Recommendations for capturing the post-harvest process

Output 3 deliverable - CTCN Jamaica food security

1 Data requirements

To fully understand and optimize the post-harvest process in Jamaica, a robust and multifaceted data collection strategy is essential. This involves going beyond basic metrics and delving into the nuances of each stage, from the moment a crop leaves the field to its arrival on the consumer's plate.

1.1 Harvesting and field operations

While Brix and moisture content are valuable indicators of ripeness, relying solely on these metrics can be limiting, especially for the diverse range of crops cultivated in Jamaica. Each crop possesses unique visual, textural, and even aromatic cues that signal optimal harvest time. Documenting these crop-specific indicators, perhaps through a collaborative database accessible to farmers, extension officers, and researchers, could significantly enhance post-harvest quality. Farmers could then use a smartphone app that allows them to compare images of their ripening coffee cherries with established standards for different grades, ensuring they harvest at peak flavour and market value.

Beyond maturity indicators, understanding the impact of harvesting techniques on specific crops is crucial. While mechanical harvesting might be efficient for certain crops, it could lead to bruising or damage in others, ultimately shortening shelf life and reducing profitability. Analysing these nuances can guide farmers towards adopting best practices. Additionally, tracking the adoption of technologies like selective harvesting machines, which use sensors to identify and harvest only ripe fruits, can provide valuable insights into how technology can improve labour efficiency and reduce post-harvest losses.

Labour availability and affordability are also critical factors in post-harvest management. Mapping the availability of skilled labour across different regions, particularly for specialized tasks like grafting or operating modern machinery, can help anticipate potential shortages and inform targeted training programs. Similarly, analysing labour costs across different farming systems, from smallholder farms to larger estates, can shed light on economic sustainability and identify opportunities for optimization.

1.2 Handling and transportation: Protecting value, minimizing loss

A system that implements real-time temperature monitoring throughout the cold chain, would not only provide alerts if temperatures stray outside acceptable ranges, but also generate valuable data for identifying recurring points of spoilage risk. This would allow for targeted interventions, such as improving insulation in specific trucks or providing training on proper temperature management to handlers.

Complementing this system, conducting time studies of transportation routes can uncover hidden inefficiencies. Are delays caused by poor road conditions, bureaucratic checkpoints, or inefficient loading practices? By pinpointing these

bottlenecks, targeted investments in infrastructure upgrades, streamlined regulations, or improved logistics can significantly reduce transit times, translating to fresher produce and reduced losses.

Packaging, which is often overlooked, also plays a pivotal role in preserving product quality. Evaluating the effectiveness of different materials, from traditional woven baskets to modern biodegradable polymers, can reveal optimal solutions for specific crops and transportation distances. For example, a shift towards reusable, stackable crates may help minimize bruising, optimize space utilization within trucks, and reduce reliance on single-use packaging. This not only benefits the environment but also enhances the competitiveness of Jamaican produce in increasingly sustainability-conscious markets.

Finally, analysing post-harvest losses requires a nuanced approach. Simply measuring weight loss provides an incomplete picture. Categorizing losses by type – whether it's bruising due to rough handling, decay from inadequate temperature control, or pest damage from improper storage – allows for targeted interventions. This data-driven approach will ensure that resources are directed towards the most impactful solutions, whether that's investing in training programs for handlers, upgrading storage facilities, or promoting integrated pest management practices.

1.3 Processing and value addition: Unlocking potential, expanding markets

A comprehensive map of Jamaica's food processing landscape would be a powerful tool for both public and private sector stakeholders. Having access to a digital platform that not only pinpoints the location of each facility, but also details its processing capacity, the specific crops it handles, and the technologies employed, would highlight geographic areas where processing capacity falls short of agricultural output, identifying opportunities for investment in new facilities or the expansion of existing ones. This would prevent bottlenecks that lead to spoilage and lost income, particularly for perishable goods.

Beyond infrastructure, understanding the adoption rate of modern processing technologies is crucial. Are Jamaican processors embracing automated sorting systems to improve efficiency and reduce reliance on manual labour? Are energy-efficient drying techniques being implemented to enhance product quality and reduce post-harvest losses? By tracking these trends, policymakers and industry leaders can identify opportunities to incentivize the adoption of beneficial technologies, perhaps through subsidies, training programs, or knowledge-sharing initiatives. This can lead to a more competitive and resilient agricultural sector.

Finally, a focus on value addition holds immense potential for Jamaican agriculture. Conducting consumer surveys and market analysis can be very useful in determining the demand for unique products like breadfruit flour, mango leather, or jackfruit-based meat alternatives. By investing in research and development, and by fostering collaboration between farmers, processors, and food technologists, Jamaica can move beyond exporting raw materials and tap into the lucrative market for value-added goods. This strategy not only increases profit margins for producers but also promotes food security and reduces reliance on imports.

1.4 Storage and inventory management: Preserving quality and reducing waste

Jamaica's ability to store and manage its agricultural produce efficiently is key to reducing post-harvest losses and ensuring food security. Regular assessments of existing storage facilities should go beyond simply measuring square footage. It is important to understand whether the facilities are adequately sealed to prevent pest infestations and whether they offer climate control mechanisms suited to the specific needs of different crops. Outdated infrastructure

and poor management practices can lead to significant spoilage, eroding farmers' incomes and undermining national food security.

Furthermore, equitable access to cold storage is crucial, particularly for smallholder farmers who often lack the resources to invest in individual facilities. Analysing the geographic distribution of cold storage options and their affordability can highlight areas where access is limited. Promoting shared facilities, perhaps through cooperative models or government support, can provide smallholders with a cost-effective way to preserve their harvests, reduce losses, and access more lucrative markets.

Finally, robust inventory tracking systems are no longer optional in the modern agricultural landscape. Implementing digital traceability systems that follow produce from "farm to fork" can revolutionize food safety, allowing for quick identification and containment of potential contamination events. Furthermore, by combining real-time data on stock levels, shelf life, and market demand, Jamaica can optimize its inventory management practices. This data-driven approach can minimize waste due to spoilage, will ensure a consistent supply of produce to meet market demands, and ultimately will boost the profitability of the agricultural sector.

1.5 Distribution and retail: Connecting farmers to consumers and ensuring fair returns

Understanding the intricacies of Jamaica's agricultural distribution network is essential for unlocking the full potential of its agricultural sector. Creating detailed maps of these channels would explain the journey produce takes from farm gate to final consumer. These maps should highlight key players like wholesalers, retailers, and exporters, alongside crucial information like transportation routes, storage facilities utilized, and typical transit times. By visualizing these networks, logistical bottlenecks become apparent (e.g. it should be possible to identify any regions suffering from a lack of refrigerated transport options, or any reliance on a small number of wholesalers that may create an unfair power dynamic within the supply chain).

Analysing market access goes hand-in-hand with channel mapping. By understanding the nuances of market access, policymakers can identify barriers to entry faced by small producers and craft policies that promote fairer competition and increased earning potential for farmers. For example: Do smallholder farmers have equitable access to supermarket shelves, or are they largely reliant on informal markets and roadside stalls? Are there untapped opportunities within the tourism sector to connect local farmers with hotels and restaurants seeking fresh, Jamaican produce?

Opportunities may exist in supporting the development of farmers' cooperatives to improve bargaining power, investing in infrastructure that connects rural farmers to lucrative urban markets, or launching marketing campaigns that celebrate the quality and uniqueness of Jamaican produce.

2 Recommendations for improved crop/livestock data capture in the post-harvest process

By implementing the following recommendations, Jamaica can build a robust and integrated post-harvest data ecosystem that empowers farmers, strengthens the agricultural value chain, reduces food losses, enhances food security, and promotes sustainable agricultural development.

1. Broaden data collection scope

- Move beyond weight and price data to capture crop-specific quality indicators (e.g., colour, firmness for mangoes; size, aroma for coffee beans; moisture content for yams), livestock health indicators (e.g., carcass yield, meat quality), and environmental impact metrics (e.g., water use, carbon footprint).
- Quantify and categorize losses by type (bruising, decay, pest damage) at harvesting, handling, transportation, processing, storage, and retail to pinpoint intervention points.
- Collect data on labour availability, skills, costs, and usage of inputs (fertilizers, pesticides) throughout the post-harvest process for informed decision-making.
- Capture consumer preferences, purchasing habits, and satisfaction levels through surveys and market research to align production with demand.

2. Strengthen data collection methods

- Utilize mobile apps for farmer data entry, GPS tracking for transportation monitoring, sensors for real-time temperature and humidity logging, and digital scales for accurate weight measurements.
- Develop and disseminate standardized protocols for data collection, ensuring consistency and comparability across different actors and regions.
- Invest in training programs for farmers, extension officers, and other data collectors on using new technologies and adhering to standardized protocols.

3. Foster data integration and sharing

- Establish a secure, user-friendly platform for aggregating and sharing post-harvest data collected from various sources (farmers, processors, government agencies, researchers).
- Ensure data compatibility across different systems and platforms used by stakeholders through standardized data formats and Application Programming Interfaces (APIs).
- Provide accessible data visualization dashboards and analysis tools to help stakeholders extract meaningful insights from the collected data.

4. Integrate data into existing programs

- Utilize data to provide farmers with targeted advice on best practices for harvesting, handling, storage, and minimizing post-harvest losses.
- Inform evidence-based policies and regulations related to food safety, market access, infrastructure investments, and support programs for farmers.
- Provide market actors with insights into supply and demand trends, price fluctuations, and consumer preferences to enhance market efficiency.
- Leverage data to assess farmers' creditworthiness and provide tailored financial products and insurance schemes.

5. Ensure data security and privacy

- Protect sensitive data from unauthorized access, use, or disclosure through appropriate technical and organizational safeguards.
- Obtain clear and informed consent from data subjects regarding the collection, use, and sharing of their data.

- Establish clear policies and mechanisms for data governance, ensuring transparency and accountability in data management practices.