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EXECUTIVE SUMMARY

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.

Acknowledgements

We would like to thank all of our co-authors, collaborating researchers, support staff, and interviewees, who gave generously of their time and expertise. We would also like to thank Stephanie Barrientos and Joonkoo Lee for comments on early drafts.

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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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:

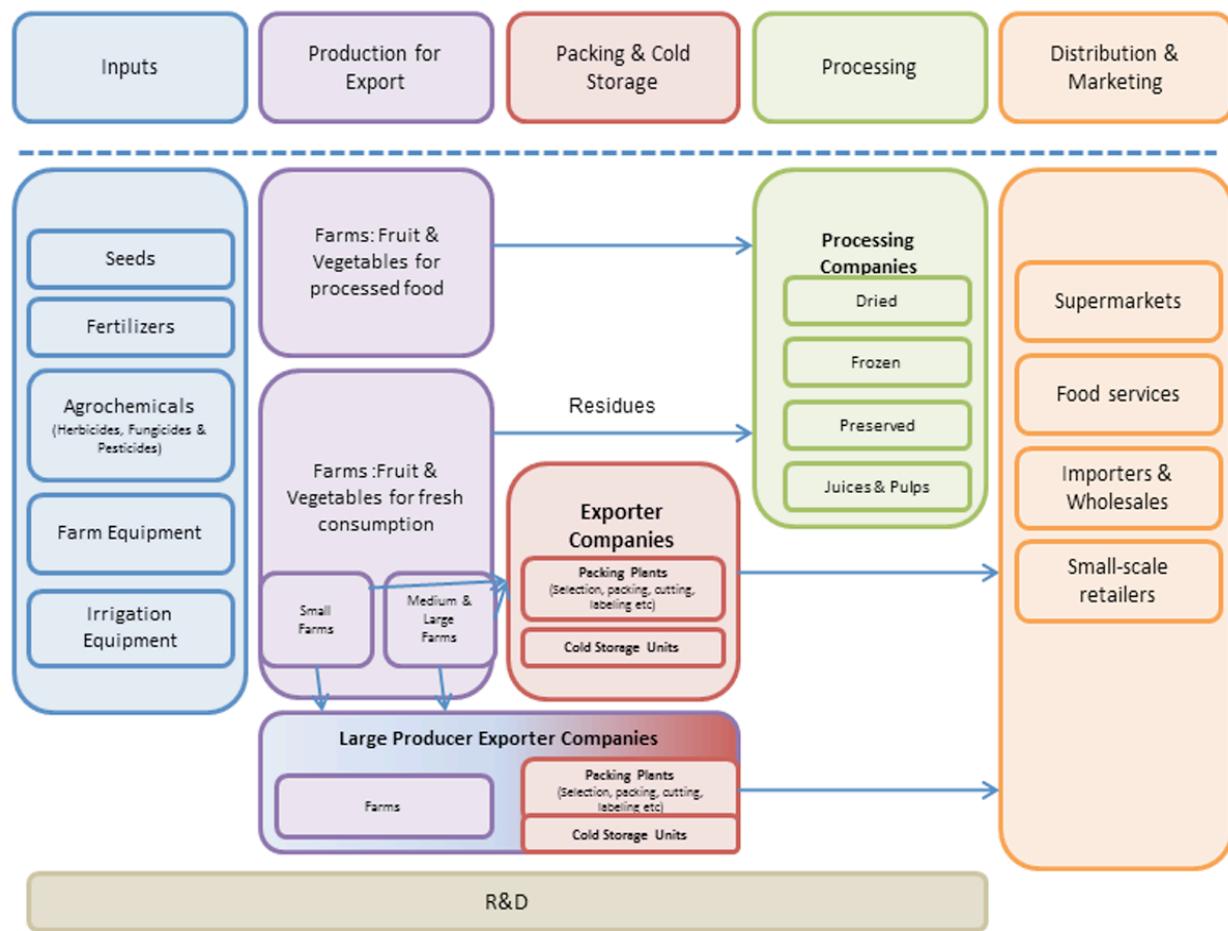
¹ Fruit and vegetables consumption has been positively correlated with income levels, with per capita consumption being the highest in high-income countries (Wu Huang, 2004).

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.

The fresh and processed fruit and vegetables value chain is presented in *Figure 1*.

Figure 1. The Fruit and Vegetables Global Value Chain



Source: Duke CGGC.

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 round 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 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

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

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 I**), 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

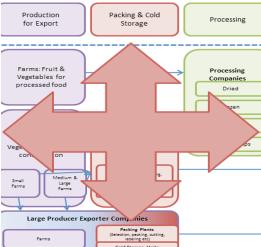
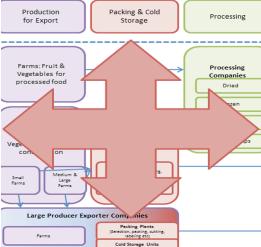
The private sector is a highly active stakeholder in workforce development initiatives. Training is done mostly on the job and is paid for by firms rather than individual employees. In the case of Chile, diverse set of stakeholders have been able to achieve a high level of coordination due to strong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

Table 1. 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.

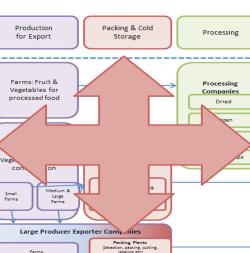
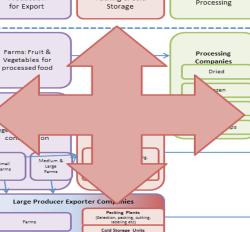
Table 2. Job Profiles in the Fruit and Vegetables Global Value Chain

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 / Bachelors 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 / Bachelor's 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

Table 3. Workforce Development and Upgrading in the Fruit and Vegetables Global Value Chain

	Diagram	Workforce Development Implications					
Production (Entry in the Value Chain)		<p>Unskilled workers are hired to work on the farm. Training for these workers is critical for insertion into the GVCs.</p> <table border="1"> <thead> <tr> <th>Skills Preparation</th> <th>Institutions</th> </tr> </thead> <tbody> <tr> <td>Short training and/ or on-the-job training</td> <td>Governments, private sector, buyers, training institutions, NGOs, and donor organizations</td> </tr> </tbody> </table>		Skills Preparation	Institutions	Short training and/ or on-the-job training	Governments, private sector, buyers, training institutions, NGOs, and donor organizations
Skills Preparation	Institutions						
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Packing & Cold Storage (Functional Upgrading)		<p>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> <table border="1"> <thead> <tr> <th>Skills Preparation</th> <th>Institutions</th> </tr> </thead> <tbody> <tr> <td>Short training, certification, and/ or on-the-job training</td> <td>Governments, private sector, buyers, training institutions</td> </tr> </tbody> </table>		Skills Preparation	Institutions	Short training, certification, and/ or on-the-job training	Governments, private sector, buyers, training institutions
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Processed Fruit & Vegetables (Functional Upgrading)		<p>This stage shows a movement from agriculture to manufacturing. Workers are operating machinery to process the fruit and vegetables</p> <table border="1"> <thead> <tr> <th>Skills Preparation</th> <th>Institutions</th> </tr> </thead> <tbody> <tr> <td>Short training and/ or on-the-job training 2-year degrees</td> <td>Governments, private sector, buyers, training institutions</td> </tr> </tbody> </table>		Skills Preparation	Institutions	Short training and/ or on-the-job training 2-year degrees	Governments, private sector, buyers, training institutions
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Product Upgrading		<p>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> <table border="1"> <thead> <tr> <th>Skills Preparation</th> <th>Institutions</th> </tr> </thead> <tbody> <tr> <td>Short training and/ or on-the-job training Formal training to obtain certifications</td> <td>Governments, private sector, buyers, training institutions, and NGOs</td> </tr> </tbody> </table>		Skills Preparation	Institutions	Short training and/ or on-the-job training Formal training to obtain certifications	Governments, private sector, buyers, training institutions, and NGOs
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Process Upgrading		<p>Companies undertake process improvement to upgrade their capabilities and boost productivity.</p> <table border="1"> <thead> <tr> <th>Skills Preparation</th> <th>Institutions</th> </tr> </thead> <tbody> <tr> <td>Short training and/ or on-the-job training Formal training to obtain certifications</td> <td>Governments, private sector, buyers, training institutions</td> </tr> </tbody> </table>		Skills Preparation	Institutions	Short training and/ or on-the-job training Formal training to obtain certifications	Governments, private sector, buyers, training institutions
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