Industry Article:

Chiquita & MIT Center for Transportation & Logistics Aim High on Defining Carbon Footprint Measurement

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Chiquita and the MIT Center for Transportation & Logistics (CTL) recognized the challenges on carbon footprint measurement and started a multi-year collaboration to determine the correct information and methodology needed from supply chains to support ongoing Corporate Responsibility and Sustainability efforts.

Another application of the correct carbon footprint measurement is product labeling. Product label allows customers and consumers to make better purchasing decisions, and in the case of environmental labels, it also helps companies to measure and reduce their products' environmental impact. Over the last few years, carbon labels measuring greenhouse gases in products have mushroomed throughout the world. However, due to the complexity of the product supply chain, self-reported labels are susceptible to "green washing," where companies claim lower carbon footprints than is really the case.

Dr. Edgar Blanco, a research director at MIT CTL., says that MIT CTL evaluates the three supply chain dimensions for carbon footprint measurement: depth, breadth and precision. "Depth is how far back or forward in the supply chain the analysis extends," says Dr. Blanco. "Breadth refers to the type of information recorded at each supply chain stage. And precision is the degree of accuracy used to estimate the carbon emissions." Through a systematic collaboration, MIT CTL and Chiquita mapped the various sources of emissions of a banana throughout its supply chain and evaluated the tradeoffs of these dimensions.

Depth

Choosing a depth of the system creates tradeoffs between cost, completeness, and complexity. As the system is expanded upstream or downstream in the supply chain, its scale can quickly expand. This expansion may greatly increase the effort and cost required to collect the measurements. Further, although the closest trading partners in the supply chain may be clearly visible, the level of visibility may diminish as the measurement system moves further up and down the supply chain. Such induced myopia may decrease the ability to gather the necessary measurements or trace the inputs any further.

Breadth

A viable carbon labeling system requires that the greenhouse gases generated by each product-related process be measured. The appropriate units of measurement have to be determined

For example, which processes to include in the measurement phase is an obvious consideration. At the broadest level, this may encompass every associated activity, including business travel and even employee commuting. A narrower definition takes in only the materials and energy directly consumed, but even this can be complicated, since capital goods and indirect emissions are difficult to monitor and assign to specific products. These issues must be weighed against the completeness of the information.

Precision

The precision dimension determines how the actual measurements should be made. This includes the level of aggregation of the data, how the measurements can be allocated to products, the appropriate use of data estimates, and how often the measurements must be made.

A Chiquita Banana's Carbon Footprint

To illustrate the complexities of

carbon footprint measurement, let's consider the banana supply chain for Chiquita. Bananas are boxed and palletized at plantations in Central and South America and shipped in refrigerated containers to multiple ports in the United States. Upon unloading from the ocean vessel, the refrigerated containers are transported to distribution centers. The pallets are then stored in temperature-controlled rooms for ripening. Once the bananas have reached the appropriate ripeness, the banana pallets are delivered to retail stores along with other produce. In the store, the boxes are broken and banana bunches placed on display for consumers to purchase.

In terms of depth, one could argue that the supply chain starts the moment the bananas are cut from the plant and ends the moment the consumer purchases the items in the store. This depth certainly captures all of the movement of the fruit from the plantation to the hands of the consumer, and will be suitable for capturing all the warehousing and transportation elements of the supply chain. However, from an emissions point of view, not including the banana plantation fields may introduce significant distortions; emissions associated with fruit harvesting could add up to 25% of the total carbon value of a banana

Once the depth of the supply chain has been decided, then the elements to capture at each of the stages are determined. Some elements are straightforward, for example, the relative fuel combustion efficiency of ocean and transportation links, energy use for warehousing operations and the type of packaging used to support the product flow. Others are more subtle. For example, at the plantation, more detailed scorecards may be needed given the variations in farming techniques, farm sizes, and the age and maintenance of farm equipment. Less obvious elements include the repositioning of refrigerated containers to the farms, an integral part of the operation that consumes energy and resources.

Besides precision issues, there are many other supply chain elements that affect the final carbon value assigned to an individual banana. Differences in the operational efficiency and degree of congestion between ports systems in California and the Mississippi can influence the outcome. Different stores require different banana ripening profiles, resulting in longer or shorter ripening cycles at the distribution centers (and thus more or less energy use per banana). Depending on the distance from the central distribution center and the time of the year, deliveries are made by refrigerated trucks (using less or more diesel to maintain the right temperature). Another factor is the variation in backhaul opportunities by lane and time of year, which can affect fuel consumption in the distribution network. The relative impact of these variables on the final label needs to be understood to make the right decisions about supply chain precision.

Table 1. Measuring the Carbon Footprint for a Chiquita Banana: Supply Chain Considerations

Element	Definition	Examples
Depth	How far back and forward in the Supply Chain?	• Plantation emissions may account for up to 25% of total carbon • Customer travel distances may be affected by choice of distribution channel
Breadth	What should you measure at each stage of the supply chain?	• Detailed farming and harvesting techniques • Empty container movements at each stage need to be considered
Precision	How should the actual measurements be made?	• Climate patterns reduce need of refrigerated shipments to stores • Store ripening preferences affect energy consumption

Key Learning

"At Chiquita our challenge was to incorporate as much depth as possible for the measurement of the overall banana carbon footprint in order to highlight the main areas of opportunity in our supply chain," said Deverl Maserang, vice-president, product supply at Chiquita Fresh North America. "The work with MIT has validated all the Green transportation initiatives that are currently underway and focus on reducing carbon emissions in transportation in North America."

Besides the actual carbon footprint measurement, there is some interesting learning through the process:

1. The objectiveness of the measuring process allows for proper and clear communication with our customers regarding our product carbon footprint

2. Enables new tools and processes to support Chiquita's current sustainability program.

3. Defines an objective baseline to measure in preparation of future government regulations.

4. Validates defined areas of opportunity where Chiquita has direct control to reduce emissions.