford Business Group, 2009). Engineers and mechanics were also hired to manage and maintain the drip irrigation systems.

Training by individual firms has been limited despite examples of success by a small number of farmers and exporters who developed their own support systems (Haddadin, 2007). These producers have been able to significantly increase their exports, diversify and train on new crops, and obtain standards certifications. Much of the training to support an increase in production and export promotion has been provided by government agencies, NGOs, and international donor agencies, in particular, USAID (see **Table 8** for more details). The quality of government training is questionable, however, as extension offices in charge of carrying out training activities are undermined by limited instruction and resources (Haddadin, 2007).

Stage 2. Packing and cold storage: Late 1990s–Present

Jordan has not yet effectively upgraded into the packing segment of the value chain, and packaging, quality control, and marketing continue to be critical constraints that hinder Jordan's export capacity, particularly to the EU where buyers require additional post-harvest arrangements from their suppliers (Magnani et al., 2004). Competitiveness in this segment is limited by two key factors: (1) overfilling of containers, which damages produce and lowers the unit price; and (2) low quality of the locally available packaging materials. Most fruit and vegetables are packed in (5–10kg) Styrofoam or corrugated boxes, which provide limited protection for the product; together with overfilling, this can easily damage the product in transit (James et al., 2008; Kader, 2006). This packaging is suitable only for local markets and exports to the Gulf countries, where standards are lower and transit time is limited (Magnani et al., 2004).

While packaging appears to be improving for the smaller European market, with one-way plastic containers used for export to Eastern European countries and fiberboard containers used for export to EU countries (Kader, 2006), a portion of Jordanian produce destined for the European market continues to be exported to neighboring countries, such as Turkey and Syria, where it is graded, repackaged, labeled, and exported to the EU and the Gulf at higher prices (Jordan National Competitiveness Team, 2000). This lack of post-harvest management systems has limited Jordan's ability to effectively sell its produce, gain market share in the EU, and capture higher prices for its products (Magnani et al., 2004). In addition, supply chain gaps in the industry remain unresolved, including the constraints in infrastructure, cold chain and transport logistics, and contractual arrangements at destination ports (World Bank, 2008).

Workforce Development. Some larger producers such as JORICO provide in-house training on produce handling and packing to meet export standards since they understand that training is needed to develop skills in cutting and produce preparation and packing according to global standards and marketing.

Albaraka Farms offers consulting services to other producers and training courses for packhouses' supervisors and staff.

Table 8 summarizes the most important workforce development initiatives in this industry.

Table 8. Jordan: GVC Upgrading and Workforce Development Initiatives

| Stage 1: Production for export 1980s | Stage 2: Packing and Storage Late 1990s |
|---|---|
| Production for Export | Packing & Cold Storage |
| Private Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> Majority of farmers are unskilled, use low-tech methods and are not investing in training and education. Some farms train on integrated pest management and food safety. Large fruit and vegetables companies train their suppliers informally. | <ul style="list-style-type: none"> The fruit and vegetable export company JORICO invests in staff development and has created its own internal training programs for its 140 employees on production processes and quality standards such as GlobalGap; Albaraka Farms offers training courses for packhouse supervisors and staff; Dr. Fayez Sabri at Jaber Farms trains staff on organic farming and Fair Trade. Merchants Union for Vegetables and Fruit Exporters provides training workshops on topics such as pricing, standards and marketing. |
| Public Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> MOA provides extension services and has been working with international organizations to implement programs to train graduate youth and women in organic farming, irrigation, production, drying, storage, and mechanization. | <ul style="list-style-type: none"> NCARE provides training for extension services and famers. |
| Multi Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> USAID-funded Agricultural Marketing Development Project (AMDP) started in 1988 helps to increase growers' productivity, marketing, and income in domestic and export markets. 2004 USAID-funded Horticultural Export Improvement Association (HELA) training on EurepGap. | <ul style="list-style-type: none"> Jordan Export Development and Commercial Centers and JEPA provide training on technical, administrative, and logistical management; exports; and GlobalGap. |
| <ul style="list-style-type: none"> By 1996 USAID-funded AMDP became a fully integrated horticultural operation and export promotion project and provided training on production, marketing, and packaging. World Bank Horticultural Export Promotion and Technology Transfer Project was launched in 2003 to increase Jordanian horticultural exports through quality testing, export certification, financing of technology transfer, and other capacity-building measures for small- and medium-scale farmers. 2005 USAID-funded KAFA'A trained farmers and associations on farm water use efficiency, better farming, product diversification, standards, export, supply chain, marketing, finance, and market linkages. USAID (2006–2011) funded Sustainable Achievement of Business Expansion and Quality (SABEQ); provided training and capacity building activities on work force development, exports, and sector value-added activities. | |

Source: Duke CGGC.

E. Honduras⁵⁹

In 2008, Honduras exported US\$250 million of horticultural products. Key products include bananas, melons, pineapples, tomatoes, and Asian vegetables, including okra and eggplant. The United States is the most significant trading partner for these products, and absorbs over 95% of tomato exports, although Honduras also benefits from regional trade with El Salvador. While Honduras has significant

⁵⁹ The Honduras country case was developed by Shelli Jo Heil and Penny Bamber and includes information based on interviews carried out in the field in March 2011.

potential for product diversification toward fruit and vegetables given its variety of microclimates and its proximity to major markets in developed countries (FAO, 2003), the country faces numerous obstacles to accelerate growth in this sector. In particular, weak SPS regulations constrain access to foreign markets and limited access to credit makes it difficult for growers to expand production or to invest in new product lines.

Industrial Organization

The industry is divided into three well-marked subsectors: (1) production of bananas and pineapples by two multinational firms, Dole and Chiquita; (2) production of melons and watermelons by a small number of large and medium-sized locally owned firms;⁶⁰ and (3) vegetable production using a variety of production models.⁶¹ Vegetables producers exporting from Honduras are subdivided into two main categories: (1) individual smallholder producers who sell their product to large exporters, and (2) independent producer-exporters with a secure market. Smallholder producers usually work under a mixture of formal or semi-formal contract arrangements with producer-exporters. The growers of Asian vegetables typically operate through contracted outgrower schemes, as these products do not have a local market and thus entail higher risks for the producers. Resources provided by exporters to producers typically include technical assistance to ensure quality production, although some exporters also provide credit facilities and inputs. Melon and vegetable exporters are funded by both domestic and foreign capital and typically sell to one major client in the United States that dictates conditions of supply.

Workforce Development

The horticulture segment in Honduras draws primarily on a poorly educated labor force; in rural Honduras, both male and female participation in secondary education is below 25% (FAO, 2008). In addition, while unemployment in the country's urban centers is high, employment in the packhouses around these centers is not considered an attractive alternative, and many firms have had to focus on improving their recruitment and retention strategies (Mejia Palacios & Oconnor, 2011).

Exporter firms provide on-the-job training for their employees, as well as extension services for their outgrowers (Hernandez, 2011; Medlicott, 2011; Pacheco, 2011). Extension agents are usually trained agronomists. The two major foreign technical assistance providers, Fintrac and Technoserve, which receive their funding from USAID and USDA, respectively, have played central roles in training producers of all sizes in this segment. Zamorano, an Agricultural University based in Honduras and well respected

⁶⁰ Melons traditionally depended on smallholder production, but this has changed dramatically in recent years as smallholders could not meet the demands for quality and consistency of supply for the export market and were forced out of the market.

⁶¹ The National Agricultural Census of Honduras in 2003 estimated the total horticultural producers at 15,000 (Lundy et al., 2006).

across Latin America, provides undergraduate programs in agronomy, as well as an array of technical training programs for the private sector.

Stage 1. Production of fresh fruit and vegetable for export): 1980s–Present.

Throughout the 1900s, the horticulture sector in Honduras was dominated by the production of bananas by Standard Fruit and United Fruit Company, which today are the multinational corporations (MNCs), Dole and Chiquita International. The country was known as the “banana republic” due to the economic and political dominance of these firms, which enabled the country to become the world’s largest exporter of bananas for 100 years. These firms, however, operated in relative isolation from the rest of the economy and, with the exception of the spinoff of the research operations of Standard Fruit as the FHIA,⁶² there were few positive spillover effects regarding exports or horticultural production in the country.

Vegetable production for export began in the mid-1980s, fostered by USAID initiatives to help Honduras to take advantage of the Caribbean Basin Initiative (CBI), the forerunner to the Central American Free Trade Agreement (CAFTA). While USAID’s support was reduced during the mid-1990s, major new efforts were initiated after Hurricane Mitch (October 1997). In 1998, USAID awarded a grant to the US technical assistance provider, Fintrac and the Agricultural Research Foundation (FHIA) as part of the USAID-Rural Economic Diversification Program to implement its farm-to-market value chain approach. These efforts were focused on continuing to diversify production, and unlike many programs in developing countries, these interventions began with the larger producers and gradually added smaller suppliers (Medlicott, 2011).

Asian vegetables were introduced in Comayagua in 1989, although growth was very slow in initial years, as there was no demand for these types of vegetables on the local market, and as farmers were reluctant to cultivate unknown vegetables, exporters had to produce on their own farms (Hernandez, 2011; Medlicott, 2011). More extensive growth in the industry really began after Hurricane Mitch, when large producers restructured their production and small and medium producers were gradually contracted to supplement supply (Imbruce, 2008). A particularly important part of the industry’s growth strategy has been the diversification of supply to include multiple vegetable products. By creating multiple “product lines” and income streams, exporters have decreased risk to producers and allowed them to operate with a year-round supply of produce (Medlicott, 2011). While the last decade has seen significant growth in the production of these vegetables, overall export earnings from vegetables have risen only marginally from less than 1% of total export value in 1997 to a little over 1% in 2007.

⁶² FHIA went on to play an important role through contributions to research and technology transfers and in the advancement of cucumber, squash, oriental vegetables, pepper, jalapeño, eggplant, and plantain exports (USAID, 2008)

Workforce Development. Private firms with outgrower programs provided training for their producers, particularly with respect to the new vegetable varieties that were not known in local markets. Key technical assistance programs were offered by Fintrac as part of the recovery initiatives following Hurricane Mitch. Fintrac's strategy was based on employing and training local university graduates as extension agents and trainers, many of whom later went on to work with exporter firms in the sector (Medlicott, 2011). Fintrac provided training on SPS regulations, GlobalGAP, and other private standards, as well as introducing new technologies and product varieties. By 2010, Fintrac had trained producers at all levels, including large, medium, and small firms (Medlicott, 2011).

Two important universities, Zamorano University's Pan-American School of Agriculture and Universidad Nacional de Agricultura, offer undergraduate and diploma programs in agronomy. By 2010, there was an oversupply of agronomists in the labor force, and many graduates of these programs opted to work in other sectors (Bamber & Fernandez-Stark, 2011). Zamorano also provides extension services, including management training and training in integrated pest management (Rueda & Valenzuela, 2011). In addition, other nonprofit organizations such as the rural development foundation, Fundación para el Desarrollo Empresarial Rural (FUNDER), were set up to organize smallholder supply through community-owned firms and provide technical assistance and business administration training. One of these firms has grown successfully and now produces for export (Maradiaga & Galo, 2011).

While the public research organization FHIA provides training and market advisory services for almost 6,000 producers linked to the export market, little if any extension services have been provided by the government, both as a result of policy decisions that focus on privatization of these services and a lack of resources (Maradiaga & Galo, 2011; Medlicott, 2011).

Stage 2. Packing and cold storage: 1990s–Present.

Due to the expanded production of fruit and vegetables, packing and storage improvements occurred in parallel with the significant increases in production, and development agency programs provided funding and technical assistance for the construction and operations of these facilities (Hernandez, 2011). The private sector Asian exporters also constructed packing and storage facilities when they initiated their own farm production. Produce is packed and shipped in bulk in large boxes or crates; limited value-added processes are included for export; and no trimming, chopping, or mixing is carried out in Honduras, with the exception of jalapeños that may not be exported fresh to the United States, and are thus halved, deseeded, and stored in vinegar prior to export.

Workforce Development. New employees are briefly instructed in their activities prior to being included on the packing line, these employees then continue their training under the tutelage of a mentor, taking approximately three weeks to produce at full capacity (Hernandez, 2011; Medlicott, 2011);

Velasquez, 2011). While production is typically male dominated, employees in the packhouses in Honduras are predominantly young women between 20 and 30 years old (Medlicott, 2011; Mejia Palacios & Oconnor, 2011; Pacheco, 2011; Velasquez, 2011). As Honduras exports mostly to the United States and El Salvador, standards training has been mostly linked to hygiene and healthcare. Few buyers include codes of conduct that require additional benefits for the workers as is more common in the European markets (Barrientos et al., 2003). Fintrac offers training programs for HACCP, as well as guidance regarding quality assurance and control certifications.

All firms are required to contribute to a government training organization, but the institution continues to favor industrial production activities over agricultural production, and most firms make little use of their offerings (Rueda & Valenzuela, 2011). Shortcomings with this institution may derive from its broader mandate of servicing all industries, rather than just the horticultural sector, as well as the absence of coordination measures between the training institution and the private sector.

Table 9 shows the horticulture value chain and the selected workforce development initiatives in Honduras. The stages of industry upgrading are presented below.

Table 9. Honduras: GVC Upgrading and Workforce Development Initiatives

| Stage 1: Production for Export (1990s) | Stage 2: Packing and Storage (1990s) |
|--|---|
|  |  |
| Private Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> • Agro-exporters of Asian vegetables provide technical assistance and inputs on credit to producers. | |
| Public Sector Workforce Initiatives | |
| <ul style="list-style-type: none"> • FHIA provides training and market advisory services. FHIA has worked with 5,815 producers linked to the export market to diversify crop lines and has improved production practices for numerous product lines. • Pan-American Agricultural School (Zamorano) provides science-based training to managers, technicians, and extension agents. • FUNDER provides technical training and start-up marketing assistance for small and medium producers in high altitude vegetables. | |
| Multisector Workforce Initiatives | |
| <ul style="list-style-type: none"> • Fintrac Farmer Training and Development program with FHIA and Zamorano provides technical and marketing assistance. • Asian vegetable exporter uses technicians from the local technical school to make weekly visits to outgrowers. • Fintrac funded by USAID/MCC, introduced GAPs, including drip irrigation and integrated pest management. • Fintrac employed a lead farmer approach to spread GAPs and scale-up production. | <ul style="list-style-type: none"> • Fintrac funded by USAID/MCC trains farmers in GMPs (HACCP), designs, and modifies processing plants, provides guidance in certification and quality standards established by GlobalGap. • TechnoServe funded by USDA trains hot pepper processors on sanitary conditions and quality control to meet international standard. • COHORSIL, farmer co-op provides members with access to warehouses, packaging facilities and market services and establishes links with private sector. |

Source: Duke CGGC.

VII. Analysis and Discussion of the Country Cases

As highlighted in the previous case studies, the GVC perspective provides a useful framework to understand how countries upgrade along the value chain and to identify the most relevant workforce development practices implemented therein. This section highlights key findings revealed through the comparative analysis of the preceding country cases, with a particular focus on factors driving entry and upgrading through the chain, successful workforce development initiatives, and the corresponding engagement by different institutions. These lessons provide developing countries with a solid basis for examining development strategies for their local fruit and vegetable industry.

A. Economic Upgrading

Overall, the analysis of economic upgrading trajectories indicates that the export of fruit and vegetables represents an opportunity for low-income countries to drive economic development. Kenya is an important example of a nation that has advanced in the fresh and processed horticulture value chain by understanding the market and being able to meet the private and public European standards. Chile shows sound best practices and the industry has been characterized by a clean upgrading trajectory with strong institutions that support the sector development. Honduras and Jordan need to work on institutional capacity building, creating strong associations that can lead the development of the sector.

Entry into the Value Chain

Several basic conditions must be met for a country to enter the fruit and vegetable value chain. These include climate allowing for a year-round growing season; adequate road and transport infrastructure, such as ports and airports essential for moving fragile produce to market; establishment of sanitary and phytosanitary regulatory systems to prevent diseases spreading around the world; and favorable trade policy changes that improve the competitiveness of the supplier.

Within the past two decades, conditions for entry into the fruit and vegetable GVC have changed as a result of the adoption of more rigorous standards in the industry. Entry is now much more difficult for newcomers to the industry than it was for suppliers such as Chile and Kenya that began exporting in the late 1980s and early 1990s prior to the consolidation of the value chain, when produce was principally sold by wholesalers or greengrocers. Today, the entry strategy for some developing countries, such as Honduras and Jordan, requires them to leverage regional markets where standards are generally less rigorous.⁶³ Only

⁶³ Banana production in Honduras should be viewed as an outlier because for over a century the United States has been its major trading partner. Jordan's major export partners are more regionally oriented within the Arabian Gulf countries.

countries that are able to comply with high standards are rewarded with easy access to developed countries markets. Conversely, countries that have problems in meeting the standards may lose the export market.

Upgrading through the Value Chain

The cases reveal that developing countries have experienced greater success upgrading into the packing segment of the value chain than into the processing segment. Upgrading into packing has depended on understanding the market needs, investment in capital goods, and the availability of supporting industries within the country.

- Understanding the market is a priority in this sector, especially as this is a buyer-driven value chain. Maintaining open lines of communications regarding demand preferences in products, quality, packing, etc., and fostering buyer involvement are critical in all stages of the value chain. Associations in Kenya and Chile, for example, organize trips to key export markets, in particular observing interactions at the point of purchase.
- Investment in new technologies increases the shelf life of produce. Kenya upgraded into the packing segment via initial investments by private firms in a wide variety of equipment to attain very high standards of hygiene within the packhouse operations, as well as onsite laboratories for product and staff health tests (Jaffee & Masakure, 2005).
- Upgrading into the packing segment depends significantly on the existence of a local packaging industry to supply the appropriate containers on a regular and reliable basis. Jordan's horticultural sector has been greatly inhibited in its upgrading along the value chain by the lack of good quality packing materials. Much of the produce destined for the EU is shipped to neighboring countries where it is repackaged, resulting in a significant loss of value for Jordan.

Upgrading into the processing segment of the value chain has been difficult to achieve for low-income developing countries because processing of fruit and vegetables is cost prohibitive at low levels of crop production. Therefore, countries must gain a degree of expertise during the production stage to increase output to a level that will enable the country to upgrade to the fruit and vegetable processing stage. Chile is the only country in this study that has been able to effectively upgrade into the processing segment to date as a result of joint efforts by the government and the private sector to expand and add value to fresh fruit and vegetables.

Product and process upgrading to increase the value of horticulture exports for developing countries are key elements in the industry's development. Process upgrading was essential to help all of the countries studied to meet the growing number of public and private standards in both the production

and packing segments of the chain. The health and safety protocols in packhouses, for example, have been key factors in protecting consumers from disease and meeting SPS around the world. Product and process upgrading to cultivate and handle increasingly fragile and perishable product varieties in Chile (berries), Kenya (French beans), and Honduras (Asian vegetables) offer greater financial returns than more easily manipulated fruit and vegetables.

B. New Global-Local Interactions

Given the significant level of buyer control in this value chain, producers in developing countries are directly impacted by the requirements and practices of lead firms. Two particularly important consequences for industry upgrading are discussed below.

First, lead buyer requirements and standards have led to the restructuring of the supply chain in all of the countries studied, fostering mid-size and large producers and exporters that can more easily meet new demands. Exporter firms have assumed responsibility regarding the quality and safety of their products, and thus are now more rigorous in their sourcing practices in developing countries. In particular, many decided it was easier to produce themselves and set up farms. While this has led to the exodus of many smallholder farmers from the industry, the private sector's focus on training and development and investment in capital goods allows for more rapid upgrading.

Secondly, the implementation of these standards has had an impact on the end-markets targeted by developing countries. Only countries that are able to comply with high standards are rewarded with easy access to developed countries markets. While both Chile and Kenya have been proactive in establishing standards and aligning their own GAPs with GlobalGap.⁶⁴ Rather than invest in compliance initiatives, citrus producers in Morocco preferred to switch markets from Europe to Russia that is less stringent about standards traceability. In Jordan, the maturity of standards adoption is low, and they export their products to regional markets that do not have strict standards in place. While Honduras continues to export to the United States, it has also had problems in meeting standards; such as its 1-year ban from the U.S. market following the 2008 FDA recall of Honduras cantaloupes due to salmonella contamination.

⁶⁴ In 2008, ChileGap was validated by GlobalGap and, in 2010 KenyaGap was also authorized to act independently.

C. Workforce Development

These changes have begun to alter the approach to workforce development in the industry. As the case studies reveal, remaining competitive and upgrading in this sector now requires a workforce development component in order to improve productivity, meet standards, align skills with demand needs, diversify products, and develop innovative new packing systems. These workforce initiatives have been implemented in different ways across the countries: on-the-job informal training, on-the-job formal training and assessment, off-job regular classes, off-job short courses, industry training sessions, training led by educational institutions that grant a certification, training by buyers, and training by governments, NGOs, and donor organizations.

Four important workforce themes can be identified: (1) standards training today is a basic requirement to compete in high value markets and efforts to reduce the cost of implementation is important to ensure adoption; (2) return on investment for training is fundamental for providing incentives for this expenditure and ensuring overall workforce skills can rise, particularly for temporary workers; (3) formal higher education remains important for key positions in the value chain, and the lack of this creates bottlenecks that prevent upgrading; and (4) skills training must be carried out in all job categories of the value chain to maximize growth and upgrading opportunities.

Training in standards is imperative for entry and continued upgrading in the industry. This requires a number of initiatives: First, understand global requirements; second, identify the skills needed to meet these global requirements; and finally, train the workforce in those skills. Standards training requires programs focused on food safety and health-related training, especially for employees in the packing houses to avoid transfer of disease from packers to consumers in other countries. In Chile, the government and private sector developed and implemented training programs to enable producers to meet the Chile-GAP standards prior to the evolution of more rigorous standards in the EU and the United States. Previous basic training may be necessary to ensure that standards training is successful. In Kenya and Morocco, for example, standards have led to additional training initiatives to improve adult literacy because of the need to read pesticide labels and understand barcodes.

Given the importance of training for standards and productivity, the private sector has taken on a central role in workforce development in the countries studied. However, the temporary and migrant nature of the labor force makes it challenging for private firms to internalize the returns from this investment. In the more advanced countries, additional social benefits have been incorporated into the employment arena, such as housing, day-care facilities for young children, and unemployment and health care benefits. In Kenya, the leading firms are reversing the tendency to rely on flexible labor and are shifting toward a more permanent workforce to capture the gains (Jaffee & Masakure, 2005).

Chile's National Labor Skills Certification System (see **Box 1**) offers an interesting example of how the horticultural sector can benefit from improving the skills of the temporary workforce. Since the Chilean industry depends mostly on off-farm labor, this helps to facilitate the mobility of skills across the industry, leading to increased productivity and maximizing national return on investment in training. NLSCS has certified more than 9,000 workers in a range of skills following the international standards required by the industry.

Box 1. Chile National Labor Skills Certification System

This program was created in 1998 by Fundación Chile. This system aims to provide a framework for the recognition of competencies, regardless of how these were acquired, with the goal to improve industry competitiveness. The program involves both public and private stakeholders from 15 different industries. In these 15 industries, more than 500 occupational standards have been established, and 40,000 workers have been certified. Skills standards have been transferred to vocational training institutions to refine their curricula. At the same time, the workers that have not passed the evaluation are offered training courses to fill the skills gaps and later receive the certification of skills diploma. Certification is carried out by ChileCalifica, a publically funded joint initiative of the Ministries of Economy, Education, Labor, and Social Security .

This system has identified the skill profiles required for jobs performed in the horticulture production, packing, cold storage, and processing stages of the fruit and vegetables value chain. For example, in the production stage, a diploma is granted to a person that manages the GAP program in the farm; in the packing plant, a person that has the skills to pack the fruit in a box will receive a certificate, and. in the processing stage. there is a certification of skills for the workers that can pit the fruit or operate the machine to seal cans. To date, more than 9,000 workers in these segments have been certified.

The main advantages of this system is to facilitate the portability of skills, decrease uncertainty in the hiring process, fully accredit the workers' abilities, and most importantly, create a proud sentiment among certified workers to establish a culture of lifelong learning and development. While this system is still in a nascent stage, in the medium term it will be expanded to include the entire agro sector.

Sources: Araneda, 2010; Chilealimentos, 2010b; Kis & Field, 2009; Lopez, 2009.

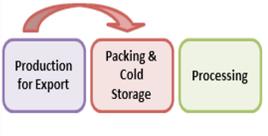
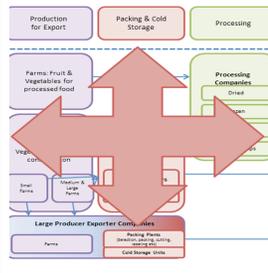
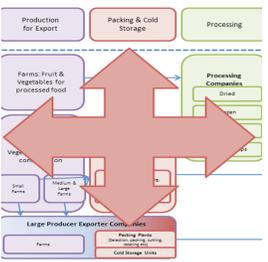
Formal education programs are essential for key positions. Formal education in agronomy is fundamental for driving the industry's productivity levels and maintaining its competitiveness in production. All of the countries studied depend significantly on this professional staff. In Kenya, full-time agronomists are important for driving innovation in new crop varieties and training smallholder suppliers in techniques required to meet global standards. In addition to agronomists, innovation in packing, processing, and cold chain technologies also require formal education in food technologies, food safety, and management. Increased collaboration between educational institutions and private sector firms is important to ensure that the education programs meet the needs of the industry. In Chile, this has been facilitated through the establishment of the public-private council.

Investments in training are required for all job categories of the value chain, from farm workers to managers. The training needs to be oriented to all job categories. This industry involves three quite distinct groups of workers: (1) farming activities and the workforce within the agriculture sector; (2) packing and

storage positions; and (3) the processing stage in which workers are classified under the industrial workforce. All three types of workers require training programs, albeit differentiated based on group and entry-level skills of the workers. While training pickers to improve their technique can translate to 20 percent increase in yields from the field, it is just as critical to train managers in how to guide and motivate workers. For example, in Kenya, sexual harassment training for predominantly male managers in packhouses has improved the work environment and increased productivity amongst the female workers.

Table 10 describes the types of successful workforce development initiatives to overcome the challenges faced by the horticulture industry at different upgrading stages in developing countries.

Table 10. Workforce Development and Upgrading in the Fruit and Vegetables Global Value Chain

| | Diagram | Workforce Development Implications | |
|---|---|---|---|
| Production (Entry in the Value Chain) |  | Unskilled workers are hired to work on the farm. Training for these workers is critical for insertion into the GVCs. | |
| | | <p>Skills Preparation</p> <p>Short training and/ or on-the-job training</p> | <p>Institutions</p> <p>Governments, private sector, buyers, training institutions, NGOs, and donor organizations</p> |
| Packing & Cold Storage (Functional Upgrading) |  | Typically women are hired to work in the packing plants. They must follow strict procedures to pack the products and prevent losses as well as protect against sanitary problems. | |
| | | <p>Skills Preparation</p> <p>Short training, certification, and/ or on-the-job training</p> | <p>Institutions</p> <p>Governments, private sector, buyers, training institutions</p> |
| Processed Fruit & Vegetables (Functional Upgrading) |  | This stage shows a movement from agriculture to manufacturing. Workers are operating machinery to process the fruit and vegetables | |
| | | <p>Skills Preparation</p> <p>Short training and/ or on-the-job training 2-year degrees</p> | <p>Institutions</p> <p>Governments, private sector, buyers, training institutions</p> |
| Product Upgrading |  | Product upgrading training can occur in all stages of the value chain. One example is the GAPs to make sure that products are following all the sanitary and phytosanitary regulations. | |
| | | <p>Skills Preparation</p> <p>Short training and/ or on-the-job training Formal training to obtain certifications</p> | <p>Institutions</p> <p>Governments, private sector, buyers, training institutions, and NGOs</p> |
| Process Upgrading |  | Companies undertake process improvement to upgrade their capabilities and boost productivity. | |
| | | <p>Skills Preparation</p> <p>Short training and/ or on-the-job training Formal training to obtain certifications</p> | <p>Institutions</p> <p>Governments, private sector, buyers training institutions</p> |

Source: Duke CGGC.

D. Institutions

Workforce development for the fruit and vegetable industry within these countries has been supported by a variety of institutions. The private sector is an active stakeholder in workforce development initiatives. This is fostered by the strong impact of training on the productivity of workers. Training is done mostly on the job and is paid for by firms rather than individual employees. In the case of Chile, the development of training programs beyond the scope of the private sector with the establishment of the NLSCS is the result of diverse set of stakeholders that have been able to achieve a high level of coordination due to strong industry associations supported by the government. While Kenya has a strong industry association, FPEAK, most workforce development still takes place on the job; in Jordan and Honduras, where the nascent industry is small, the countries have lacked a strong industry organization that can link stakeholders in a coordinated chain to adequately channel the needs of the sector. Indeed, in Jordan (and in Morocco until the mid-2000s), there are no private training institutions at all.

The government's role in workforce development generally has been most successful as facilitator or catalyst. In the capacity of facilitator and coordinator, governments have been more effective in driving industry growth and upgrading through workforce development than through direct training initiatives. In Chile, the government offers tax breaks to companies that conduct training through certified training institutions, while at the same time, it has played a key role in coordinating the industry actors by creating a public and public strategic council, involving all the value chain stakeholders to help develop the sector. In other cases, like Kenya, the role of the government has been minimal and mainly confined to its regulatory and facilitative functions. The strong performance of the industry in Kenya has been ascribed to this policy, with autonomy in production and marketing decisions fostering significant local private initiatives and dynamism within the industry.

Where the government has led training through agriculture extension services, training often has been undermined by a lack of financial and technical resources and thus has a limited effect in increasing productivity. In Morocco, the quality of government workforce training is considered to be subpar, in part because many trainers lack professional experience, and they possess low-quality training materials and inadequate information about further training and career options. In Honduras, government extension services have been undermined by a lack of political will and financial resources (Labarca, 1999; Maradiaga & Galo, 2011; Pacheco, 2011). In all the countries studied, where the industry successfully upgraded into packing and processing, private sector training replaced public sector involvement.

Foreign agencies have provided a significant portion of the training related to the adoption of standards needed to secure access to GVCs. These programs were focused on securing the place of smallholders in the value chain, due to the high costs of meeting standards. Given the dominance of large exporters in both Chile and Kenya, the government worked closely with the private sector in those

countries to develop standards and to educate the workforce in the Chile-GAP and Kenya-GAP certifications, respectively. However, programs led by foreign agencies have, in some cases, displayed limited effectiveness in providing skills required by the market. NGO-led training in Honduras, for example, is reported to use the same methodology and content regardless of the experience of the trainees. When training is provided in such a standard, undifferentiated manner, its impact is reduced, and it is likely to fail (IICA, 2006). Demand-driven training—as provided by the agricultural consulting firm, Fintrac—appeared to be much more successful in Honduras. Although the interventions are funded by USAID, the relationship between the firm and the client is managed as a professional consultancy.

VIII. Conclusion

The fruit and vegetable industry has expanded in the last two decades, creating significant employment opportunities in developing countries. While this employment was initially focused on unskilled labor, nowadays it requires a prepared labor force due to the complex demands of global buyers, the enforcement of new public and private standards, and the growing global competition among developing countries.

To compete successfully and upgrade in the fruit and vegetable GVC, various workforce development initiatives have been implemented by developing countries. Workers have been trained in health protocols and safe food preparation; they have certified skills to ensure quality; and global buyers are aligned with industry stakeholders to provide the well-trained labor force needed by the sector. The countries able to upgrade their industries show coordination and collaboration among their stakeholders in which the private sector leads the development of the sector; the public sector acts as a facilitator; and foreign donors intervene to fill the gaps.

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