

No Food Left Behind

PART V Growers' Perspective on Measuring Fresh Produce Left in the Field:
A Summary Business Case

Preface

Too often the voice of the growers is not included in food loss and waste discussions. This summary business case stems from a project designed to connect directly with growing operations to hear their perspective, help them measure the amount of unsold produce—particularly what remains unharvested, and help buyers understand where growers need support.

It demonstrates to other growers and buyers the business case for measurement, and that there is a low-cost and resource-efficient way to collect data. Insights shared in this document come from interviews with project participants and represent what they learned.

INTRODUCTION

By now, most of us realize how serious of an issue food waste is for our communities and the environment. We know millions of tons of food in the US are grown, only to then be wasted in grocery stores, restaurants, and our own kitchens. Yet a lesser-known part of our food waste problem happens at the very start of the foodchain—on farms—due to a complex web of factors across the supply chain. In fact, [new research out of WWF-UK](#) shows that as much as 1.3B tons (2,600,000,000,000 lbs) of food is lost on farms during, around, and after harvest. That's sadly equivalent to almost 15% of all food produced.

For the last several years, through WWF's [No Food Left Behind](#) initiative, we have been working closely with specialty crop growers and other partners to examine how loss of certain crops is measured on farms and what's driving it. The reality is that loss is not measured consistently or transparently for fruit and vegetables, which makes it all the more challenging to understand why it's happening or how it can better be avoided. Currently, some of the key loss drivers are: market structures that separate growers from buyers; strict retail specifications; labor shortages and high cost of labor¹; unpredictability of weather events; market

¹ It has been reported by growers that the cost associated with sending labor crews back to the field to harvest edible product is too high to justify. This "high" cost of labor does not necessarily correlate with fair labor wages in the produce supply industry.



dynamics and changes in demand; and inflexible, short-term contracts which can pose challenges to growers if a buyer suddenly drops a contract.

More attention has been drawn to food loss on farms as a result of the pandemic’s supply chain disruptions, which led to loads of perfectly good food being left behind, unsold on farms. Retailers and food processors are increasingly interested in collaborating with their suppliers to reduce this upstream food loss. Yet these efforts will remain hamstrung until more growers and buyers track food loss and waste across their operations.

Supporting Grower Operations

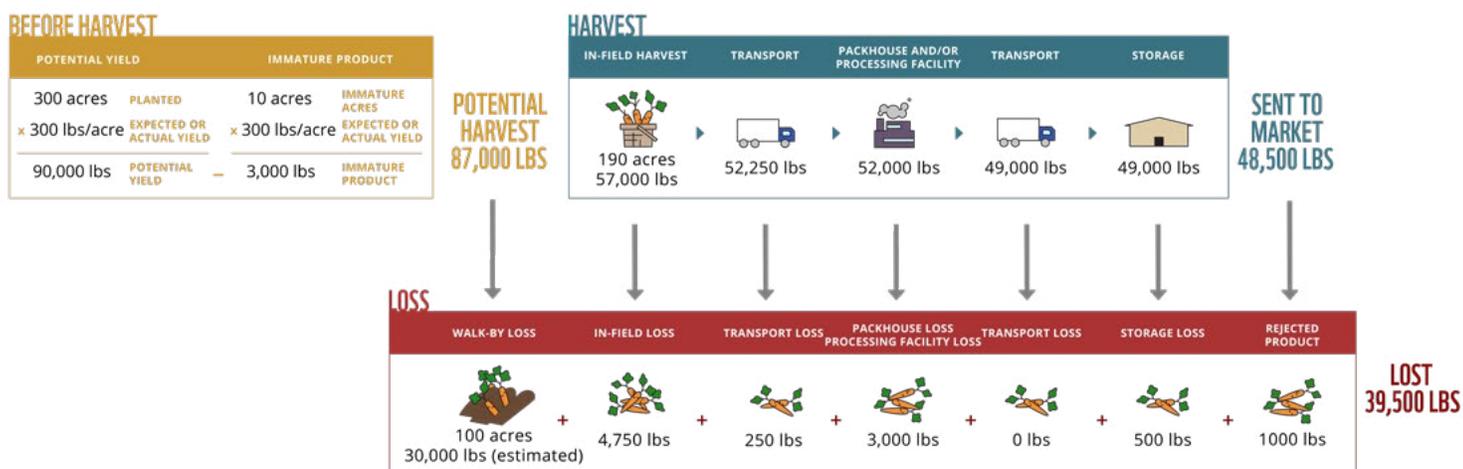
At World Wildlife Fund (WWF), we believe the first step in addressing this critical supply chain vulnerability of food loss on-farms is to support growers in being able to more regularly measure their loss. Greater field sampling of what’s left behind in-field fills a critical gap in US agricultural data, which can then be used to identify opportunities for growers and buyers to

utilize more of the nutritious food we grow—and strengthen our growers’ bottom line.

To kickstart this process, WWF partnered with a select number of growers in the 2021 growing season to assess the total food left behind in their fields and operations using the **Stewardship Index for Specialty Crops (SISC) Food Loss Metric tool**. The project was designed to work directly with growers to hear their perspectives, help them measure the amount of unsold produce (particularly what remains unharvested), and document where growers need support from buyers and policymakers.

We believe our findings below make the business case to both growers and buyers that there is a low-cost and resource-efficient way to collect on-farm food loss data. The insights shared in this document come directly from the interviews with the growers who participated in this project and represent their key takeaways.

Areas Where On-Farm Losses May Occur (A Hypothetical Example)





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ABOUT THE PROJECT

In the fall of 2020, WWF hosted the **No Food Left Behind Virtual Convening**, bringing together a diverse group of produce supply chain stakeholders from across the industry to develop actionable and approachable interventions to minimize produce loss throughout the supply chain. One of the five interventions that was developed over the course of the convening included this food loss measurement tool adoption project, using the SISC Food Loss Metric tool. The SISC Food Loss Metric tool was developed for growers to track and report the total amount of food grown to the point of maturity, but ultimately not used. In other words, these are crops that were “ready for harvest,” but did not enter the supply chain for human consumption. The current SISC tool lays out the steps for growers to measure this

loss throughout their operations, which may include fields, packinghouse or processing facilities, storage, and transport between each link on-farm.

Over the past year, WWF and the original working group from the NFLB convening—Nikki Cossio of Measure to Improve (MTI), Kai Robertson of KOR Consulting, and Dr. Lisa K. Johnson of LKJ Consulting—have partnered with seven growers to use the SISC Food Loss Metric tool. Being a participant in this project included taking part in a pre- and post-measurement interviews, as well as reviewing instructional materials to prepare for using the metric. These **materials** included a metric guide, video tutorial and FAQ, and the Food Loss Metric tool.



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Growers provided substantial insight and evidence that using the Metric tool is key not only to mitigate risk of marketable product left in-field, but also to identify and develop opportunities based on the data collected for crop that is perfectly edible but perhaps does not meet quality specs for primary buyers. Based on these growers' feedback, the Metric tool was streamlined to be more comprehensive and

usable to all specialty crop producers. Since the launch of this project, CropTrak and SISC have also partnered to make the SISC metrics available in CropTrak's software program, which is widely used by growers today in the US and around the world.

THE GROWER'S PERSPECTIVE

About the Project Participants

WWF partnered with several companies and growers to pilot test the Food Loss Metric tool and lead the way for on-farm food loss measurement in fresh produce supply chains. Participants included: **Calavo, Campbell Soup Company** and **E&H Farms, Coastline Family Farms, Dole Fresh Vegetables** (a division of Dole Food Company, Inc.), **Duda Farm Fresh Foods, Lipman Family Farms**, and **Pacific International Marketing**. The fields where measurements were undertaken are located in California, Hawai'i, and Virginia. Crops measured included: broccoli, cauliflower, celery, lettuce, tomato, and papaya. All crop were hand-harvested, except the tomatoes which were sold into the processing market.

Why Growers Participated

Pre-measurement interviews and usage of the Food Loss Metric tool began in May 2021. Project participants took time to measure what was left unharvested in the field to have better data for discussing and marketing the product left behind. One grower commented, **“when you find waste, it brings new opportunities for innovation and profit.”** Another grower mentioned that **“by having this data and documented reasons for why the product gets left behind [see Box 1], we have evidence and the confidence to have the conversation.”**

Participants shared that the project would help them evaluate and compare their current approach to estimating what is not harvested and improve how they document, track, and



communicate: how much product was left in the field; why product was left in the field; and the quality of product left in the field.

“The biggest reason [to use the Food Loss Metric tool] is to find out if we have anything marketable still out there. Unfortunately, 90% of the time we are selling our crops against a loss, so if we have an opportunity to reduce the financial losses and increase revenue even if only by one or two percent with the volumes we grow, that can make a big difference.”

Growers mentioned the potential internal and external value of the project. For example, better data can help them to improve operational efficiencies, train their workforce, and identify new market outlets. One grower mentioned being motivated to measure, **“so we can better manage the workforce—who is doing a good job versus who needs more coaching. As a grower—measuring gives me information to better assess how we compare to others.”**

BOX

1

WHY PRODUCE IS LEFT IN FIELD

There are a range of reasons why growers said produce is left unharvested in the field.

- Lack of economic incentive to cover the cost of harvesting and distribution
- Quality specifications (i.e., commercial, regulatory), which limit what is marketable
- Inconsistent coordination and transparency between growers and buyers on forecasting, planning, and marketing

No Food Left Behind Part I and Part II look into these, plus other primary drivers for loss.



What Growers Found After Measuring

Growers confirmed that in-field measurement helped them better document, track, and communicate about their operations. They learned how much, and why product was left in the field and gained insights into what was possibly marketable. This method did not increase labor or strain resources, providing more accurate and valuable information than existing estimates and/or SOPs.

“The tool gave us insight on what was left and why... Moving forward, we want to [continue to] capture that.”

“...the amount of food waste ... on each of our samples correlated to a weathering or market condition that took place. Quantifying these changes was enlightening.”

“... [this will] help with the planning process. How much we would potentially have available outside the supermarket [for secondary markets].”



What Actions Growers Are Considering

1 Have internal conversations about production and marketing opportunities (such as where to prioritize in-field training, identify new sales outlets, etc.)

*“Do we have the **right planting schedule** to avoid the pile-ups we’re seeing?”*

*“Great to be able to look back on the **history of what and why product gets left by growing region/areas**. By having that intimate understanding of the growing areas/regions, you are able to better prepare/plan.”*

*“Farm operations manager ... was very interested in the marketable produce that was left ... **focused on crew performance ... spot checking for efficiency reasons.**”*

*“Reveals that it’s not a result of how someone performed, but a **reflection of external conditions**, [such as weather or the market].”*

2 Communicate with key stakeholders externally to tell their story and explore innovative options

*“Perfectly **fine to eat but has scars on it**. It’s ugly, our consumers would reject it. But would be good for a local market or restaurants.”*

“Going to pay growers for bringing in culled [produce] and actively looking for different markets for that. Food that’s rejected by some customers... there are other customers available fine with that type of fruit (like schools).”

*“...over time, it will help us **talk to clients** and let them know what we’re working on and how we’re measuring it.”*

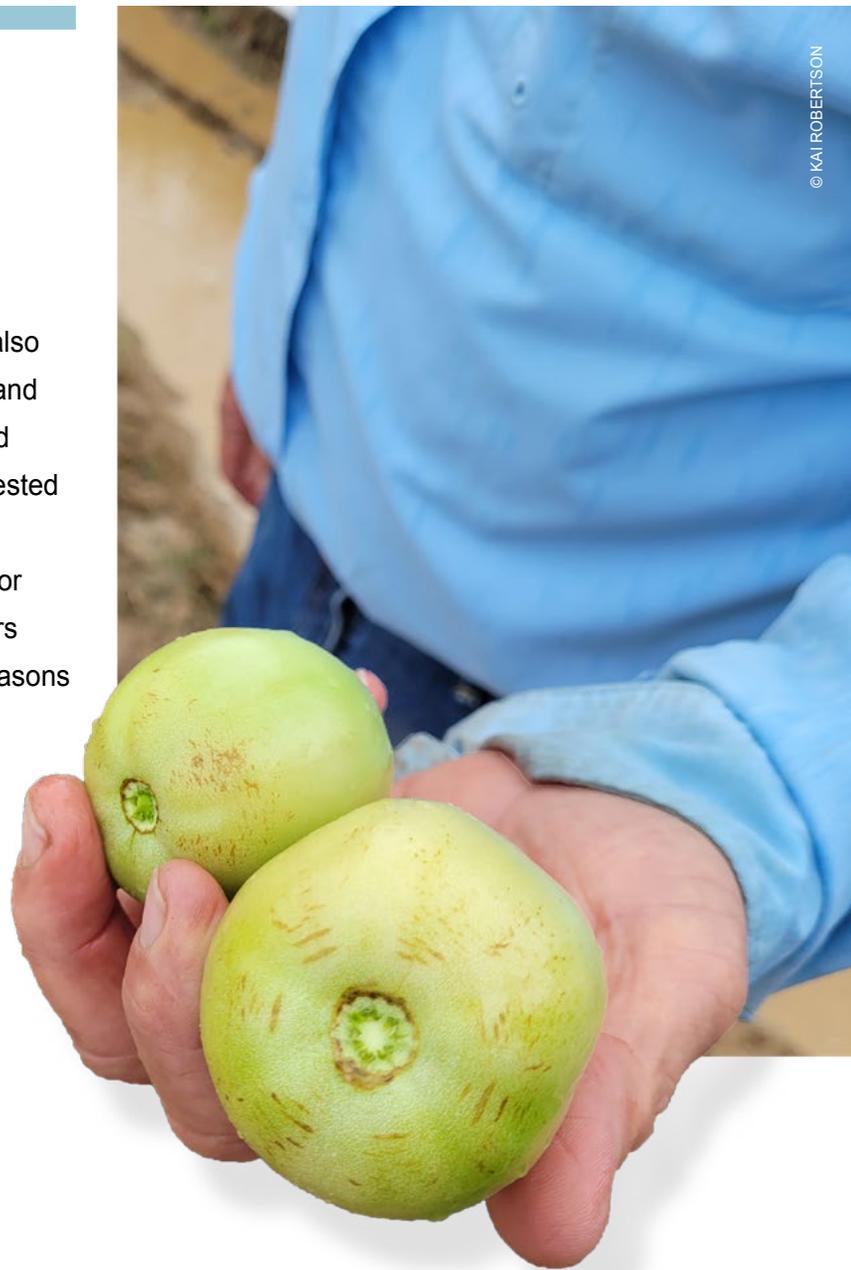
*“We plant on a continual basis, but contracts typically talked about in the springtime, when [growing operations] already have product in the ground. [Grower] is **working hard today to get more customers (buyers) to understand the planting cycle, so they don’t have food waste.**”*



Where Growers Need Support

Growers clearly saw value in measuring the amount of product left in the field, but they also need support in several areas from buyers and policymakers. The incentive to go in the field and measure samples of what's left unharvested is greater when a customer is asking for the information, or there's a financial incentive for doing so. Once the data is collected, growers value partners who can help address the reasons product is left in the field.

Opportunities for support noted by participants include improved coordination with customers during the planning, planting, and harvesting cycles, as well as finding outlets for the still edible but not traditionally marketable product available.



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“[Request to measure amount of product left in the field] needs to come through a vendor, an important customer.... Especially this time of year, growers are busy. [Company] is a main contract for us, if they feel it’s beneficial, then we want to look into it.”

“Trying to coordinate the ideal conditions in the field is NOT lined up today with buying practices.”

“The other potential use I could see is other marketing opportunities for [unripe product]. If there was a brand interested in tackling food waste through an opportunity like that.”

“... but would be amazing if ... [customers] wanted to know and purchase more of the edible. Retailers probably have no idea how to utilize all the ‘edible’ crop that there is out there, so it’s also a supply and demand issue.”

“...been leaving behind product that is good quality, but we don’t have the demand and can’t afford to harvest at a loss and sell to a buyer at a loss with the increasing inputs on top of the growing costs including cartons, pallets freight, fuel.”

“We can solve a lot of the quality issues in the field by harvesting on time when the crop is ready. ... do a really good job growing but when outside sources, like computer programs, come into buying decisions then you get sideways and have to play catch up.”

“Not [usually] focused [on unharvested product] beyond what’s marketable. That could change if there’s an economic incentive to do so. Until then, I’m not going to penalize the [harvesting] crew for leaving [product that’s edible but not marketable] in the field; it doesn’t cost me anything.”



MEASUREMENT PROCESS

Growers found that measuring how much was left unharvested in the field was not very time-intensive (see [Measurement Photo Guide](#)). Helping a grower to easily sample and measure what's left in the field sets apart the SISC Food Loss Metric tool from other options that more commonly ask growers to just estimate the amount. Although measurement tends to signal “time intensive” to users, growers who participated in the study were able to quickly see how simple measurement can be and how valuable it is to have better data.

Sampling and data collection in the field took about one hour for two people. This included 20 minutes to gather the equipment and about 15-20 minutes per row to harvest the samples.

Sorting and weighing by the three categories (marketable, edible but not marketable, and inedible), and analyzing the data took between 1 and 1½ hours.

Box 2 shows a summary of the steps for in-field measurement. More information on in-field measurement can be found in the video tutorial on SISC's website [here](#).

The Measurement Photo Guide can be found on WWF's [No Food Left Behind Website](#) to help you visualize the process for in-field measurement.

Answers to frequently asked questions about measurement by growers can be found in the [Annex](#).



1 Prepare for measurement

- » Gather equipment and review [Measurement Photo Guide](#) or video tutorial
- » Equipment list
 - measuring tape
 - flags (2)
 - harvest containers
 - harvesting tools (e.g., knife)
 - scale
 - clipboard / electronic device for notes and data



2 Harvest samples

- » Identify three rows and harvest samples



3 Sort,* weigh, and analyze measured samples

- » Sort and weigh samples by:
 - marketable
 - edible but not marketable
 - inedible
- » Extrapolate to estimate total unharvested potential



* An example of categories can be found in the [Measurement Photo Guide](#).

CONCLUSION

As one grower in this project noted, “**Data is powerful. 100%.**” This project demonstrated to **growers** the value of measuring how much fresh produce is left unharvested as a key tool not only to mitigate risk but also, as growers regularly noted: to identify and develop sales opportunities, better assess labor efficiency, and plan for future plantings.

However, growers alone cannot act on this data. Without the help of buyers and policy measures to develop new potential markets/ sales channels for growers to profitably harvest the edible produce that’s left behind, growers do not have the financial backing, time, or labor to

return to the fields. On the **buyer** side, retailers and brands can use on-farm loss data to better understand the environmental and climate impact of their supply chains, and partner with growers to develop new products and markets (such as processed foods or cosmetically imperfect product to sell through new and existing channels). **Policymakers** can use on-farm food loss data to identify and mitigate current supply chain inefficiencies—through policies and incentives that help develop new markets for edible (but not marketable) produce, and programs that prioritize getting surplus food left-behind to those in need.



Focusing on food systems can be one of the greatest cross-cutting sustainability strategies of our generation. When food is wasted on-farm, it also wastes the hard work and resources (water, energy, fertilizer) of growers. Regular measurement of the amount left unharvested and unsold can help initiate a domino effect towards more efficient, circular, and resilient

food systems. This business case demonstrates that growers see the value in measuring and reporting on loss, and it's now time for the rest of the supply chain—and policymakers—to support them in this process. Ensuring that food is harvested and eaten by humans is low hanging fruit that can be a win-win-win for food businesses, people, and the planet.





ACKNOWLEDGMENTS

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RESOURCES

The following resources were used by growing operations in this project:

- Lisa Johnson's **5 Minute Videos on Finding Opportunities in the Field**
- In depth step-by-step video tutorial walk through on **how to use the Food Loss Metric tool in the field**
- **Stewardship Index for Specialty Crops (SISC) Food Loss Metric tool calculator** (currently an Excel-based calculator)
- **Webinar recording** from September 28, 2021: includes an overview of the project and a panel of growers sharing their perspective (around minute 25)
- **Blog** by WWF-US summarizing launch of this project

Additional resources growing operations and others may find useful about measuring losses in the field include:

- Reports from **No Food Left Behind** project (WWF-US)
- **Measurement Photo Guide** (WWF-US)
- **Overcoming Resistance to the Measurement of Food Loss and Waste** (FLW Protocol)
- Produce Resource Guide for retailers downloadable at: pacificcoastcollaborative.org/retailtoolkit/ (PCFWC)
- **Contractual Terms for Reducing Food Waste: Possibilities and Potentials Within Fresh Grocery Supply Chains** (Consumer Goods Forum)
- **Economic Drivers of Food Loss at the Farm and Pre-Retail Sectors: A Look at the Produce Supply Chain in the United States** (United States Department of Agriculture)
- Dunning, R.D., Johnson, L.K., and Boys, K.A. (2019) Putting Dollars to Waste: Estimating the Value of On-farm Food Loss. *Choices*. 34(1). Accessible at: [lisakjohnson.com](https://www.lisakjohnson.com)
- Johnson, L.K., Dunning, R.D., Bloom, J.D., Gunter, C.C., Boyette, M.D., Creamer, N.G. (2018) On-farm food loss at the field level: A methodology and applied case study on a North Carolina farm. *Resources, Conservation & Recycling*. 137:243-250. Accessible at: [lisakjohnson.com](https://www.lisakjohnson.com)

ANNEX

Frequently Asked Questions

WHEN SHOULD THE SAMPLES BE COLLECTED IN THE FIELD?

Collect samples as soon after the harvest as possible. The ideal time is after the same harvest interval that has been used throughout the season. For example, if broccoli were harvested every four days, then four days after the final harvest would be perfect. Do the best you can, realizing that the timing changes how much volume will end up in the marketable, edible, and inedible categories.

SHOULD DROPPED PRODUCT BE MEASURED AS WELL?

If harvesting by hand, typically no. However, if you want information on the amount left on the ground for other reasons (e.g., shattered during harvest), or as a result of equipment deficiencies (if mechanical harvest), that could also be valuable.

WHAT CRITERIA ARE USED TO DETERMINE WHAT IS MARKETABLE, EDIBLE BUT NOT MARKETABLE, AND INEDIBLE?

Sorting by quality provides important insights. The suggestion is to sort by marketable, edible but not marketable, and inedible. Criteria to make this determination include size, shape, defects, maturity, color, insect/disease evidence, and decay.

The most subjective decision is about what's still potentially edible but not marketable. This would be product that could be eaten but falls outside of marketable range for color, size, shape, or blemishes.

It may be helpful to create more than one category for the edible but unmarketable product. As an example, for fresh tomatoes that are unmarketable, one subcategory may be right-size but too mature [red] or blemished, and a second subcategory may be right-maturity [green] but too small.

TIPS

LANGUAGE MATTERS: Embracing a variety of terms for what may be considered “trash” on the farm is important. The buyers that are working to move products with a wider range of appearance quality may use terms like seconds, unmarketable, processing grade, ugly, blemished, misshapen, culls, or waste.

FIND AN INTERNAL CHAMPION: It helps to have someone in the organization that is leading this project. This champion should be passionate about the value of data and will serve as an initial point person.

PARTNER WITH EXTERNAL EXPERTS: Researchers and others are available for answering questions about measuring in the field, trouble-shooting, and interpreting results (see Acknowledgements).

HOW DO I DETERMINE THE LENGTH OF THE SAMPLE ROWS?

The answer to this question is really up to you. Collecting samples should not become a burden. If you decide that three sample row sections of 10 feet each is sufficient, go with that.

This measurement technique was designed to collect robust, replicable, strong data that would generate as accurate an estimate as possible. Typically, three 50' lengths were sampled, categorized, weighed and recorded. However, this may be unnecessary for developing an estimate strong enough to inform decision-making for your operation.

The Food Loss Metric tool recommends a sample area of 0.1% of the field area. If the strength of the estimate is important to you, your sample may even exceed this recommendation. This is your measurement, for your operation.

To adapt this measurement to tree crops, a representative selection of trees or portions of trees will be needed.

CAN THIS APPROACH BE USED FOR ALL CROPS?

This approach was designed for measurement in vegetable crops. It can be adapted to measure losses in all specialty crops, but is not appropriate for grain and nut crops. Tree fruit can be measured by employing a sample size of 1% of the orchard area, rather than the 0.1% of field area suggested for vegetable crops.

DOES THE SIZE OF THE FARM OPERATION MATTER?

No. Tracking loss in-field can be done in fields of all sizes.

CAN HAND OR MACHINE HARVESTED CROPS BE MEASURED?

Any and all harvest methods are suitable for measurement.

CAN THIS MEASUREMENT APPROACH BE USED IN ANY GEOGRAPHY?

The sampling methods and calculations have been tested in the U.S. but are suitable for global use.

WHAT ABOUT GREENHOUSE OR CONTROLLED ENVIRONMENT AGRICULTURE OPERATIONS?

The measurement approach has been adapted for use in greenhouse or controlled environment operations, giving careful thought to the area calculations.