



Photo: Women gain employment opportunities through cassava processing;
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Reducing Global Food Waste and Spoilage

A Rockefeller Foundation Initiative

*Assessing resources needed and available
to reduce post harvest food loss in Africa*

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Written by:



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Executive Summary

Post harvest food loss in Africa represents a multi-faceted challenge that reduces the income of approximately 470 million farmers and other value chain actors by as much as 15% (The Rockefeller Foundation 2013). While relatively simple approaches exist to reduce post harvest loss (PHL), such as improved handling of perishable crops, no isolated intervention will prove effective at mitigating this issue at a scale sufficient to dramatically improve the lives of poor and vulnerable people affected by it. A systems-based challenge such as PHL requires an integrated innovation strategy that incorporates technological and financial innovations, capacity building across the value chain, enhanced market access for smallholder producers, cross-cutting value chain coordination mechanisms, and other elements to achieve impact at scale.

Understanding this need, the Global Knowledge Initiative — an international non-profit organization with the mission of building collaborative networks to solve development challenges pertinent to science, technology, and innovation — solicited input from over 120 international experts to create a visualization of the many aspects of the PHL challenge. The resultant “Integrated Challenge Map” (pages 13-14) features prioritized opportunities to reduce PHL in Africa as informed by expert input. Using a rigorous selection process, which married expert ranking with voting and case analysis, GKI identified a sub-set of these opportunities as the Top Ten Potential Big Wins for reducing PHL in Africa. The Top Ten Potential Big Wins do not represent the *only* viable solution pathways for reducing PHL in Africa, but rather those that, when brought together in unique, creative ways, GKI believes might begin to tip the scales in favor of transformative PHL mitigation.

Focusing on these 10 Potential Big Wins, GKI oriented a second phase research inquiry on the question: *What resources are available, and what resources are needed, to seize the Top Ten Potential Big Win opportunities identified?* A global assessment of all resources pertinent to these opportunities fell outside the scope of this effort. As such, GKI identified 2 to 4 case studies per Top Ten Potential Big Win that feature organizations and projects demonstrating momentum toward seizing those opportunities. By design, the 26 case studies vary in terms of scope, longevity, country, crop, and emphasis of the intervention. Together they paint a picture of the diverse type of initiatives underway to reduce PHL and boost the efficiency of agricultural value chains in Africa.

The cases studies reveal an abundance of resources — technologies, human, institutional, communication, and knowledge — that can inform the design of an integrated innovation solution for reducing PHL in Africa. By looking across the cases through the lens of resources, composite “Resource Maps” further showcase the range of resources available to and needed by the organizations and projects featured in the case studies. While these resources represent only a segment of those resources at play on PHL globally, they highlight unique opportunities to “thread the needle” between existing initiatives in this space. They also reveal the need to more rigorously pursue innovative scaling strategies for available resources to reduce PHL, as the case studies expose a dearth of resources for reducing PHL available at scale. In sum, this resource assessment validates the need to develop creative approaches aimed at amplifying the global resource base being put to use to reduce PHL in Africa. By harnessing available resources and considering strategic partnerships that leverage pre-existing ingredients for success, the Rockefeller Foundation’s Waste and Spoilage Team will be better positioned to cultivate integrated innovation solutions for PHL mitigation. Such solutions will be poised to achieve transformative impact in ways faster, more inclusive, and sustainably.

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About This Report

GKI developed this report to serve three objectives, to (1) elaborate some of the highest priority opportunities to reduce the post harvest food loss challenge in Africa, (2) investigate case studies of organizations and programs endeavoring to seize these opportunities, and (3) assess the resources — technologies, humans, policies, etc. — being put to use and still needed by the organizations and programs featured. This report is not an exhaustive catalogue of the resources needed and available across Africa to reduce post harvest loss (PHL). Rather, it provides examples of activities, actors, and resources that might inform and indeed contribute to an integrated approach to reducing PHL. Further, it proposes a template to catalogue additional resources in the future that additional actors might wish to adopt (see Appendix I).

Understanding how existing assets like those featured can be effectively mobilized to reach impact at scale in ways more efficient, faster, and inclusive serves as a major thrust of this research inquiry. To that end, readers are encouraged to consider the following questions as they review this report: What opportunities for resource sharing might prove most transformative? How might these be mobilized? What is missing from the landscape that merits new investment?

Definitions

Poor: People currently earning less than \$2 per day, equivalent, at purchasing power parity

Vulnerable: People at risk of falling into poverty in the near future¹

Food loss: The decrease in edible food mass at production, post harvest, processing, and distribution in value chains directed to human consumption²

Food waste: Food fit for human consumption being discarded at the retail or consumer level²

Food wastage: The combination of “food loss” and “food waste”²

Agricultural production loss: Spilled or damaged agricultural output during harvest, sorting, and handling²

Post harvest handling and storage loss: Losses due to spillage and degradation during handling, storage, and transportation off the farm²

Processing loss: Losses due to spillage and degradation during industrial or domestic processing, including crops sorted out or lost during process interruptions²

Distribution loss: Losses experienced while in the market system, e.g., in wholesale markets, supermarkets, retailers, and wet markets²

Durables: Cereals (excluding beer), which include: wheat, rice (milled), barley, maize, rye, oats, millet, sorghum, and other cereals

Perishables: Roots and tubers (i.e., potatoes, sweet potatoes, cassava, yams, other roots) and fruits and vegetables

¹ World Bank, “Measuring Vulnerability,” 2013

² FAO “Global food losses and food waste,” 2011

All other definitions based on The Rockefeller Foundation’s Food Waste and Spoilage initiative Search Materials

Acronyms and Abbreviations

ACDI/VOCA	Agricultural Cooperative Development International / Volunteers in Overseas Cooperative Assistance
AECF	Africa Enterprise Challenge Fund
Africa RISING	Africa Research In Sustainable Intensification for the Next Generation
ASNAPP	Agribusiness in Sustainable Natural African Plant Products
ASRuD	Associates for Sustainable Rural Development
C:AVA	Cassava: Adding Value for Africa
CEPB	Centre of Excellence for Postharvest Biotechnology
EAG	East African Growers
EDAIF	Export Development and Agricultural Investment Fund
EDIF	Export Development and Investment Fund
GAIP	Ghana Agricultural Insurance Programme
GAP	good agricultural practice
GEMS4	Growth and Employment in States Part 4
GGP	Ghana Grains Partnership
GIZ	German Society for International Cooperation
HQCF	high quality cassava flour
ICT	information and communication technology
IFAD	International Fund for Agricultural Development
IITA	International Institute of Tropical Agriculture
IPA	Innovations for Poverty Action
KAVES	Kenya Agricultural Value Chain Enterprises
M&E	monitoring and evaluation
MFIs	micro-finance institutions
NEPAD	New Partnership for Africa's Development
NGO	non-governmental organization
OAF	One Acre Fund

OICI	Opportunities Industrialization Centers International
PH	post harvest
PHL	post harvest loss
PICS	Purdue Improved Crop Storage
PTSC	Postharvest Training and Services Center
R&D	research and development
SA	South Africa
SHF	smallholder farmer
SME	small and medium enterprises
SOPMEP	Sahelian Onion Productivity and Market Expansion Program
ToT	training of trainer
UNM	University of Nottingham, Malaysia Campus
USAID	United States Agency for International Development
VC	value chain
VP Group	VegPro Group
WCF	World Cocoa Foundation
WEF	World Economic Forum
ZECCs	zero energy cool chambers



Photo: Bananas being transported by van to market;
Credit: International Institute of Tropical Agriculture via Creative Commons license

Unpacking the post harvest food loss challenge in Africa

*Identifying potential big win
opportunities*

Post harvest food loss in Africa as an integrated challenge space

Post harvest loss represents a paradoxical challenge space, as the likely solution set is at once simple and complex. The simplicity derives from the many rudimentary changes along the value chain that can vastly reduce the burden of post harvest quantity and quality losses. These include ensuring proper handling of perishables from field to market, providing shade cover for harvested crops, using locally available materials to construct improved staple crop storage, among others. However, mitigating PHL at scale proves complex because achieving impact at scale is not about implementing specific interventions but *orchestrating a concert of actions and interactions by millions of people, at numerous points in the value chain, across multiple value chains, in numerous countries*. Many of these actors may never come into contact with one another, though they all bear on the system's ability to reduce PHL. Many do not receive clear signals (i.e., monetary, market-based) as to why even a simple change is warranted; yet action on their part is critical.

So while the specific interventions to reduce PHL may not be very complex, coordinating the multiple levers of change that enable and incentivize PHL mitigation at scale has proven daunting for the global community. As such, PHL in Africa remains a persistent challenge. According to the World Resources Institute, approximately 23% of available food in Sub-Saharan Africa is lost or wasted (WRI 2013). This equates to the loss of 545 kilocalories per person, per day across a sub-continent where 24.8% of the population is undernourished according to the Food and Agriculture Organization (FAO) of the United Nations (FAO 2013). Food loss reduces the income of approximately 470 million farmers and other value chain actors by as much as 15% (The Rockefeller Foundation 2013). Many of these 470 million people are themselves food insecure, further increasing the urgency of this challenge (Ibid.). Innovative, integrated solutions that bring together many levers of change are needed to reduce the burden of PHL on the poor and vulnerable people hit hardest by this challenge.

Identifying integrative innovation solutions to reduce post harvest food loss

Against this backdrop, The Rockefeller Foundation launched its *initiative on Food Waste and Spoilage*. The initiative aims to identify integrated innovation solutions to the food loss challenge that have the potential for impact at scale. Given the potential impact on poor and vulnerable people, The Rockefeller Foundation Food Waste and Spoilage initiative will focus on opportunities to reduce food loss in developing countries, especially in Sub-Saharan Africa (The Rockefeller Foundation 2013). Additionally, the initiative will address losses in food crops such as fruits and vegetables, roots and tubers, and cereals, as they account for an alarming 86% of total losses in Sub-Saharan Africa (the rest mostly come from dairy, livestock, and aquaculture) (Ibid.). Ultimately, The Rockefeller Foundation seeks to ensure through this initiative that two million African smallholder farmers have greater income and economic opportunities, improved resilience, and increased food and nutritional security through reduced PHL in food crop value chains by 2020.

In November 2013, The Rockefeller Foundation named the Global Knowledge Initiative — an international non-profit organization with the mission of building collaborative networks to solve development challenges pertinent to science, technology, and innovation — as one of its Global Engagement Network (GEN) Innovation Labs. In this role, the Global Knowledge Initiative (GKI) employs a systems-based approach to identify clearer opportunities, more capable stakeholders, and more transformative approaches to reduce food loss in developing countries. This work involves a year-long process to (1) frame the Food Waste and Spoilage Challenge as understood by a variety of agricultural value chain actors across the world, (2) assess the resources available and needed globally to address the challenge, (3) envision possible solutions meriting further investigation, and (4) connect key stakeholders and resources involved in bringing the highest potential solutions to scale. In the end, GKI aims to provide innovative, vetted options for integrated interventions poised to significantly reduce food loss and benefit the lives of poor and vulnerable people.

Mapping the PHL challenge

Grappling with the integrated nature of the post harvest food loss challenge represents an essential element of designing innovative solution sets positioned to deliver sustainable impact at scale. Without facing this reality head-on, proposed “solutions” likely will be too narrow in scope to deliver the desired economic, nutritional, and environmental benefits. Moreover, stakeholders may miss opportunities to connect-the-dots between existing resources and efforts to reduce PHL.

For these reasons, GKI undertook a 6-country problem framing exercise in which over 120 food value chain actors, including producers, exporters, researchers, policymakers, and others, collectively mapped the many opportunities for and barriers to reducing PHL

in Africa. The countries in which GKI convened the workshops—Ghana, Kenya, Malaysia, Mexico, Nigeria, and the United States—offer contexts rich with learning and testing on post harvest food loss, and thus valuable focal points for this effort. Taken together, the outputs of the problem framing sessions create a cross-cutting depiction of the post harvest food loss challenge in Africa. These outputs are visualized in the Integrated Challenge Map (ICM) featured on pages 13-14. A primer on how to read the ICM precedes the visual. *For more information about the problem framing sessions and the steps GKI took to create the post harvest food loss ICM, see the text box.*

Challenge mapping by the numbers:

120	Expert participants
6	Countries
590	Opportunities to reduce PHL
200	PHL innovations in use
47	Potential Big Wins
29	Additional areas of convergence

Creating the Integrated Challenge Map

Challenge mapping is an iterative information design tool used to help companies and others identify opportunities for radical innovation. Challenge mapping provides a visual representation of a full challenge space and, therefore, affords users a more comprehensive appreciation of key bottlenecks that, if not addressed, may impede unlocking innovation and impact in other areas. GKI designed and facilitated six problem framing sessions (November 2013 – January 2014: Kenya, Nigeria, Ghana, USA, Mexico, Malaysia) in which key experts identified and organized creative ideas for reducing post harvest food loss in Africa. All told, the experts identified approximately 590 opportunities to reduce PHL, from which they prioritized 47 “Potential Big Wins”. The Potential Big Wins point to possible solution pathways that participants within a single session (e.g., in Ghana) highlighted as particularly promising in terms of potential impact and amenability to change.

Upon completing the six problem framing sessions, GKI reviewed the outputs and uncovered an additional 29 “Areas of Convergence.” These Areas of Convergence represent bottlenecks that received no fewer than four mentions across the six sessions, underscoring their high priority across geographies. Out of the 76 prioritized opportunities to reduce PHL (47 “Potential Big Wins” and 29 “Areas of Convergence”), GKI selected ten particularly high potential elements of an integrated innovation solutions to this challenge. These Top Ten Potential Big Wins received this distinction based on GKI’s rigorous analysis of the challenge mapping outputs, including assessment of those prioritized opportunities that hold the most possibility for unlocking broader areas of innovation in this challenge space.



Photo: In Africa, significant losses of staple crops occur during post harvest handling and storage, such as in the process of winnowing as pictured.

Credit: International Institute of Tropical Agriculture via Creative Commons license

How do I read a challenge map?

The notes below offer a quick guide to reading a challenge map. We suggest reading these maps from top to bottom along vertical “challenge branches.” A branch is a line of challenges that evolve from larger to smaller. Each challenge in a branch offers an answer to the question “What’s stopping us from tackling the challenge directly above in the challenge branch?” An answer is then placed below in the form of another challenge.

1

All challenges on a challenge map are framed not as bottlenecks nor as opportunities, but as questions. We frame each idea as a “How might we...”(HMW) question to invite ideas and actions by others.

Appropriate food processing technology is often not affordable.



HMW make appropriate food processing technologies affordable?

2

Grow map upward by asking

WHY?

(This allows us to identify rationales for action)

HMW scale the use of innovative processing/handling technologies?



HMW make appropriate food processing technologies affordable?

3

Grow map downward by asking

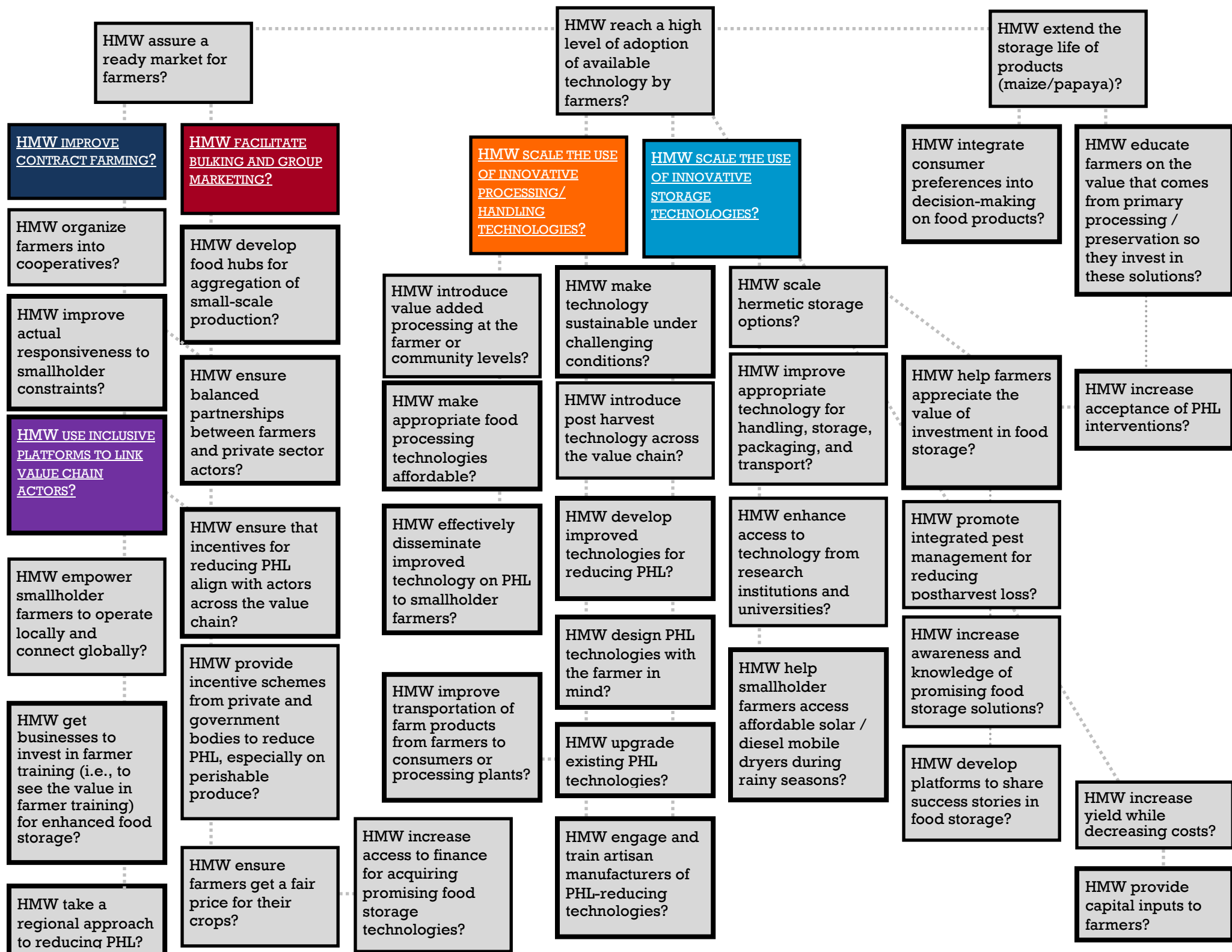
WHAT'S STOPPING US?

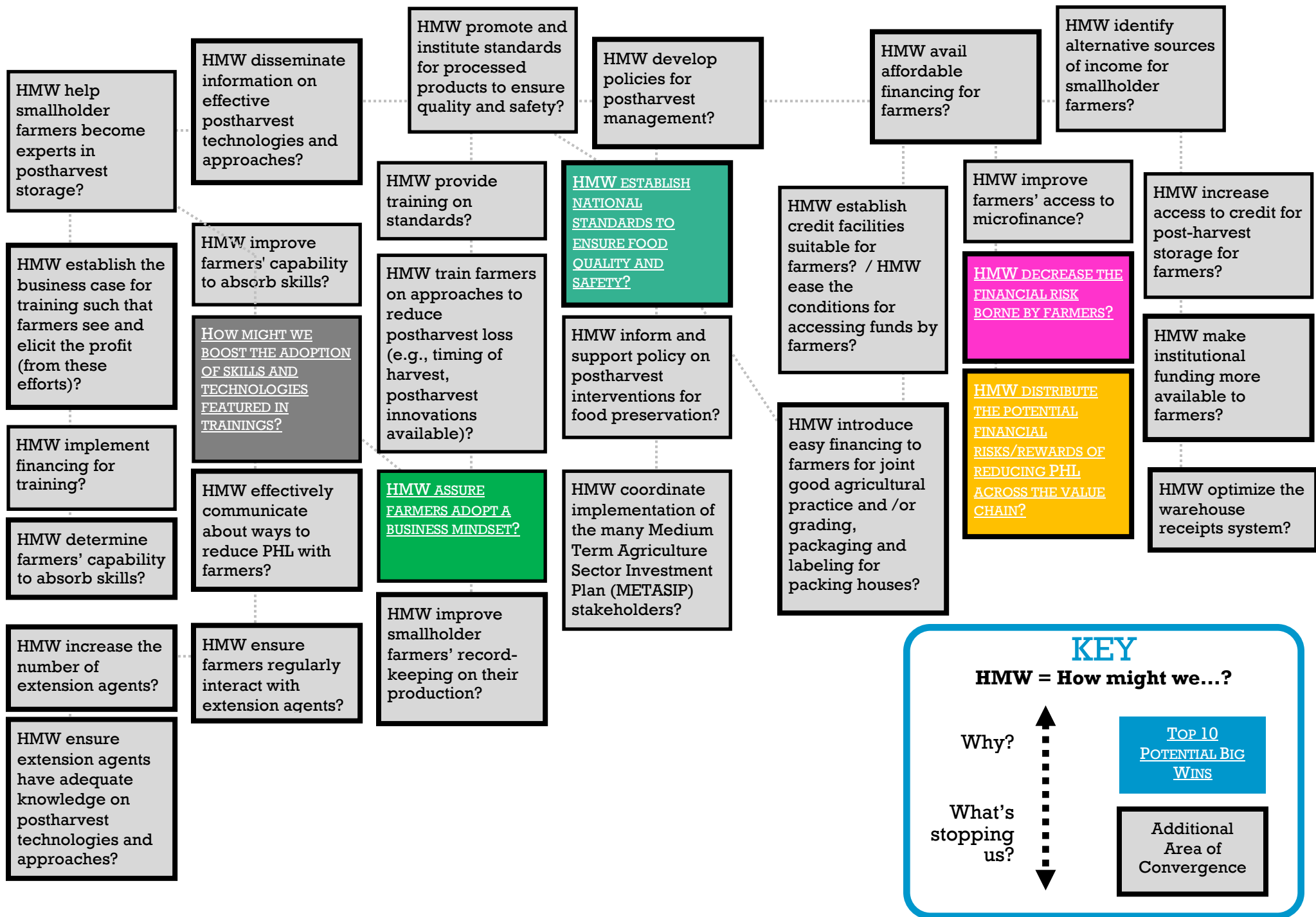
(This allows us to identify bottlenecks that, if not addressed, might impede a solution)

HMW make appropriate food processing technologies affordable?



HMW effectively disseminate improved technologies on PHL to smallholder farmers?





Top Ten Potential Big Wins for reducing PHL in Africa

Out of the 76 prioritized opportunities to reduce PHL (47 “Potential Big Wins” and 29 “Areas of Convergence”), GKI highlighted ten as particularly relevant to the aim of identifying integrated innovation solutions to this challenge. These Top Ten Potential Big Wins received this distinction based on GKI’s rigorous analysis of the challenge mapping outputs along the following criteria: likelihood of delivering substantial benefits to the poor and vulnerable people affected by PHL, if seized; potential for achieving triple-bottom-line impacts (i.e., health, wealth, environment), if seized; degree of expert buy-in; convergence with calls for action highlighted in major sector studies and policy documents; and, amenability for integration with other prioritized opportunities (i.e., diversity of emphasis on technology, skills building, finance, etc). The Top Ten Potential Big Wins and their specific rationales for selection follow.

1

How might we scale the use of innovative storage technologies?

Rationale: Poor handling and storage of perishable food crops contributes to high rates of PHL. Insufficient storage capacity allows for pest or rodent infestation, causes physical damage, and promotes rapid spoilage. However, there are a number of simple innovations, such as this example, that can drastically reduce PHL as long as farmers can access and properly use them.

2

How might we scale the use of innovative processing/ handling technologies?

Rationale: Processing serves as a key strategy for reducing PHL of perishable crops with short shelf lives, such as cassava and horticulture products. By transforming perishables into shelf-stable products, processing offers a way to diversify the market opportunities available to producers and improve people’s opportunities to consume those valuable nutrients that would have otherwise have gone to waste.

3

How might we assure farmers adopt a business mindset?

Rationale: For many smallholder farmers, limited business management and entrepreneurship skills restrict their ability to seize productivity and quality improvements that in turn help reduce food loss. These changes may be in terms of upgrading their own farm management practices, or seizing unique market opportunities, including in processing. Efforts to help farmers undertake agriculture as a business, such as the example given, offer a way to help increase both the efficiency of farming (i.e., reducing loss) and income generation opportunities available to smallholders.

4

How might we boost the adoption of skills and technologies featured in trainings?

Rationale: Many simple tools and approaches for reducing post harvest exist; however, uptake and adoption by smallholder farmers remain limited in part due to lack of awareness of these alternatives and skills to use them. Efforts to boost adoption of viable post harvest solutions, such as the example given, demonstrate how technological learning (e.g., learning as a function of use/adaptation of a technology) can be increased among smallholders.

5

How might we decrease the financial risk borne by farmers?

Rationale: For smallholder farmers with limited capital, the risk of investing in better inputs or processes to reduce PHL is very high, thus limiting the resources they have available to make needed changes. However, innovative financing mechanisms such as new models for low-interest lending can increase investment and opportunities for greater returns later.

6

How might we distribute the potential financial risks / rewards of reducing PHL across the value chain?

Rationale: Agriculture is an inherently risky undertaking, but sometimes the risks are disproportionately shared across the many value chain actors involved. Supporting risk-sharing schemes that incentivize investment by a broad sub-set of actors offers a way to increase efficiency, and thereby reduce the PHL burden, of value chains.

7

How might we use inclusive platforms to link value chain actors?

Rationale: Agricultural value chains involve many actors — farmers, input suppliers, transporters, traders, retailers, policymakers, bankers — that provide different functions and respond to different incentives as they move crops from field to market. Inclusive value chain platforms that enable streamlined communication and planning help reduce inefficiencies that can contribute to PHL.

8

How might we institute national standards to increase quality and reduce PHL?

Rationale: Promoting food quality and safety standards not only serves an important prerequisite for exporting produce grown in Africa to international destinations, but it also helps ensure that smallholder farmers and their families fully benefit from high quality, nutritious food grown locally.

9

How might we facilitate bulking and group marketing?

Rationale: For smallholder farmers, achieving the large volume of crops required by many wholesale and retail buyers presents a barrier to gaining market access. Aggregation often falls to middlemen who introduce additional layers of transactions in the value chain. Further, in instances bereft of aggregation, farmers miss out on the better pricing that can be fetched further down the value chain. Increasing bulking and group marketing can improve value chain efficiency and open market opportunities for smallholders.

10

How might we improve contract farming?

Rationale: Contract farming represents an opportunity to create more direct linkages between smallholder farmers and buyers who off-take food crops. In this way, the distance between the smallholder farmer and the market shrinks, and farmers gain more regular, often more profitable, opportunities to sell their outputs. Improved contract farming mechanisms help mitigate the risks that can come from these arrangements, such as side selling (by farmers) and unbalanced leverage (by buyers).



Photo: Mud silos provide a locally available solution for grain storage;
Credit: International Institute of Tropical Agriculture via Creative Commons license

Clarifying resources needed and available to reduce post harvest food loss in Africa

Case studies demonstrating momentum

Clarifying resources available to seize the Top Ten Potential Big Wins

The Top Ten Potential Big Wins do not represent the *only* viable solution pathways for reducing PHL in Africa, nor do they represent opportunities that apply only to reducing PHL. Rather, they indicate expert-sourced opportunities that, when brought together in unique, creative ways, might begin to tip the scales in favor of transformative PHL mitigation. For each of these opportunities there are dozens, if not hundreds, of initiatives around the world aspiring to deliver the change called for in these Top Ten Potential Big Wins. This means there likely are thousands of resources — technologies, humans, knowledge — available globally to address PHL. Understanding where those resources exist, and how they might be tapped to deliver an innovative, integrated solution to PHL in Africa constitutes a major focus of this research inquiry.

Assessing the full scope of resources available and needed to reduce PHL in Africa proves critical to the design of integrated innovation solutions for a number of reasons:

- (1) The global community is not starting from scratch. Much progress has been achieved, many lessons have been learned, and significant investments have been made. Taking these efforts forward into a transformative initiative means capturing the momentum achieved by the host of stakeholders active in this challenge space.
- (2) Resources consist of much more than finances, often touted as a major constraint to growing the impact of promising innovations and programs. While financial support constitutes a critical element to reducing PHL, it is by no means sufficient to achieve impact at scale. Scanning the many different resources—knowledge-based, technological, institutional, communication-based, etc.—that contribute to PHL mitigation enables stakeholders to get more specific about what is actually needed to deliver transformative change.
- (3) Assessing what is available across discrete initiatives may inspire creative ideas about how to bundle existing resources in novel ways, or connect ongoing initiatives to deliver multiplier effects. Insights regarding how to better “thread the needle” between existing efforts to tackle aspects of the PHL challenge merit close attention when designing integrated initiatives.
- (4) Finally, assessing resources needed to scale existing efforts to reduce PHL and boost the efficiency of agricultural value chains offers a chance for The Rockefeller Foundation and other partners to understand what new investments may be needed to amplify impact. Such an assessment helps ensure that new investments target the highest priority needs that are ripe for catalyzing significant change.

GKI uses the THICK methodology to assess the full scope of resources available — and needed — to deliver integrated innovation solutions such as those pursued in The Rockefeller Foundation Waste and Spoilage initiative. An acronym, THICK represents five types of resources crucial for promoting integrated innovation, as detailed in the image at right. Together, these THICK resources empower the design and implementation of integrated innovation initiatives. Taking stock of these resources allows stakeholders to better understand what they have

available, and what they still need, to deliver transformative change. In this way, stakeholders can move faster, and more purposefully toward desired impacts.



Case studies demonstrating momentum

An exhaustive assessment of resources available and needed to reduce PHL in Africa fell beyond the scope of this research inquiry. Instead, case studies offer the focal points around which resource stocktaking was performed. GKI identified 2 – 4 case studies per Top Ten Potential Big Win that feature organizations and programs demonstrating momentum toward seizing those opportunities. By design, the case studies vary in terms of scope, longevity, country, crop, and emphasis of the intervention. Together they paint a picture of the diverse type of initiatives underway to reduce PHL and boost the efficiency of agricultural value chains in Africa. The following table provides a list of the case studies featured in this report corresponding to the Top Ten Potential Big Win that they highlight.

Each of the case studies features a description of how the organization or project is making strides in realizing the opportunity featured in the Top Ten Potential Big Win of focus. The case study also highlights many of the highest priority resources the organization or project is putting to work and those they still require to amplify impact. In all cases, primary interviews with representatives close to the featured program or project served as the main source used in developing the case study.

CASE STUDIES FEATURED IN THE RESOURCE ASSESSMENT

1 HOW MIGHT WE SCALE THE USE OF INNOVATIVE STORAGE TECHNOLOGIES?

- Sahelian Onion Productivity and Market Expansion Program (Agribusiness in Sustainable Natural African Plant Products, Ghana/Burkina Faso)
- Purdue Improved Crop Storage bags (Pan-Africa)
- Zero Energy Cool Chambers (Tanzania)

2 HOW MIGHT WE SCALE THE USE OF INNOVATIVE PROCESSING / HANDLING TECHNOLOGIES?

- Arabic gum coating for perishables (Centre for Excellence for Post harvest Biotechnology, University of Nottingham, Malaysia)
- Cassava: Adding Value for Africa (Nigeria)
- Dryers for Africa (South Africa)
- Super Gari (OIC International, Liberia)

3 HOW MIGHT WE ASSURE FARMERS ADOPT A BUSINESS MINDSET?

- Growth and Employment in States (GEMS 4) program (Nigeria)
- Associates for Sustainable Rural Development (Ghana)

4 HOW MIGHT WE BOOST THE ADOPTION OF SKILLS AND TECHNOLOGIES FEATURED IN TRAININGS?

- Africa RISING (Research In Sustainable Intensification for the Next Generation, Tanzanian)
- Mud silos extension program (OIC International, Ghana)
- Post harvest Training and Services Center (Tanzania)

5 HOW MIGHT WE DECREASE THE FINANCIAL RISK BORNE BY FARMERS?

- Ghana Agricultural Insurance Program
- Kilimo Salama (East Africa)
- One Acre Fund (East Africa)

6 HOW MIGHT WE DISTRIBUTE THE POTENTIAL FINANCIAL RISKS / REWARDS OF REDUCING PHL ACROSS THE VALUE CHAIN?

- Export Development and Agricultural Investment Fund (Ghana)
- SlimTrader (MoBiashara, Nigeria)

7 HOW MIGHT WE USE INCLUSIVE PLATFORMS TO LINK VALUE CHAIN ACTORS?

- Cocoa Livelihoods Program (World Cocoa Foundation, West Africa)
- Grow Africa (World Economic Forum, Pan-Africa)
- Kenya Agricultural Value Chain Enterprises (US Agency for International Development / Fintrac)

8 HOW MIGHT WE INSTITUTE NATIONAL STANDARDS TO INCREASE QUALITY AND REDUCE PHL?

- Woni Veg-Fru Exporters Ltd (Kenya)
- VP Group (East Africa)

9 HOW MIGHT WE FACILITATE BULKING AND GROUP MARKETING?

- Project Nurture (TechnoServe, Kenya and Uganda)
- SNV (Kenya)

10 HOW MIGHT WE IMPROVE CONTRACT FARMING?

- East African Growers Ltd (Kenya)
- Ghana Grains Partnership



Photo Credit: undp.org

Agribusiness in Sustainable Natural African Plant Projects

Potential big win: *How might we scale the use of innovative storage technologies?*

Rationale: *Poor handling and storage of perishable food crops contributes to high rates of PHL. Insufficient storage capacity allows for pest or rodent infestation, causes physical damage, and promotes rapid spoilage. However, there are a number of simple innovations, such as this example, that can drastically reduce PHL as long as farmers can access and properly use them.*

Description:

Accessing effective storage technologies that delay spoilage and allow farmers to hold their crops for extended periods of time poses a major barrier to smallholder farmers trying to decrease post harvest loss. With a focus on increasing availability of effective storage options, ASNAPP (Agribusiness in Sustainable Natural African Plant Projects) completed a value chain assessment on onion production in Northern Ghana through the Sahelian Onion Productivity and Market Expansion Program (SOPMEP). This dry season crop provides an important source of farmer income in the off-season of January, February, and March. The ASNAPP assessment showed that properly storing onions to maintain quality, not marketing onions as one might expect, serves as the greatest challenge to farmers. While there are a number of market outlets and rather short value chains that ease marketing, farmers largely lacked access to effective onion storage facilities. ASNAPP, therefore, took on the work of developing an inexpensive, practical, and easily adopted storage technology. ASNAPP found the solution in family-based storage structures. While smallholders do have access to community level storage structures owned by farmer groups, management and trust issues prevented farmers from using them, mainly out of fear that their produce would not be safe in the hands of others. Conversely, family-based storage allows farmers to store 50-70% of their output in structures farmers can build themselves out of locally sourced materials.

ASNAPP targeted 2,500 farmers in partnership with local organizations and the Ministry of Agriculture throughout this year-long program. Using a Trainer of Trainers approach, farmers nominated lead farmers, those who farmed an acre or more (compared to other farmers working on as little as 1/8 acre) and were at least partially literate to become master trainers. These master trainers were charged with training 100 farmers each. ASNAPP developed training materials and held intensive trainings for master trainers on good agricultural practices and post harvest handling/storage techniques (e.g. planting in rows to respect plant density and increase bulb size) with the Ministry of Agriculture. These result: increasing yields by as much as 70% and an increase of bulb size by 50-100 grams.

After conducting tests to determine the specifications of the storage unit, ASNAPP held community demonstrations and trained master trainers in constructing the units out of plaster, wood, mud, and straw. A total of 12 master trainers built 34 storage structures during the project while other farmers constructed a total of 80 structures, with additional farmers planning to construct the units during the dry season. Data show that these storage units increase onion shelf life by 3-6 months and increase farmer incomes by 100% or more. For farmers who store onion for 3 months or more, revenue doubled or even tripled. At a cost of \$140-260 USD, farmers easily recuperate their investment in a short amount of time.

Based on the success of this pilot, opportunity exists to re-launch the program on a larger scale, and with additional considerations for sustainability. For example, efforts to develop the business case and distribution model for the family-level storage unit warrant further investigation. As well, there may be a market for larger storage facilities at aggregation centers.

Resources currently available:

- **Technological:** locally sourced materials for construction of storage units (of which a total of 80 were built)
- **Human:** 12 master trainers responsible for training 100 farmers each; 1,200 onion producers; consultant to conduct product testing and trainings on building the storage units; trainings on good agricultural practices
- **Institutional:** partnership with the Ministry of Agriculture
- **Communication:** coordination and outreach between master trainers and trainees
- **Knowledge:** farmer understanding of good agricultural practices, such as planting onions in rows; training materials for farmer instruction; data demonstrating the effectiveness of the program in terms of increased yields and incomes

Resources needed to achieve impact at scale:

- **Technological:** improved techniques for storing onions as well as larger versions of the storage unit for use at aggregation facilities
- **Human:** demonstrations in new communities on how to build the storage structures; additional master trainers
- **Institutional:** funding to re-launch the program with additional considerations for sustainability and reaching impact at scale
- **Communication:** regional platform for cross-sectoral dialogue about improved varieties, storage options, etc.; information technology platform for knowledge sharing; radio programs in local dialects that instruct listeners/farmers on proper handling and storage and that allow listeners to call in and ask questions
- **Knowledge:** hard data on how much this storage innovation reduces quantity and quality losses versus status quo storage options (e.g., storing onions on the floor of the home) because current data is anecdotal



Purdue Improved Crop Storage (PICS) Bags

Potential big win: *How might we scale the use of innovative storage technologies?*

Rationale: *Poor handling and storage of perishable food crops contributes to high rates of PHL. Insufficient storage capacity allows for pest or rodent infestation, causes physical damage, and promotes rapid spoilage. However, there are a number of simple innovations, such as this example, that can drastically reduce PHL as long as farmers can access and properly use them.*

Photo credit: ag.purdue.edu

Description:

Up to 50% of cowpeas are lost in Africa each year, due to pest infestations. To avoid this risk, many farmers sell their cowpeas immediately after harvest, when they receive the lowest market price. Manufactured in Sub-Saharan Africa and available in more than 17 countries, PICS bags provide a simple, yet effective, form of chemical-free hermetic storage that allows farmers to store their cowpeas at home and sell them in the off-season when they can receive double or triple the harvest price. A triple layer bag, this technology limits the permeability to oxygen and kills insects living inside, stopping their reproduction and minimizing the damage to the grain.

Working through a network of existing input distributors and vendors, efforts to scale the uptake of PICS bags focus both on strengthening distribution channels and boosting farmer demand for this technology. Trainings and demonstrations serve as an important mechanism to boost farmer awareness of the PICS bag, showcase its value to farmers and potential vendors, and transfer technical knowledge on its proper use. Government extension service and non-governmental organization workers active in target communities are engaged as trainers. To date, in West and Central Africa alone, this program has trained 1.6 million farmers in about 31,000 villages. In terms of strengthening supply chains, identification of viable manufacturers and distributors in key geographies serve as a focal point for making the technology available to farmers in rural areas. Local supply chain experts support the development of distribution networks in each country.

From 2007 to 2013, more than 3.2 million PICS bags were sold across West and Central Africa, with distribution now underway in East Africa. Farmers are able to reuse PICS bags for at least 3 years, and have begun using them for crops other than cowpeas, including maize, common beans, green grams (pulses commonly made into stew), and sorghum. Estimates put the aggregate return on investment to farmers at USD \$ 213 million over the last 5 years, not including profit generated by other supply chain actors. In addition to reducing losses due to pests, this storage technology has contributed to price stabilization of cowpeas. Where consumers used to purchase cowpeas for as little as USD \$20 per 100kg bag, market price has stabilized around USD \$40.

Resources currently available:

- **Technological:** locally manufactured PICS bags
- **Human:** extension agents conducting trainings in the use of PICS bags; community demonstrations showing the effectiveness of PICS in reducing pest infestation in stored grains; PICS manufacturers (6 in West Africa, 5 in East Africa) have a new line of products; paid local consultants who are experts in the rural supply chain, local culture, etc.; local vendors who have added PICS bags to the list of goods they sell; smallholder farmers who use PICS bags
- **Institutional:** Over \$13.8 million from the Bill and Melinda Gates Foundation invested in disseminating PICS bags in West and Central Africa, and in exploring the use of PICS bags to store other crops; project management support and research provided by Purdue University and other partners
- **Knowledge:** manufacturer understanding of how to produce PICS bags; farmer understanding of how the triple-layer hermetic storage works and the value it delivers
- **Communication:** Effective extension approaches in scaling up PICS bags including ICT tools

Resources needed to achieve impact at scale:

- **Technological:** Increase manufacturing capacity of PICS bags in other regions and; R&D to improve performance and reduce cost
- **Human:** partners to improve efficiency in the supply chain (e.g., logistics in the distribution); more employees to manage the vast and increasing demand for PICS bags; improved management capacity of vendors to deliver bags on-time and coordinate re-stocks
- **Institutional:** government policy supportive of hermetic storage as an alternative to pesticides; government policy requiring extension agents to be trained in the use of PICS bags (this is the case in Togo); funding for scale up to countries not covered in existing funding streams (i.e., Mozambique, Zambia, Rwanda, and others); increase capacity of local partners to address questions/issues during dissemination of PICS bags for other crops
- **Communication:** expanded effective media approaches including ICT tools to build awareness
- **Knowledge:** expanded capacity in the use of the PICS bag in countries not covered in existing streams



Photo Credit: Lizanne Wheeler
(Arusha Tanzania 2013)

Zero Energy Cool Chambers (ZECCs)

***Potential big win:** How might we scale the use of innovative storage technologies?*

***Rationale:** Poor handling and storage of perishable food crops contributes to high rates of PHL. Insufficient storage capacity allows for pest or rodent infestation, causes physical damage, and promotes rapid spoilage. However, there are a number of simple innovations, such as this example, that can drastically reduce PHL as long as farmers can access and properly use them.*

Description:

Evaporative coolers can extend the shelf life of many horticulture crops by as much as 50-200%, helping producers avoid spoilage by keeping crops at 10 to 15°C below room temperature without using electricity. Even just a few days of additional shelf life for perishables can mean a lot in terms of the price farmers capture for their crops. An example of a low-cost evaporative cooling option, ZECCs can store multiple crops at one time, and help farmers maintain water weight in their crops, reducing wilting and quality diminishment that hastens crops' decay and reduces marketability. ZECC units can be fairly easily constructed with local materials: bricks, sand, water, and branches/leaves. An outer brick wall, soaked in water, houses an inner brick wall with wet sand between the two walls, and the top covered with branches/leaves. ZECCs can be constructed in a variety of sizes (100 kg to 1 metric ton), serving the needs of individual farmers, farmer associations, packinghouses, and others.

To date, ZECCs have demonstrated success in reducing post harvest loss in horticulture crops in India, namely. Only recently introduced in Africa, ZECCs have yet to experience significant uptake among smallholder farmers and farmer organizations across the continent. Efforts to sensitize farmers and farmer organizations to the ZECC option (such as by Postharvest Training and Services Centers-based master trainers, highlighted on page 32) have proven successful at generating interest and even excitement among potential beneficiaries. Still lacking, however, are widespread efforts to introduce this option across many geographies. Of note, ZECCs do not work well in coastal regions that experience high humidity, as it interferes with the evaporative cooling principle on which it is based.

In addition to providing a means of extending the shelf life of perishable crops (such as tomatoes, leafy vegetables, root and tuber crops, fruits, herbs), the act of constructing ZECCs in communities presents a potential near-farm employment opportunity, such as by master builders trained to design and install the units. The cost associated with transporting the materials needed to construct the units may prove a barrier to wide adoption. Service models that incorporate such considerations could be developed to overcome this potential barrier.

Resources currently available:

- **Technological:** locally accessible materials for building ZECCs, such as bricks and sand
- **Human:** master trainers to teach farmers and farmer organizations how to build ZECCs and demonstrate the difference ZECCs can have on their crops; farmer organizations willing to participate in trainings and test for themselves the effects of ZECCs; individual farmers who will install ZECCs on their farms; project support international and local NGOs
- **Institutional:** financial support for training from international donor agencies,
- **Knowledge:** understanding on the part of trainers and farmers of how to build and operate ZECCs; costs/benefits of ZECCs; materials demonstrating which crops can be stored together in the ZECC; good handling practices for horticulture crops

Resources needed to achieve impact at scale:

- **Technological:** materials for constructing ZECCs including use of alternative porous local options; affordable transportation for the materials to make ZECCs (even if a village has a designated local manufacturer, the materials have to get to him/her)
- **Human:** local organizations that can serve as partners in scaling up the number of trainings; increased numbers of master ZECC builders
- **Institutional:** additional funding to continue/increase trainings on ZECCs; market linkages to ensure off-take of crops stored in ZECCs
- **Communication:** media outreach to inform farmers of the impact ZECCs can have on their crops, their incomes, and generally on their livelihoods
- **Knowledge:** increased community understanding of how to build ZECCs and of crops that can be stored together in the ZECC



Photo Credit: rtb.cgiar.org

Cassava Adding Value for Africa (C:AVA)

Potential big win: How might we scale the use of innovative processing/handling technologies?

Rationale: Processing serves as a key strategy for reducing PHL of perishable crops with short shelf lives, such as cassava and horticulture products. By transforming perishables into shelf-stable products, processing offers a way to diversify the market opportunities available to producers and improve people's opportunities to consume those valuable nutrients that would have otherwise have gone to waste.

Description:

Cassava is one of Africa's primary staple crops; indeed, the continent supplies over 60% of the world cassava market. However, due to bulkiness, high water content (65-70%), and a 48-hour shelf life, this staple suffers 40-50% post harvest loss. With flash drying technology and pre-processing of raw tubers into wet cake before further processing into High Quality Cassava Flour (HQCF), the C:AVA project is working to increasing cassava yield and processing efficiency in Ghana, Tanzania, Uganda, Nigeria, and Malawi. This effort will contribute to improved nutritional security, increased incomes for over 90,000 smallholder cassava farmers, and diversified livelihood options through employment in the processing industry.

Led by the National Resources Institute of the University of Greenwich (UK) and engaging a host of partners in each country, the C:AVA project focuses on improvements in the HQCF value chain. C:AVA aims to achieve three goals: ensure a consistent supply of raw cassava; develop viable processors and other intermediaries; and promote market development for HQCF. For example, since 2010, the program in Nigeria has tremendously improved the efficiency and reduced the energy cost of flash dryers in use. The drying efficiency increased two-fold while about 60-70% reduction in energy cost was achieved. C:AVA Nigeria works with small and medium sized enterprises (SMEs), flash dryer fabricators, and other partners to achieve these gains.

Through trainings, C:AVA teaches farmers about different cassava varieties, how to clear the land and take care of the topsoil, and how to best plant cassava, all of which reduces losses and increases yields. After harvest, the project introduces graters and presses for on-farm pre-processing of raw cassava roots into wet cakes, which have a longer shelf life than raw roots and can be more easily transported via traders to SMEs for drying and packing. C:AVA invites processors to a processing outfit for HQCF demonstrations and to discuss the possible market outlets for this processed good as well as delivering quality Management training. The C:AVA industrial users' forum serves as an innovation platform to link value chain actors and showcase these opportunities in the cassava industry.

While the technical contributions of C:AVA are many, one of the greatest contributions may be the advocacy for HQCF on behalf of value chain actors. C:AVA projects in Nigeria and Tanzania, for example, gained recognition for boosting awareness and acceptance of HQCF. To reach scale, however, additional efforts are needed to expand the availability of quality planting material and develop new markets for HQCF, especially through fortification.

Resources currently available:

- **Technology:** graters and presses for on-farm production of cassava wet cakes; flash dryers to dry cassava before it is processed into HQCF; processing equipment and tools
- **Human:** thousands of participating farmers and farmer groups; 25 SME participants (in Nigeria); flash dryer fabricators; training programs on good agricultural practices; demonstrations for processors
- **Institutional:** grant from the Bill and Melinda Gates Foundation to NRI, head of the C:AVA project; policies requiring the use of HQCF in bread products
- **Communication:** C:AVA industrial forum (innovation platform) to link value chain actors

Resources needed to achieve impact at scale:

- **Technology:** value addition technologies (such as for fortification micronutrient mix); expanded access to quality planting material; more efficient processing equipment such as flash dryers
- **Human:** increased smallholder delivery of raw cassava tubers (targeting 40,000 farmers)
- **Institutional:** more funding and investment (45-55% of farmer incomes goes to production costs; investment in the pre-processing of cassava wet cake before transportation to processing plants)
- **Communication:** improved marketing strategy; more robust engagement in policy to bring in new actors
- **Knowledge:** understanding of how to produce fortified HQCF if/when value addition is incorporated into project; consumer awareness of and increased demand for HQCF



Photo Credit: dryersforafrica.co.za

Dryers for Africa

Potential big win: How might we scale the use of innovative processing / handling technologies?

Rationale: Processing serves as a key strategy for reducing PHL of perishable crops with short shelf lives, such as cassava and horticulture products. By transforming perishables into shelf-stable products, processing offers a way to diversify the market opportunities available to producers and improve people's opportunities to consume those valuable nutrients that would have otherwise gone to waste.

Description:

A leading cause of post harvest loss in horticulture and grains, high water content in crops can lead to spoilage, mold, pest/rodent infestation, and a decrease in nutrient content. One of the best ways to address this problem is through drying crops after harvest. That said, most smallholder farmers resort to open air solar drying, which typically is less efficient and unhygienic because crops are left exposed to many elements. Open air drying can even prove hazardous because improper drying can lead to aflatoxin contamination in crops such as maize, sorghum, and groundnuts.

South Africa-based Dryers for Africa combats these issues through the sale and distribution of both solar dryers and forced air dryers that extend shelf life for year-round crop sale and consumption, reduce the risk of loss, decrease the cost of storage and transportation because products are shelf-stable, and add price-enhancing value to the end product. To date, Dryers for Africa has supplied agri-dryers to Angola, Côte d'Ivoire, Ghana, Kenya, Lesotho, Mozambique, Namibia, Nigeria, Rwanda, Senegal, South Africa, Swaziland, and Tanzania. Each dryer is custom made; Dryers for Africa does not keep stock on hand. The forced air dryers are larger and more efficient than their solar dryer counterparts, but they are also more expensive and require a consistent electricity supply. Solar dryers require no electricity and can be purchased at a fraction of the cost, at \$600 USD, making them suitable for use by cost-sharing smallholder farmer groups. These solar dryers require only a secure, sheltered location and access to clean water. Furthermore, no specific skills are required for operating the solar dryers because they are manually loaded and rely on human sensor grading (i.e., the operator observes the product to determine if it is dry). The solar dryers have a control panel to make adjustments based on environment and product, so operator literacy is advantageous.

To reach impact at scale, Dryers for Africa must contend with a range of marketing and distribution challenges, including the fact that smallholder farmer groups often lack access to the capital required to invest in the solar dryers and other post harvest processing technologies. Reaching scale may be hastened by creating novel solar dryer service models in which farmer groups procure drying services from dedicated providers, thus lowering barriers to entry for individual smallholders. Dryers for Africa is currently exploring entrance into new country markets, which would require expansion of both their fabrication facility and staff capacity.

Resources currently available:

- **Technology:** solar dryers and forced air dryers; production facility
- **Human:** local staff to build dryers on site after an order from a client
- **Institutional:** partnership with the Department of Science and Technology Sasol ChemCity, and the Nkowankowa Demonstration Center; partnership with the West Africa Agricultural Productivity Program (5-year program initiated by the Economic Community Of West African States and funded by the World Bank); longstanding relationship with the Agricultural Research Council's Institute for Tropical and Subtropical Crops.
- **Communication:** email correspondence and communication with clients via website enquiry form to maintain data on organization name, location, and type/quantity of product to be dried

Resources needed to achieve impact at scale:

- **Technology:** a larger facility for building dryers; enhanced transportation options to increase access to remote areas (i.e., better shipping logistics)
- **Human:** additional staff and staff trainings to cover new geographies; country assessments (both in terms of research and field studies); partnerships with government officials to identify regions for project startup
- **Institutional:** training institute; government support and engagement (financially and otherwise); financing for smallholder farmers to increase the affordability and accessibility of dryers
- **Communication:** development of a long-lasting relationship with service providers, such as clearing agents and freight forwarders for shipment deliveries (e.g., Melbe Trading and Aramex)
- **Knowledge:** farmers understanding of the proper use of solar dryers; accurate forecasting for shipment requirements that would allow for lower rates



Gum Arabic Coating (CEPB)

Potential big win: How might we scale the use of innovative processing/handling technologies?

Rationale: Processing serves as a key strategy for reducing post harvest loss of perishable crops with short shelf lives, such as cassava and horticulture products. By transforming perishables into shelf-stable products, processing offers a way to diversify the market opportunities available to producers and extend consumers' opportunities to consume those valuable nutrients that would have otherwise gone to waste.

Photo Credit: nottingham.edu.my

Description:

The moment farmers harvest their horticulture crops, they risk high levels of spoilage, often in the first 48 hours after harvest. Smallholder farmers need basic, inexpensive innovations to preserve their yields until they can be sold up the value chain. With this issue in mind, the Centre of Excellence for Post-harvest Biotechnology (CEPB) at the University of Nottingham Malaysia conducts cutting-edge research related to post harvest physiology, handling, and technology for storing and processing fresh fruits and vegetables. The Centre aims to develop methods for prolonging the shelf life of fresh produce in economically viable, safe, and environmentally friendly ways.

Fruits and vegetables have to maintain their life after harvest with their own respiration. Modified atmosphere techniques limit the oxygen levels in fruit, slowing down respiration. However, this process is expensive. Edible coatings mimic the modified atmosphere, achieving the same outcome, but at a fraction of the cost. For example, a novel coating technology that uses Gum Arabic costs a few cents per kilogram, and can be used on all horticulture crops. Unlike the synthetic waxes used on fruits and vegetables in the 1990s, Gum Arabic is environmentally sustainable and has been used in consumer goods for decades (e.g., in Coke and ice cream). It preserves antioxidants and delays ripening with a semi-permeable membrane. Lab test results suggest that by using a 10% Gum Arabic edible coating, tomato ripening can be delayed and antioxidant levels preserved for up to 20 days during storage at 20°C without any negative effects on post harvest quality. Because Gum Arabic is sourced in Africa, launching this product for use by smallholder farmers across the continent would also serve to increase employment opportunities for those working at Gum Arabic production plants, especially since this product is not currently on the market.

Introducing this post harvest technology would require development of distribution channels and awareness raising campaigns among smallholder farmers and other value chain actors such as buyers. That said, proponents at CEPB are optimistic that building capacity for use of the simple technique would prove easy to facilitate. A simple training would demonstrate proper Gum Arabic use on a few commodities, after which farmers would be instructed on how to prepare the coatings themselves. A major focus of the trainings would be on making certain farmers understand the different concentrations of coating required for different crops and application techniques. Ensuring that potential users can access this novel post harvest solution will be hastened through partnerships with private sector companies keen to commercialize Gum Arabic coatings. It would also enable increased production efficiency and product consistency. While the product currently is not available to consumers, CEPB researchers are confident in both the commercial viability and post harvest loss reducing potential of Gum Arabic coating for horticulture crops.

Resources currently available:

- **Technology:** Gum Arabic mixture; tools to test horticulture respiration levels, antioxidant levels, and spoilage levels
- **Human:** professors, PhD students, and post-doctoral fellows conducting research on this technology and its impacts on nutritional content, shelf life, and post harvest loss
- **Institutional:** labs and technical research support from the University of Nottingham Malaysia's CEPB
- **Communication:** news articles and outreach on the research projects within CEPB
- **Knowledge:** scientific journal articles authored by CEPB researchers presenting the current data on the use of Gum Arabic coating for tomatoes

Resources needed to achieve impact at scale:

- **Technology:** processing equipment and facilities to produce Gum Arabic coating in bulk for sale to smallholder farmers
- **Human:** pilot project conducted in two different locations (e.g., one in Africa and one in Asia) on two different commodities to determine each commodity's specific respiration rate and therefore the appropriate concentration of coating; post-doctoral students and other staff members to run the pilot project; partnerships with Gum Arabic producers and farmer organizations to produce and test the product
- **Institutional:** funding to launch the pilot project and run monitoring and evaluation
- **Communication:** discussions with Gum Arabic producers to demonstrate the predicted economic gains of producing this coating



Photo credit: wishh.org

OIC International Super Gari

Potential big win: *How might we scale the use of innovative processing / handling technologies?*

Rationale: *Processing serves as a key strategy for reducing PHL of perishable crops with short shelf lives, such as cassava and horticulture products. By transforming perishables into shelf-stable products, processing offers a way to diversify the market opportunities available to producers and improve people's opportunities to consume those valuable nutrients that would have otherwise have gone to waste.*

Description:

An important staple crop across Sub-Saharan African, cassava is a perishable crop that must be processed within 48 hours to avoid spoilage. Cassava can be processed into a number of forms, such as flour and gari, and is easily fortified to provide additional nutritional value that is especially needed among poor and vulnerable populations who are at high risk of becoming chronically malnourished, or stunted. Super Gari—which consists of cassava processed into gari and combined with a micronutrient mix—represents a processing innovation that holds potential as a new market opportunity for cassava while offering the additional benefit of boosting people's access to fortified products. It is being promoted through a 5-year Opportunities Industrialization Centers International (OICI) project, which began in 2010 in Liberia with the aim of reducing chronic malnutrition, targeting children under age two and pregnant/lactating mothers.

The OICI Super Gari project focuses on value chain improvements needed to introduce, test, and eventually market Super Gari. Beginning with farm-level interventions, the project provides clean planting material and other inputs, as well as agricultural training to farmers, who are organized into farmer groups that sell their cassava tubers to processing facilities (owned by the Liberia OIC affiliate). OICI largely engages with processors already involved in value addition activities, with a heavy emphasis on employing women in their processing facilities. These processors receive support in terms of new equipment and additional training focused on enhancing quality of the operations.

The project serves to provide farmers a ready market for the crops as well as a means to reduce post harvest loss of cassava, which can be as much as 40%. Cassava processing extends the shelf life from 48 hours for raw cassava tubers to 6 months for the fortified gari. Beginning in 2014, the project introduced farm-level technology to enable farmers to transform their raw tubers into wet cakes, which will further reduce the losses experienced. OICI is currently in the pre-commercialization stage of the project, during which they are exploring different supply chains and distribution channels for Super Gari. Commercialization of the product is expected within the next 12-18 months. Evidence of leakage into local markets provides positive signals of latent market demand for such fortified goods.

Resources currently available:

- **Technological:** machines/tools to peel, shred, compress, dry, sift, and mix in micronutrients to turn cassava tubers into Super Gari; micronutrient packet that is mixed into cassava
- **Human:** farmers that provide raw cassava to processing facilities; on-farm trainings aimed at boosting quantity and quality of crops; processors that operate equipment and manage facilities; trainings aimed at boosting processing quality and efficiency
- **Institutional:** processing plant operated by OIC Liberia; partnerships with institutional buyers such as the school lunch programs; project management, market research, and other support by OICI

Resources needed to achieve impact at scale:

- **Technological:** additional machines to outfit processing facilities, onsite packaging equipment, food quality test kits
- **Human:** staff exchange opportunities to learn from other institutions processing fortified goods; expanded base of farmers and skilled processors that can propel decentralized processing model to which OICI aspires
- **Institutional:** additional processing plants; lab-based research to test outcomes of this fortification process in other foods; partnerships with institutions like the International Institute of Tropical Agriculture to source soya locally (for micronutrient mix); quality assurance measures and certification to meet national and regional standards
- **Knowledge:** market analysis to determine how best to introduce Super Gari into retail markets; costed options for supply chain and distribution channels that can be integrated into commercialization plans



Photo Source: asrud.org

ASRuD SME development

Potential big win: How might we assure farmers adopt a business mindset?

Rationale: For many smallholder farmers, limited business management and entrepreneurship skills restrict their ability to seize productivity and quality improvements that in turn help reduce food loss. These changes may be in terms of upgrading their own farm management practices, or seizing unique market opportunities, including in processing. Efforts to help farmers undertake agriculture as a business, such as the example given, offer a way to help increase both the efficiency of farming (i.e., reducing loss) and income generation opportunities available to smallholders.

Description:

For smallholder farmers, poor access to credit and other financial resources stands as a barrier to making investments in their farming practices. While some financial innovations for agriculture are focused on availing affordable finance at the individual level, Associates for Sustainable Rural Development (ASRuD) recognized the need for small and medium enterprise (SME) development because this area of the Ghanaian economy is neither pronounced nor professionalized.

For instance, according to ASRuD, many SMEs do not maintain sales records, so no separation exists between household and business economies. To address this and other business challenge issues, ASRuD designed trainings on entrepreneurship development, credit management, banking culture, group dynamics, human resource management, record keeping, and general business management. ASRuD also provides credit to SME operators on the condition of approval (based on an application and interview) and participation in the trainings. The application includes information about the existing business operations, plans for growth, which the ASRuD business officers validate. New credit applicants also receive counseling by ASRuD staff to ensure the finances are well invested. Loans are provided both to individuals and groups. For groups, loans are part of a joint guarantee system in which no collateral is required, but the members are liable if any of the individuals does not pay within a six-month period. ASRuD receives the funds at a 2% interest rate through the Microcredit and Savings Loan Scheme, run by the Ghanaian government. Beneficiaries can then borrow from ASRuD at a rate of 4% interest for a 5 Ghanaian CD processing fee, well under the market lending rate.

Beyond trainings and credit lending, ASRuD links the numerous value chain actors through workshops with participation of the Ministry of Food and Agriculture, financial service providers, and transporters. Bringing these actors together, ASRuD facilitates trainings in value chain dynamics so each actor can see and understand the role he or she plays in the commodity value chain. The trainings cover a variety of commodities including soybeans, pineapple, mango, rice, and cassava. ASRuD has also worked directly with input providers and aggregators to facilitate credit schemes with farmers.

Four years ago, ASRuD began with one group of five women. Since then, the program has grown exponentially to serve over 3,000 farmers and about 5,000 individuals total, 98% of which are women. As a result of business training and facilitated linkages from ASRuD, beneficiaries' businesses often double in size in the first six months of program participation, later increasing four or five fold. With additional support (a number of key grants have ended or will end in short order), this exponential growth could continue as this program reaches scale across the region. That said, the microcredit scheme has built in sustainability, so growth of that particular program is not as dependent on external support.

Resources currently available:

- **Human:** trainings on entrepreneurship development, credit management, banking culture, group dynamics, human resource management, record keeping, and general business management; over 5,000 individual program participants; 22 staff members
- **Institutional:** 2% interest rate loans from the Ghana Microcredit and Savings Loan Scheme; funding from the Gates foundation for ASRuD's participation in the Cassava: Adding Value for Africa (C:AVA) project (featured on page 24); pending renewal of agricultural development and value chain enhancement project funds from the US Agency for International Development
- **Communication:** facilitated linkages between value chain actors
- **Knowledge:** a business mindset adopted by 5,000 individual program participants

Resources needed to achieve impact at scale:

- **Technology:** processing equipment to support transformation of raw crops to value added products by SMEs
- **Human:** a greater number of staff members to expand services offered; increased number of trainings for SMEs
- **Institutional:** working capital for ASRuD operations, so that it can achieve sustainability through its microcredit scheme; expanded partnerships with value chain actors such as input suppliers and aggregators
- **Knowledge:** increased uptake of the business mindset among additional smallholder farmers throughout the region



Photo credit www.changemakers.com

GEMS4 (Growth and Employment in States)

Potential big win: *How might we assure farmers adopt a business mindset?*

Rationale: *For many smallholder farmers, limited business management and entrepreneurship skills restrict their ability to seize productivity and quality improvements that in turn help reduce food loss. These changes may be in terms of upgrading their own farm management practices, or seizing unique market opportunities, including in processing. Efforts to help farmers undertake agriculture as a business, such as the example given, offer a way to help increase both the efficiency of farming (i.e., reducing loss) and income generation opportunities available to smallholders.*

Description:

Nigeria is a country with significant demand for high quality, locally sourced produce. However, few local value chain actors have yet to adopt a business mindset that enables them to significantly reduce losses, boost quality, and ultimately tap into high value markets, such as for processed goods. Tomatoes, for example, suffer 40-50% post harvest losses, even while the country stands as the largest tomato paste importer in Africa. Much of the tomato crop losses occur during transport via raffia baskets, which are not durable and enable damage through insects, moisture, and physical trauma. These losses have a detrimental effect on smallholder farmer incomes. However, research has shown that transporting tomatoes in plastic crates can reduce loss to as little as 1.5 %.

A program of Coffey International, GEMS4 aims to mitigate these unnecessary losses while increasing incomes for 500,000 tomato farmers by at least 15% and creating 10,000 full time jobs in the tomato sector in Nigeria. They take a market-oriented approach to helping smallholders approach tomato farming as a business, such that they realize the inherent value in adopting quality enhancing approaches. In many cases, the necessary mindset shift results from clearly understanding the income improvements and return on investment that can come from forgoing outdated approaches such as using raffia baskets. GEMS4 offers a crate rental program to lower barriers to entry for smallholders. As well, the program developed a tomato price formation system that includes price premiums for high quality, not just volume. The emphasis on higher quality for higher wages provides farmers with clear incentives to improve their production and post harvest management techniques. To further enable farmers' success, GEMS4 provides value chain actors with tomato color charts that depict the different quality levels of tomatoes and their associated prices. The quality improvements benefit value chain actors further downstream as well, as they capture more value as a result of trading and selling higher quality goods.

The potential for scale of this market-led approach is significant due to large unmet demand for high quality tomatoes in Nigeria. Given that plastic crates can be used with a wide range of perishables, this project has the ability to impact the 130+ million agricultural workers in Nigeria. As well, the price premium scheme could be applied across many value chains where quality improvements are required to ensure market uptake and reduce loss. Ensuring commiserate investments in processing infrastructure and capacity constitutes an important measure to ensure gains afforded through this initiative are not foregone by farmers in lieu of those further down the value chain.

Resources currently available:

- **Technological:** plastic crates produced by local manufacturers and distributed through a crate rental pilot project
- **Human Resources:** thousands of farmers, dealers, business associations, service providers, retailers, wholesalers, and consultants (Best Produce UK Ltd.); Training of Trainer program through which master trainers train farmers in proper handling, grading, and transporting of tomatoes
- **Institutional:** rental model for crates that lowers the barrier to investment; price formation system that includes quality in addition to quantity
- **Knowledge:** color charts used to grade tomatoes based on quality so tomato price formation system can include quantity *and* quality

Resources needed to achieve impact at scale:

- **Technological:** greater supply of plastic crates
- **Human:** outreach to markets to determine standards requirements; partners with information on market demands; larger number of trainers to train farmers in adopting a business mindset; partnerships with local manufacturers to supply/rent plastic crates to dealers and farmers; capacity building for good handling practices in collection centers
- **Institutional:** more packing houses for processing/distribution centers
- **Knowledge:** market analysis and value chain analysis for other perishables besides tomatoes; increased business mindset among smallholder farmers and other value chain actors



Photo Credit: africa-rising.net

Africa RISING

Potential Big Win: How might we boost the adoption of skills and technologies featured in trainings?

Rationale: Many simple tools and approaches for reducing post harvest exist; however, uptake and adoption by smallholder farmers remain limited in part due to lack of awareness of these alternatives and skills to use them. Efforts to boost adoption of viable post harvest solutions, such as the example given, demonstrate how technological learning can be increased among smallholders.

Description:

Post harvest losses result from many factors, including poor agricultural practices and limited market access. Especially for grains and other staple crops, a significant portion of loss occurs during the storage phase, when insects and pests can damage up to 40% of stored grains. Challenges associated with insufficient storage facilities and knowledge of proper storage techniques exacerbates post harvest losses in grains. Working in West, East, and Southern Africa, Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) focuses on boosting sustainable intensification of maize producing regions across the continent, and has identified improved storage capacity as a key element of achieving this overarching goal. They target improved storage as a way to increase household access to staple crops as well as to enable farmers to market grains well beyond the immediate post-harvest timeframe. Supported through the US government's Feed the Future program, Africa RISING involves partners such as the International Institute of Tropical Agriculture (IITA).

The post harvest portfolio of Africa RISING focuses on identifying and testing simple post harvest technologies and approaches in cooperation with communities. Specific interventions include expanding access to community storage facilities and Purdue Improved Cowpea Storage (PICS) bags (featured on page 22). Fieldwork reveals that farmers often need a combination of technologies to fully address post harvest loss, a reality that the program takes into account when piloting technologies. The program works through lead farmers likely to use the storage technologies well and extension workers who create linkages with farmers. The approach to raising awareness and dissemination of post harvest technologies emphasizes community demonstrations that showcase the value of the solutions firsthand to potential beneficiaries. Additionally, Africa RISING is beginning to test processing and packaging solutions for grains. For example, they have set up pilot processing centers where they provide mentorship directly to farmers on the technologies available. That said, Africa RISING realizes that not all technologies — especially for processing — are appropriate for farmers, so they cultivate farmers' skills to build market linkages and seize value addition opportunities that can be augmented with the right choice of technology.

Africa RISING continues to focus on testing, refining, and demonstrating post harvest technologies to increase adoption among smallholder grain farmers. The program aims to broaden the scope of their testing to include higher value addition technologies and services. Given the wide geographic scope of the project's efforts, with further funding and partnerships, impact at scale may be achieved by continuing to add new technologies to the testing/training program and by expanding beyond current target countries, which include Ghana, Ethiopia, Mali, Tanzania, Malawi, and Zambia.

Resources currently available:

- **Technology:** numerous processing and storage technologies tested, demonstrated, and used
- **Human:** extension agents who provide linkages to smallholder farmers; scientists who conduct field tests on different technologies; training programs for smallholder farmers in the proper use of various technologies
- **Institutional:** funding from the US Agency for International Development; partnerships with IITA, and other international agriculture centers
- **Communication:** extension agent platform for communicating with farmers and farmer organizations
- **Knowledge:** understanding that often a suite of different technologies is the most efficient way to reduce post harvest loss

Resources needed to achieve impact at scale:

- **Technology:** new technologies for higher value products
- **Human:** trainings for field researchers and national partners; increased capacity of young scientists; further partnerships with extension officers; more private sector and non governmental organization actors involved to demonstrate / introduce new technologies and quickly scale their use in new locations
- **Institutional:** financing for lab-based technology development
- **Communication:** awareness raising in collaboration with extension officers to increase participation of farmers in trainings/testing



OIC International Mud Silos Program

Potential big win: *How might we boost the adoption of skills and technologies featured in trainings?*

Rationale: *Many simple tools and approaches for reducing post harvest exist; however, uptake and adoption by smallholder farmers remain limited in part due to lack of awareness of these alternatives and skills to use them. Efforts to boost adoption of viable post harvest solutions, such as the example given, demonstrate how technological learning can be increased among smallholders.*

Photo Credit www.adraghana.org

Description:

Introduced by traders from Burkina Faso, mud silos have been a farming tradition in Ghana for the past 300 years. Proven to significantly reduce post harvest loss in grains, these storage units are designed with three compartments that can store several commodities, thus making them amenable to multi-cropping systems. In 2001, the Ministry of Agriculture in Ghana evaluated different storage systems, finding that mud silos are the most cost effective and best way to maintain the nutritional value of the crops during storage.

To date, over 5724 mud silos have been constructed in Ghana through Opportunities Industrialization Centers International (OICI)'s mud silos program. The silos have the capacity to store up to 1.5 metric tons of grain and can last 10 to 50 years if well maintained and depending on the silo location (e.g., in a room, within/outside a compound). At a cost of less than \$25, farmers get a sizeable return on their initial investment: OICI research found that mud silos result in almost zero percent loss when grains are well dried and treated before storage, either by sun drying, mixing ash with the grain to prevent rodents, or covering the silo with non-hazardous pesticide. To enable construction, OICI provides the artisan/mud silo builder while the farmer provides the cementing agent, water supply, clay, and grass.

While some areas of Ghana have been using this technology for hundreds of years, the key to reaching scale lies in promoting the uptake of mud silos in areas where it is not traditionally practiced, yet is agriculturally and socially feasible. OICI's experience shows that rural farmers may be hesitant to use the storage practices of other tribes. As such, ensuring acceptance and ultimately uptake requires effective technological sensitization and training programs. This effort involves demonstrating the value of investing in this technology, as well as analyzing local resources available. For instance, not every tree and type of grass is suitable for mud silos. Therefore, a thorough evaluation of the local context is needed to ensure that training is aligned with community-level realities and resources.

Beyond reducing post harvest loss, constructing mud silos also provides an income generating opportunity for communities. This OICI project mobilized 457 volunteers who were trained by master-builders at the mud silo construction site. Through focused training, this method created jobs for local artisans and built a stock of skilled mud silo builders at the community level, assuring the sustainability of the program. This program was limited in size due to temporal and financial constraints; it was a short-term project. That said, additional support in terms of ensuring market access for the farmers using the stores and expanding the training program would enable this project to be re-launched on a much larger scale.

Resources currently available:

- **Technological:** physical resources to build storage units: cementing agent, water, clay, grass; vehicles to transport those materials
- **Human:** thousands of farmers building mud silos; over 457 volunteer trainees; master mud silo builders; job creation for local artisans
- **Communication:** connecting trainees to master-builders; materials for sensitization campaigns explaining the importance of investing in this technology
- **Institutional:** Ministry of Agriculture data on storage systems; pilot funding
- **Knowledge:** understanding of how to build mud silos; comprehension of the positive outcomes that result from investing in this storage technology; research demonstrating the effects of mud silos on post harvest loss

Resources needed to achieve impact at scale:

- **Human:** awareness raising programs on preventing loss and gaining market access for saved crops; analysis of local resources for new expansion areas; analysis of forthcoming data on program outcomes used to inform future programs
- **Institutional:** financial support to restart and expand the training program; integration of partners aimed at assuring market access for participating farmers
- **Communication:** materials for awareness raising/promotion of mud silos
- **Knowledge:** monitoring and evaluation data on program outcomes



Postharvest Training and Services Center

Potential big win: *How might we increase the impact of technological learning and uptake efforts?*

Rationale: *Many simple tools and approaches for reducing post harvest loss exist, however uptake and adoption by smallholder farmers remain limited in part due to lack of awareness of these alternatives coupled with the skills to use them. Efforts to boost adoption of viable post harvest solutions, such as the example given, demonstrate how technological learning can be increased among smallholders.*

Photo credit: indiegogo.com

Description:

African agriculture is diverse in terms of crops, production approaches, and market possibilities. Most smallholder farmers grow multiple crops at a time and exploit a number of end-uses for those crops, including for household consumption, sale in the domestic market, and sometimes export. That said, most post harvest interventions use a single crop or single technology approach that fails to match the on-farm multi-crop reality. This means that farmers are rarely equipped to engage in a holistic strategy encompassing the full gamut of options available to them for reducing their post harvest losses. The Postharvest Training and Services Center (PTSC) aims to present an alternative to this traditionally siloed approach to reducing post harvest loss.

Initially funded by the US Agency of International Development through the Horticulture Collaborative Research Support Program (CRSP), this proof-of-concept center in Arusha, Tanzania offers demonstrations, training, and other services on harvesting, grading, packaging, cooling, cool storage, cool transport, small scale processing, quality measurement, food safety and marketing of horticultural crops. Additionally, the PTSC houses a retail shop where farmers can purchase the tools, supplies, and packaging materials they need to decrease losses and increase quality, which provides a source of sustainable funding for the Center's operations. Currently operated through support by the World Vegetable Center and Ministry of Agriculture and Food Security in Tanzania, the PTSC actively engages extension workers as well as farmer organizations, NGOs, women's groups, and individual farmers in their training and demonstration efforts.

A year-long training of master trainers program serves as an important focus of the PTSC model. An initial cohort of 36 master trainers from 7 countries in Africa has reached 16,000 members of farmers' associations and women's cooperatives across the continent, plus another 15,000 extension workers, lead farmers, and youth via the multiplier effect since 2011. As part of their training, each master trainer develops plans for PTSCs in their home countries, some of which have been taken to fruition through external support. Compelled by the value that the master trainers deliver, The Postharvest Education Foundation (PEF) has continued to support the training of master trainers program after pilot funding ended, training an additional 26 master trainers in 2013.

The PTSC model offers a holistic approach to reducing post harvest loss that could be expanded to include grains and other staple crops as well as fish and dairy products in addition to horticulture crops. In terms of achieving impact at scale, institutional support by host country governments (as experienced in Tanzania) and/or more explicit integration of market linkages to retailers, processors, and other possible buyers are needed.

Resources currently available:

- **Technological:** post harvest technologies to be used at the PTSC for demonstration purposes, such as solar dryers or zero energy cool chambers
- **Human:** post harvest specialists and extension agents to participate in trainings and connect with farmer groups; employees to manage and work at the PTSC stores selling post harvest tools, supplies, and packaging materials; master trainers and the training of trainer program
- **Institutional:** partnership with the Tanzanian Ministry of Agriculture and Food Security and the World Vegetable Center; PTSC retail store; funding and institutional support through Horticulture Innovation Lab, PEF, and other partners
- **Knowledge:** understanding of how to build/use post harvest technologies demonstrated at PTSCs; accessible, locally relevant training curriculum in local languages

Resources needed to achieve impact at scale:

- **Institutional:** further partnership with host country governments; space in which to operate the PTSCs, whether built through seed funding, or in partnership with government ministries or other institutions; seed funding to purchase tools and supplies for new centers
- **Human:** additional master trainers and employees to run new PTSCs; farmers/farmer organizations to attend trainings and purchase inputs at the PTSCs; additional extension officers to participate in trainings and follow up with farmer organizations
- **Communication:** outreach to potential beneficiaries in new geographies
- **Knowledge:** understanding local context (e.g., crops grown, weather patterns, post harvest challenges) for new geographies; more widespread understanding of post harvest technologies, their costs/benefits, and approaches that reduce loss and maintain quality



Ghana Agricultural Insurance Programme

Potential big win: How might we decrease the financial risk borne by farmers?

Rationale: For smallholder farmers with limited capital, the risk of investing in better inputs or processes to reduce PHL is very high, thus limiting the resources they have available to make needed changes. However, innovative financing mechanisms such as new models for low-interest lending can increase investment and opportunities for greater returns later.

Photo credit: gaip-info.com

Description:

Due to climate change and the resultant temperature variations, shifts in weather patterns, and extreme weather events, smallholder farmers face increasing risks associated with partial or total crop loss. Further, farmers confront compounding challenges in terms of accessing capital to make investments in their farming business and store up resources that might shield them from the effects of a poor crop cycle. For these reasons, farmers often suffer the devastating consequences of crop loss due to factors beyond their control. To combat this risk, in 2011 the Innovative Insurance Product for the Adaptation to Climate Change (IIPACC) Project under the German Development Cooperation (GIZ) collaborated with the National Insurance Commission (NIC) and a group of Ghanaian insurance companies to pool resources and reduce companies' risk of investment in smallholder farmers. The resulting Ghana Agricultural Insurance Programme (GAIP) is currently composed of 17 insurance companies and 2 re-insurers, and is managed by a Technical Management Unit that provides research, product design, marketing, distribution, and insurance underwriting services.

When first launched in 2011, GAIP worked with 3 banks to bundle index-based insurance with loans provided to smallholder maize farmers, adding soya farmers the following year. As with similar weather-based index insurance products, rainfall levels of the local area determine the payout, rather than specific on-farm damages. For example, more than 12 consecutive dry days (<2.5mm of rain) within 20km of a selected weather station will automatically trigger a payout to policyholders. Over 3,000 smallholder farmers were recipients of this first insurance policy. By 2013, GAIP introduced area yield index insurance and multi-peril crop insurance (MPCI) to the list of product offerings. An indemnity-based product, MPCI covers a host of issues such as drought, pests, and fire and is monitored at the individual level. GAIP realized that it could not offer all products to all farmers and successfully manage all of the downside risks. As such, MPCI is only sold to farmers with 50 acres and above, most of whom are export-oriented producers and, consequently, adhere to recognized standards and keep track of their production records. The record keeping allows GAIP to assess individual farmers' risks based on geography, crop, and production history, enabling farmers to select which risks the insurance policy should cover, and pay accordingly.

To distribute their insurance products to farmers, GAIP has partnered with non-governmental organizations (NGOs) such as ACIDI-VOCA / ADVANCE and Innovations for Poverty Action (IPA), gaining them access to potential beneficiaries that often are weary of formal financial services. GAIP has expanded their insurance offerings from 3 to 6 regions since 2011, but aims to grow the program even further to include a wider geographic coverage and number of crops. To do this, GAIP welcomes new partnerships especially with local financial institutions and governmental entities, and new policies that promote crop insurance as a risk mitigation tool for farmers and financial institutions alike.

Resources currently available:

- **Technology:** weather stations and satellite information that provide data on which insurance payouts are determined
- **Human:** 3-person Technical Management Unit inclusive of an underwriter, agro-meteorologist, and general manager; thousands of farmers purchasing insurance policies
- **Institutional:** partnerships with GIZ, ACIDI-VOCA, IPA, the Ghanaian government, and others; participation of 17 insurance companies and 2 re-insurers; index-based and indemnity-based insurance products; reduced insurance rates from 13% to below 10% to attract more farmers
- **Communication:** efforts underway to strengthen government collaboration; local language radio advertisements
- **Knowledge:** government statistical data

Resources needed to achieve impact at scale:

- **Technology:** additional insurance products for crops other than maize and soya (i.e., rice, millet, peanuts)
- **Human:** education for farmers on the various insurance products; staff knowledge strengthening for existing TMU members and expanded staff capacity in terms of new hires to meet demand for more diverse products
- **Institutional:** new national policies through the Ministry of Food and Agriculture and the Ministry of Finance to support this insurance program; funding for staff capacity building, new insurance product development, and improved weather station infrastructure; increased product marketing through trusted NGO partners; increased number of banks involved in GAIP
- **Communication:** increased media advertisement (i.e., radio) once a number of new products have been developed; cost effective media approaches



Kilimo Salama

Potential big win: How might we decrease the financial risk borne by farmers?

Rationale: For smallholder farmers with limited capital, the risk of investing in better inputs or processes to reduce PHL is very high, thus limiting the resources they have available to make needed changes. However, innovative financing mechanisms such as new models for low-interest lending can increase investment and opportunities for greater returns later.

Description:

Millions of farmers worldwide are subject to the devastating consequences of climate change. Unpredictable and severe variations in weather can leave entire agricultural regions suffering unpredictable and crippling crop losses. Consequently, smallholder farmers often cannot obtain financing because banks perceive them as too high risk. Banks are particularly hesitant to offer loans in drought-ridden areas, where the risk of farmer default is pronounced. However, crop insurance policies serve to lower a farmer's risk profile, making them a more viable investment for banks, micro finance institutions (MFIs), and input dealers.

Launched in 2009, Kilimo Salama ("safe agriculture" in Swahili) develops and distributes low-cost index-based insurance. The initiative reached over 185,000 farmers in 2013 and has reached 145,805 smallholder farmers in Kenya and Rwanda in 2014 to date, and launched the program in Tanzania. Kilimo Salama began as a partnership between the Syngenta Foundation for Sustainable Agriculture, UAP Insurance (Kenya), and the East African telecommunications giant Safaricom. Kilimo Salama (KS) protects farmers' investments in improved seeds and other inputs by developing products that cover losses due to drought, excess rain, and disease. For example, in the input-linked insurance scheme, KS works with input providers (like seed and fertilizer companies) that distribute to small-scale farmers. Using a code provided in the seed or fertilizer bag, farmers register his/her location, using their mobile phone, which is used to determine payouts should a significant weather event occur. Beyond providing geo-location, the novel mobile platform also allows KS to send farmers planting information and deliver payouts via cell phone. KS receives a margin on insurance premiums (which are generally 5% to 10% of the input retail price), which allows the company to cover operating costs, ensuring long-term program sustainability.

To avoid the high transaction costs that come with monitoring individual claims, KS uses weather and yield data as a proxy for visiting farms. Specifically, KS has access to 30 years of historical satellite data for Kenya, Rwanda, and Tanzania, which helps establish the risk profile of specific geographic areas on which premium rates are based. Using satellite data and local weather stations, KS provides payouts to insured farmers in affected areas even if they do not personally experience a loss. According to interviewed KS staff, insurers typically view incidence of post harvest loss as a management issue, which may explain why it is an unattractive focal point for insurance products. That said, impact surveys from KS reveal that insured farmers are more likely to reinvest in their farms than their uninsured counterparts, meaning there may be space to grow the scope of re-investment to include post harvest management.

KS has a bold vision for achieving scale in Africa, especially since the sustainability of their business model relies on generating an ever-growing client base. Specifically, the company plans to extend operations to Zimbabwe, Zambia, Malawi, Ethiopia, and Nigeria over the next couple of years, with the goal of reaching 1 million farmers in the same timeframe.

Resources currently available:

- **Technology:** satellites providing weather data across Africa; local weather stations; improved inputs on which their insurance products are based
- **Human:** 145,805 smallholder farmers in Kenya and Rwanda buying insurance in 2014 to date; trainings for farmers on agriculture inputs and index-based insurance products
- **Institutional:** partnerships with banks and MFIs that lend to smallholder farmers, the Syngenta Foundation, and Mobile Network Operators
- **Communication:** mobile phone-based platform for communicating with farmers and for distributing payouts via mobile money
- **Knowledge:** 30 years of historical weather data

Resources needed to achieve impact at scale:

- **Technology:** mobile phones being used by every farmer; network of weather stations in each country that can validate satellite data; investment in improved satellite data (i.e. higher resolution images that produce more accurate information)
- **Human:** expanded actuarial services and project management support as the company grows
- **Institutional:** government regulatory framework conducive to index insurance; donor funding for feasibility studies; improved mobile phone infrastructure in target countries; expanded lending to agriculture by banks and MFIs
- **Knowledge:** feasibility study in new geographies to analyze how value chains are organized, regulatory context, mobile phone sector infrastructure and capacity, etc.



Photo credit: oneacrefund.org

One Acre Fund

Potential big win: How might we decrease the financial risk borne by farmers?

Rationale: For smallholder farmers with limited capital, the risk of investing in better inputs or processes to reduce PHL is very high, thus limiting the resources they have available to make needed changes. However, innovative financing mechanisms such as new models for low-interest lending can increase investment and opportunities for greater returns later.

Description:

Smallholder farmers face many, often compounding challenges when it comes to accessing the financing they need to make on-farm improvements, such as for better drying or storage options. Primarily, banks see smallholder farmers as high-risk investments, meaning they face steep collateral requirements and tight repayment timelines. Additionally, smallholder farmers must deal with competing demands on their limited finances, so investments in post harvest solutions often fall below more immediate household needs. However, innovative financing mechanisms can help smallholder farmers actively participate in a positive cycle of lending and improving their farming operations.

Launched in 2006, One Acre Fund currently works in Kenya, Rwanda, Burundi, and Tanzania to increase productivity, market access, and incomes for over 180,000 smallholder farmers. Through the provision of small-scale loans in the form of inputs (seed and fertilizer) delivered close to farm gate, One Acre Fund decreases the risk of investing in improved methods to increase yields and lessen their crops' susceptibility to pest and disease that can contribute to post harvest losses. Beyond its main focus of access to finance, this organization provides improved storage facilities and market access opportunities through which farmers can aggregate their crops and sell for a higher profit at market. For example, OAF Tanzania plans to launch a program to connect buyers directly with villagers to set prices, facilitate market access, and cut out the middlemen, thereby increasing farmer incomes.

In their first year of participation, farmers can receive inputs to cover one acre of production and in the second year, they have the opportunity to increase that amount to cover two acres. Farmers can also choose to add a loan top up for a quarter acre sunflower farm and solar lights. Farmers are required to pay 15% of their loan by a prepayment deadline in order to receive the inputs. To increase the likelihood of repayment, farmers form joint liability groups in which each member must repay the loan or else none of them can apply for loans the following season. This system creates accountability and holds farmers responsible to others they know in their community.

OAF believes that if farmers bulk and store their grain to sell in the off-season when prices are more stable, they can increase the marketability of the maize grown. To facilitate this process, OAF plans to test the possibility of using their input warehouses for this grain storage. Once the input supplies (i.e., fertilizer) have been collected in the warehouse and then delivered, the empty space could be used as a collection center where farmers bring their maize and those farmers would receive the higher wages minus a small fee to cover transportation and storage.

Resources currently available:

- **Technology:** fertilizer and hybrid seeds; solar lights; storage silos
- **Human:** demonstration plots to show OAF maize as compared to non-OAF maize; agricultural trainings hosted by Field Officers; group leaders; over 180,000 farmer participants; over 1,800 staff members
- **Institutional:** pilot projects being conducted in Uganda, Malawi, and Ethiopia; nursery trials to expand Kenya program to include additional crops; warehouses to store inputs before they are distributed to farmers
- **Communication:** new initiative to connect buyers with certain villages and facilitate price arrangements between buyers and farmers; personal testimonies about the impact of the project; SMS messaging to farmers

Resources needed to achieve impact at scale:

- **Technology:** cheaper transportation for projects in Tanzania, where transport costs twice as much as in Kenya
- **Human:** more efficient trainings that are conducted twice in one location to increase the number of farmers it reaches; more project managers and other employees willing to work on the OAF pay scale
- **Institutional:** better locations for meetings so geographic distance does not hinder farmer participation; better use of empty warehouses (warehouses used for storing inputs before deliveries are often empty and could be used to aggregate and store crops before selling in bulk to buyers)
- **Knowledge:** OAF understanding of what incentives are useful in different country contexts; increased farmer trust and buy-in of the project



Photo credit: edaifgh.org

Export Development and Agricultural Investment Fund (EDAIF)

Potential big win: How might we distribute the potential financial risks/rewards of reducing PHL across the value chain?

Rationale: Agriculture is an inherently risky undertaking, but sometimes the risks are disproportionately shared across the many value chain actors involved. Supporting risk-sharing schemes that incentivize investment by a broad sub-set of actors offers a way to increase efficiency, and thereby reduce the PHL burden, of value chains.

Description:

Too often, investments needed to significantly reduce post harvest loss and improve efficiency of value chain operations are deemed too risky by private sector financial institutions to merit investment. Burdensome requirements for collateral and tight repayment timelines often mean that value chain actors — farmers, processors, aggregators — cannot access the financial capital they require to improve their post harvest operations. Innovative value chain financing schemes offer possible solutions. Established in 2000, Ghana's Export Development and Agricultural Investment Fund (EDAIF) provides a unique grant and credit facility aimed at achieving this goal. Through the grant scheme, EDAIF provides competitive outlays for infrastructure improvements and capacity building initiatives to farmer groups and small and medium sized enterprises (SMEs). The grant money is not recovered, so investments must demonstrate economic impact beyond the specific business venture on which the application is based. For example, grants have been used to spur infrastructure improvements in agro-processing companies; to create packing houses in underserved areas; and to develop free export zones. Grants are not distributed as cash payments, but as reimbursements for capital purchases made.

Additionally, EDAIF operates a credit facility aimed at opening new sources of credit for individuals and groups. EDAIF works with Designated Financial Institutions (DFIs) to distribute loans based on applications received. EDAIF lends to the DFIs at 2.5% and those banks then lend to farmers and other value chain actors at a low rate of 12.5% (compared to the regular market, where rates are at least 25%). DFIs are appointed for a two-year period, which is renewable given satisfactory performance. To apply for financing from DFIs, individuals must submit a technical and financial proposal as well as a comprehensive business plan. Loans can be granted over a long-term (exceeding five years), medium-term (not exceeding five years), or short-term (not exceeding twelve months) period; no single borrower can receive over \$3 million. For agro-processors specifically, demonstration of market demand is a key requirement for loan approval.

To date, EDAIF has lent over \$150 million through government funding. However, applications for support far exceed those accepted, especially for the grant facility. The agro-processing industry offers significant investment opportunities that have yet to be fully exploited. Better awareness among value chain actors for new market opportunities stands as a cross cutting need to scale the impact of the fund.

Resources currently available:

- **Technological:** logistics to monitor various projects; distribution mechanism to get funds to beneficiaries
- **Human:** government and DFI employees; M&E department to monitor indicators of the funded projects; grant and loan applicants
- **Institutional:** Ghanaian law amended in 2011 to include agro-processing in its Export Development Investment Fund and amended again in 2013 to include industry and allow for the provision of equity injections into companies; DFIs to provide low interest rate loans
- **Communications:** publicity efforts by public relations consultants; website and radio outreach
- **Knowledge:** baseline data at start of program; standardized forms to collect data from DFIs as project progresses; standards and requirements for accepting grant/loan applications

Resources needed to achieve impact at scale:

- **Human:** extension services to educate farmers and support them through the process of applying for and receiving grants/loans; trainings for extension officers and farmers
- **Institutional:** expanded scope of DFIs to include crop insurance; other institutions that can provide inexpensive, long-term loans at the commercial level; ability of EDAIF to sign agreements with companies and not route them through the Ministry
- **Knowledge:** understanding that loans must be repaid even though they come from the government; proof from value chain actors that there is demand for their proposed plan; increased value chain actors' knowledge of agro-processing opportunities



Photo Credit: icupdate.cta.int

SlimTrader—MoBiashara

Potential big win: How might we distribute the potential financial risks/rewards of reducing post harvest loss across the value chain?

Rationale: Agriculture is an inherently risky undertaking, but sometimes the risks are disproportionately shared across the many value chain actors involved. Supporting risk-sharing schemes that incentivize investment by a broad sub-set of actors offers a way to increase efficiency, and thereby reduce the PHL burden, of value chains.

Description:

Due to steep transaction costs and limited availability of financing, the cost of doing business in agricultural value chains in Africa is quite high for most if not all value chain actors. For example, an input distributor supplies agricultural inputs such as seed to a retailer on credit, incurring large upfront costs with no guarantee of return. The retailer then bears the cost of holding those inputs until farmers can afford to buy them. As a result, agricultural value chains operate at sub-optimal levels of efficiency and profitability. That said, innovative information and communication technology (ICT) platforms for value chain financing offer a promising solution. SlimTrader, a US-based ICT company, facilitates transactions through customized e-commerce solutions for businesses large or small. One of SlimTrader's innovative financing platforms, called MoBiashara ('more business' in Swahili), simplifies the distribution channel for consumer goods, such as agricultural inputs.

Still in its pilot phase, MoBiashara's partnership with the Nigeria-based agro-chemical producer Notore enables streamlined fertilizer delivery for smallholder farmers. To use this platform, both the distributor and the retailer download the application (i.e., the app) on their mobile phones, creating a record of transactions. By evaluating the retailers' business records, distributors can reduce their investment risk by making data-informed credit dispersion decisions. When the retailer visits farmers to take orders, he uses the app to examine current inventory and determine which inputs are available based on the distributor's latest supply count. After an order is placed, the farmer then uses his 'electronic wallet' (a novel mobile voucher program initiated by the Government of Nigeria) to make a payment to the retailer upon delivery of the inputs. This groundbreaking system decreases the value chain credit risks for distributors by providing data on which to make well-informed lending decisions, lowers storage costs for retailers who can more efficiently coordinate orders and deliveries, and enables input price reduction for farmers due to a more efficient distribution system.

Each step along this distribution channel is done electronically, so it can all be tracked for future use. Before taking orders, the retailer must make a profile for a farmer that includes a name and address as well as order and payment history. The tracking system also allows value chain actors to keep track of farmers' orders (e.g., 'in process' or 'complete'). These electronic records exist for retailers and distributors as well, tracking their history and progress. These records can serve as important evidence of business and payment history, often a missing asset for value chain actors trying to gain access to credit. While the platform has been applied primarily to agricultural inputs such as fertilizer and seeds, there exists opportunity to expand its application to other inputs such as for post harvest technologies. While still in the pilot stage, MoBiashara has shown impressive initial results. SlimTrader is keen to discuss potential partnership opportunities as it continues to scale the project in Nigeria and beyond.

Resources currently available:

- **Technology:** the network and mobile technology necessary to maintain this platform for a variety of users
- **Human:** distributors, retailers, and farmers within the client's distribution channel who use the MoBiashara app; trainings on how to operate the mobile app in which attendees must demonstrate proper usage before they can leave
- **Institutional:** partnerships with clients such as Notore, an agricultural input supplier
- **Communications:** video outreach that highlights the positive outcomes of using the mobile app
- **Knowledge:** understanding of the financial risks incurred by different actors along the value chain and how to decrease those risks through information sharing and coordination

Resources needed to achieve impact at scale:

- **Human:** additional staff members; partnerships with new clients in the fast moving consumer goods sector (including agricultural input suppliers)
- **Institutional:** funding through additional clients and partners to expand use of MoBiashara in new regions and for new products
- **Communication:** infomercials and other tools for promoting the app within the client's target audience along various product distribution channels; tailored communication strategies for various product distribution channels
- **Knowledge:** assessment of the distribution channel needs and challenges in new areas of operation; analysis of the ICT climate and how the mobile app will best fit into that system



USAID - KAVES Project

Potential big win: *How might we use inclusive platforms to link value chain actors?*

Rationale: *Agricultural value chains involve many actors — farmers, input suppliers, transporters, traders, retailers — that provide different functions and respond to different incentives as they move crops from field to market. Inclusive value chain platforms that enable streamlined communication and planning help reduce inefficiencies that can contribute to post harvest loss.*

Description:

Increasing numbers of large-scale buyers — exporters, retailers, wholesalers — are sourcing raw commodities from African countries, meaning value chain actors must be ever more equipped to meet higher quantity and quality standards. Understanding the new opportunities and pressures that come with expanded international market exposure, the US Agency for International Development launched at 5-year, \$40 million project entitled Kenya Agricultural Value Chains Enterprises (KAVES). KAVES aims to commercialize 500,000 farmers with increased productivity and incomes in the staple crop, dairy, and horticulture sectors. Implemented by Fintrac (a private company specializing in value chain development), this project works with smallholder farmers, businesses, and government partners to develop highly functioning, competitive value chains. KAVES upholds a market-driven approach to achieving this goal, including by supporting the implementation of hygiene standards and good agricultural practices, improving post harvest handling and processing, linking farmers to new markets, and attracting private sector investment in smallholder production.

KAVES interventions begin with analyzing a specific market opportunity, then analyzing available resources (e.g., technologies) and needs moving back from the market demand. Additionally, KAVES operates on the idea that management systems are as important as technology for improving staple crop and horticulture productivity. Knowing that exporters cannot afford losses that exceed 5%, Fintrac implementers focus on organizing distribution systems that meet market needs. The program maintains a focus on “first mile” quality enhancement — from farm gate to the first point of aggregation — for this reason. It also has introduced a traceability system that registers smallholder farmers, providing a platform to strengthen the partnership and accountability between farmers, the regulatory industry, and exporters. Previously, random testing of pesticides levels and less strict quality standards mitigated the need for traceability, the increasingly private sector-driven process requires ever growing levels of traceability and farmer registration systems.

The KAVES staple crops programming focuses more on increasing household level food security than enabling farmers to reach new markets. The rationale centers on the potential for returns that farmers can seize in high value horticulture crops versus traditional staple crops. Understanding that many smallholder farmers practice multi-cropping, using smaller plots of land for more efficient growth of staple crops frees up space for increased production of income generating horticulture. Additionally, it presents the opportunity for generating new income from productive dairy cows.

With the agricultural sector employing over 75% of the Kenyan workforce, this project has the potential to expand its reach and impact smallholder farmers at scale by diversifying value chains, increasing incomes and food security, and reducing malnutrition. Ensuring private sector participation and market-driven interventions bode well for the project to move beyond donor support at the close of the 5-year timeframe. That said, as with all donor-initiated projects, explicit measures to catalyze private sector and government ownership well in advance of the project’s sunset is required to capitalize on these positive features.

Resources currently available:

- **Technology:** traceability system for registering smallholder farmers; numerous farming technologies from basic to highly sophisticated
- **Human:** thousands of smallholder farmer program participants; trainings in the use of input technologies and good agricultural practices to increase farming efficiency; Fintrac staff support
- **Institutional:** \$40 million investment from USAID; partnerships with government and businesses, specifically export companies
- **Knowledge:** enhanced farmer understanding of Kenya Good Agricultural Practice and associated standards; market system analysis

Resources needed to achieve impact at scale:

- **Technology:** more affordable and improved ‘first mile’ transportation from farm gate to the aggregation center; improved cooling technology that uses an alternative to charcoal (potentially some kind of pumice); combined drying and freezing technology close to the farm
- **Human:** strategies for increased marketability, especially for processed fruit goods; more value chain specific farmer trainings that probe into the farmers’ specific needs
- **Institutional:** investment in innovation projects close to the farm, rather than at city center; partnerships with local companies as well international exporters
- **Knowledge:** more specific technical data on post harvest loss that establishes on which value chain segment and why post harvest losses occur, which could counter general anecdotes



Photo Credit: www.ifc.org

World Cocoa Foundation — Cocoa Livelihoods Program

Potential big win: *How might we use inclusive platforms to link value chain actors?*

Rationale: *Agricultural value chains involve many actors — farmers, input suppliers, transporters, traders, retailers — that provide different functions and respond to different incentives as they move crops from field to market. Inclusive value chain platforms that enable streamlined communication and planning help reduce inefficiencies that can contribute to post harvest loss.*

Description:

Providing an integrated platform that brings together large buyers, donors, and smallholder farmers, the World Cocoa Foundation and its Cocoa Livelihoods Program (CLP) provides a model for value chain coordination that delivers commercial and livelihood benefits to its partners and participant farmers. Started in 2009, this program, which is beginning its second 5-year phase, aims to improve value chain efficiency, farmer capacity to boost quality and productivity levels, and overall market competitiveness, all with the goal of doubling the incomes of 200,000 smallholder cocoa farming households. Food crops were not the explicit focus at the start of the program; however, realizing the food crops bear significantly on household health and stability, the program will incorporate a food crop focus starting in 2014. Reducing post harvest loss in major food crops grown by cocoa farmers likely will be a specific focus of this expanded program, though details regarding priority crops and interventions are still to be decided.

Working in Cameroon, Côte d'Ivoire, Ghana, and Nigeria, CLP provides a full package of services that include inputs, technical support, and market access. CLP has trained 36 farmer organizations with over 18,000 members, focusing on good governance, financial recordkeeping, and member-based communication. Additionally, over 200,000 cocoa farmers received training in good agricultural practices and on-farm management skills through innovative Farmer Business Schools. Beyond trainings, CLP facilitates access to improved cocoa varieties and agricultural inputs for increasing yield, which is necessary in the cocoa market where demand often outweighs supply. Additionally, CLP established 13 Business Service Centers that enable efficient service delivery for inputs, credit, training, and market information.

WCF and the CLP offer a number of unique features as an inclusive value chain platform that merit mention. First, the program positions the private sector partners as primary implementers of technical services, which serves to capitalize on the efficiency of the private sector, strengthen relationships between the companies and their farmers, and boost companies' awareness of smallholder needs and opportunities. Second, the program maintains a flat structure for negotiation and planning that positions partners, including the donors, as peers and technical experts. This allows the program to have a flexible approach to achieving impact that can adapt as market demands and other factors shift. Finally, the program offers a number of creative incentive schemes — both for the companies and the farmers — that help mobilize action and a commitment to outcomes. For companies, these incentives come in the form of performance-based matching grants provided by the program's main donor, the Bill and Melinda Gates Foundation. The program sets rigorous targets for achieving impact, against which matching funds are allocated on a company-by-company basis. For farmers, incentives such as inputs, access to credit, and technical support are distributed along a tiered system that allocates more incentives as evidence of a farmer's absorptive capacity and market orientation increases. Over the program's ten-year timeframe, CLP expects to have 200,000 farmers receiving the full package of services and inputs across 4 countries.

Resources currently available:

- **Technology:** agricultural inputs such as planting materials and fertilizer
- **Human:** supply chain managers; cocoa processors; input dealers, banks and MFIs; specialized cocoa and food crop extension officers
- **Institutional:** major manufacturers and processors (Hershey, Mars, Mondelez, and Cargill); performance-based grant model; support from the Bill and Melinda Gates and the Walmart foundations (decreasing over time) and the private sector (increasing over time); Business Service Centers;
- **Communication:** face-to-face meetings between partners/donors to develop plans and troubleshoot issues; ongoing dialogue with farmers and other partners to determine best food crop focal points; strong relationships with origin governments
- **Knowledge:** forthcoming independent third party baseline survey quantifying impact and defining targets for performance-based grants; learning agenda for designing food crop interventions; and technical working groups to troubleshoot challenging issues.

Resources needed to achieve impact at scale:

- **Technology:** improved cocoa varieties; improved food crop varieties and post-harvest technologies; and better agro-chemical inputs
- **Human:** expanded capacity of private sector partners to deliver on-the-ground technical services, especially in the food crop arena; additional staff members to support program growth; expanded extension services for farmers
- **Institutional:** technically savvy donors willing to negotiate and compromise with other partners; additional partners with food crop and post-harvest expertise
- **Communication:** Information technology-based platform for sharing knowledge (e.g., on food crops) to partners and expanded network; ongoing dialogue with companies on how to shape food crop interventions
- **Knowledge:** information on market demand, nutritional profile, and potential sources of post harvest loss information and expertise in specific food crops; resources to expand collective learning platforms through digital and social media.



Photo Credit: www.nepad.org

World Economic Forum- Grow Africa

Potential big win: *How might we use inclusive platforms to link value chain actors?*

Rationale: *Agricultural value chains involve many actors — farmers, input suppliers, transporters, traders, retailers, policymakers, bankers — that provide different functions and respond to different incentives as they move crops from field to market. Inclusive value chain platforms that enable streamlined communication and planning help reduce inefficiencies that can contribute to PHL.*

Description:

Challenges associated with communicating and coordinating across the value chain often hinder smallholder farmers' ability to identify and seize market opportunities, as they have to navigate a complex web of actors and transactions. The fragmented nature of agricultural value chains can serve as a disincentive for investment, both in smallholders as critical value chain actors and in the broader enabling environment in which value chains take shape. To address this issue, Grow Africa's country-led partnership platform fosters sustainable investment in African agriculture in alignment with the Comprehensive African Agricultural Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD), which was established by the African Union in 2003.

Developed out of the World Economic Forum's New Vision for Agriculture, Grow Africa brings together national-level decision makers, agricultural companies, and other value chain actors to mobilize large-scale investment in agricultural infrastructure and programming. Organized around national priorities for a specific commodity and/or geographic region, Grow Africa provides an oft-missing interface for government and private sector planning. Notably, this program seeks to establish trust between these parties through information sharing and providing a neutral space for negotiation on issues bearing on market-led agricultural development, such as national-level trade and tariff regimes.

Since its inception in June 2011, Grow Africa mobilized over \$5 billion in investment across the participating countries of Burkina Faso, Ethiopia, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, and Tanzania. This investment is projected to impact over 9.5 million farmers in the next three to five years. The second phase of Grow Africa will focus on moving these commitments into action. In Ethiopia, for example, the Agricultural Growth Project focuses in part on building the investment case for establishing a large-scale sesame hulling plant, which would enable sesame to be packaged for export. Given Ethiopia's status as the world's third largest exporter of sesame, the \$7 million investment is projected to obtain an internal rate of return of 40% and an increase in annual farmer incomes of 17.4% in the first year.

In the long-term, Grow Africa aims to create a continental-wide platform for cross-sectoral collaboration that becomes the standard approach for doing business in African agriculture. While potential barriers to scale exist, such as some negative perceptions of large-scale private sector companies operating in Africa, the energy and enthusiasm generated by the emergence of Grow Africa signal that stakeholders are eager for a fresh angle on doing business in agriculture in Africa.

Resources currently available:

- **Technological:** agricultural infrastructure and innovations meriting investment
- **Human:** support of NEPAD and WEF, private sector actors, small and medium sized enterprises
- **Institutional:** partnerships with 9 African governments and programs based on national plans and regional strategies; over \$5 billion in investment across participating countries; funding for the Grow Africa Secretariat from the US Agency for International Development
- **Communication:** WEF-supported platform for sharing ideas; national/regional agendas for agricultural growth; large convenings that generate energy and serve as a focal point for announcing commitments
- **Knowledge:** analysis of investment opportunities

Resources needed to achieve impact at scale:

- **Technological:** additional agricultural infrastructure and innovations meriting investment
- **Human:** larger number of private sector actors to participate in forum discussions and invest in projects that enable job creation among small and medium sized enterprises and income generation among smallholder farmers
- **Institutional:** increased government standardization (e.g., for transport and logistics) and market-driven policies; larger number of governments with national strategies for agricultural transformation; committed leadership; Grow Africa implementation unit; patient capital that allows for long-term investments
- **Communication:** change in perceptions of private sector engagement in Africa; effectively making the business case for investing in reducing food loss



VP Group (formerly VegPro Group)

Potential big win: *How might we institute national standards to increase quality and reduce PHL?*

Rationale: *Promoting food quality and safety standards not only serves an important prerequisite for exporting produce grown in Africa to international destinations, but it also helps ensure that smallholder farmers and their families fully benefit from high quality, nutritious food grown locally.*

Photo Credit: emerging-leaders.net

Description:

Despite the ever-growing international demand for African produce, complicated and ever-evolving standards and regulations often prevent smallholder farmers from accessing those export markets. With the support of VP Group, farmers serving export markets in Kenya receive training to uphold those regulatory requirements, for which they are rewarded with a guaranteed buyer of their produce. VP Group (VP), a rebranding of the former VegPro Group, serves as a major exporter of vegetables, fruits, and flowers to the United and Europe. Created in 1979, VP is the largest producer and exporter of fresh produce in Kenya, where it owns and operates six farms that employ over 1700 farmers, covering the four major producing areas of the country. Although it produces 90% of its crops on its own farms, VP partners with approximately 700-800 smallholder farmers at any given point during the year. Smallholders are organized into self-regulating groups based on their geographic location that deliver their aggregated produce to a local depot for pickup by VP, which guarantees weekly payments to farmers even when there is no market at that specific point in time.

At the start of 2013, the European Union (EU) put into effect European Commission No. 699/2009, which increased the controls on imports by requiring reduced/zero use of pesticides commonly used by Kenyan smallholder farmers. While the response of most vegetable exporters was to sever ties with those smallholders, VP continued to buy and locally sell the produce no longer accepted in the EU markets while simultaneously investing in farmer trainings on the phytosanitary standards included in the EU regulations. VP has succeeded in developing and implementing the trainings necessary to build farmers' capacity to meet strict and changing standards while also maintaining strong relationships with their smallholder farmers, who depend on the company's continued partnership and investment. Additionally, VP partners with the United States Agency for International Development's Kenya Horticultural Competitiveness Project (USAID-KHCP), to provide farmers with specialized Global Good Agricultural Practice (GAP) certification and transparent pricing information via SMS messaging.

In 2012, the International Finance Corporation (IFC) invested \$7 million in VP, enabling them to expand beyond Kenya's borders. Now operating a 1,070 hectare farm along the River Volta in Ghana and working with over 800 smallholder farmers, VP is exporting additional types of produce that are not grown in Kenya (e.g., chilies and baby corn). Working with the Ghanaian government, VP has formed a joint venture with Air Ghana to ensure quality and standards management of an airside perishables center at the major international airport. Beyond Kenya and Ghana, VP has extended its exporting facilities into Ethiopia with further exploration into Zanzibar (Tanzania). VP aims to continue its growth into new countries, enabling further extension of its expertise in standards management and its commitment to improve the livelihoods of smallholder farmers.

Resources currently available:

- **Technology:** vehicles for picking up produce from local depots; planes and airport setup for maintaining quality throughout the international transport process
- **Human:** thousands of employees who process and package their goods for export; thousands of smallholder outgrowers across countries of operation; trainings on phytosanitary and other standards imposed by Global GAP
- **Institutional:** partnerships with governments, grantmaking organizations (i.e. USAID, IFC), and non-governmental organizations; VP-owned farms as well as access to outgrower farms
- **Communication:** SMS messaging system to communicate with farmers
- **Knowledge:** technical knowledge of changes to export standards and regulations

Resources needed to achieve impact at scale:

- **Technology:** farming technology required for establishing new farms; new export stations at international airports
- **Human:** additional employees (farmers, transporters, processors, managers) to enable expansion of operations
- **Institutional:** additional partnerships with funding organizations to invest in expansion of smallholder development programs
- **Communication:** discussion and collaboration with local community upon entry into a new region (e.g. working with local leaders in Ghana to discuss the implications of the country's informal land ownership system)
- **Knowledge:** understanding of how to best source and maintain new crops that are not grown in other countries of operation



Photo Source: woni.co.ke

Woni Veg-Fru Exporters, Ltd.

Potential big win: *How might we institute national standards to increase quality and reduce post harvest loss?*

Rationale: *Promoting food quality and safety standards not only serves an important prerequisite for exporting produce grown in Africa to international destinations, but it also helps ensure that smallholder farmers and their families fully benefit from high quality, nutritious food grown locally.*

Description:

Maintaining Global GAP (Good Agricultural Practice) standards and complying with European Union (EU) regulations serves as a prerequisite for accessing European export markets for horticulture crops. Specifically, Global GAP upholds a certification system through which farmers can prove their quality and accreditation to international exporters and retailers, thereby helping to establish accountability and trust among buyers sourcing from smallholders. That said, understanding and maintaining the skills and processes to meet those standards requires agricultural knowledge and inputs that most smallholder farmers do not possess. Export companies have a unique opportunity to work with farmers on meeting and upholding standards, providing them access to increased and reliable incomes that result from supplying export markets.

Woni Veg-Fru Exporters, Ltd. is a global supplier of East African produce with a mission of providing high quality, safe produce that satisfies international customers and provides sustainable, increased livelihoods for the smallholder farmers who grow that produce. Woni currently works with 500 smallholder farmers across Kenya and has the capacity of outputting seven tons of processed products per day, resulting from 15 tons of raw material. These farmers are spread across Kenya to ensure that Woni can access crops from varying climatic regions and seasonal calendars.

Woni ensures high quality output by providing both financial and technical support to farmers. To guarantee the standards for certification are met, European Global GAP officers approve local Kenyan auditors to perform checks and evaluations of Woni's sourcing farms. Since auditors only visit the farms once a year, Woni ensures consistent compliance of its producers through more frequent internal checks. Technical advisors work locally with farmers on a daily basis, while the Technical Manager visits each farm once every two months. At the first picking of harvest, the Technical Manager collects samples from farms for laboratory-based testing of Maximum Residue Levels to confirm compliance with EU standards. For farmers not compliant with Global GAP standards, Woni conducts trainings and provides ongoing technical support. Depending on the concentration of farmers in the area, trainings can be one-on-one or in groups of 10 to 70 farmers.

Ensuring farmer attendance at trainings has not been an issue. In fact, farmers often contact the Technical Manager requesting further trainings and notes. Woni contends that this excitement and mindset shift is a result of technical advisors working alongside farmers on a daily basis. The farmers now understand that they should maintain standards not just because Woni instructs them to do so, or to access new markets, but also because it helps assure food safety for their families as well as other consumers. While Woni's has enjoyed success in promoting standards compliance and a mindset change among smallholder farmers, the company's impact remains largely relegated to its 500 smallholder farmers. The company therefore welcomes additional partnership and support for increasing their smallholder sourcing efforts and resulting technical support, such that the number of smallholder farmers complying with Global GAP standards can be widely expanded.

Resources currently available:

- **Technology:** one truck to travel to all regions where Woni's 500 farmers work
- **Human:** approximately 100 staff members including those working in the pack house, one Technical Manager, and technical advisors working daily with farmers; one-on-one, small group, and large group farmer trainings
- **Institutional:** one pack house facility that holds 7 tons of processed product
- **Communication:** longstanding, trusting relationship between technical advisors and smallholder farmers
- **Knowledge:** farmer understanding of Global GAP standards and the benefit of those standards both for export and local consumption

Resources needed to achieve impact at scale:

- **Technology:** more trucks to reach farmers in different regions at different harvest times
- **Human:** larger number of staff, especially Technical Managers (Woni currently has one Technical Manager supporting all 500 smallholder farmers); increased trainings and support materials covering Global GAP standards; partnership with local leaders in new farming communities
- **Institutional:** additional pack house capacity so Woni can source from additional farmers
- **Communication:** local leader communication with smallholders about the opportunity and benefit of sourcing to Woni
- **Knowledge:** identification of new regions for production

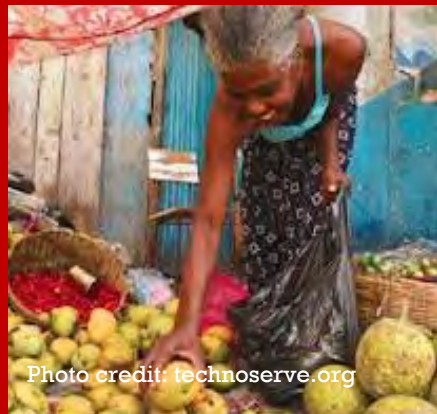


Photo credit: technoserve.org

TechnoServe—Project Nurture

Potential big win: *How might we facilitate bulking and group marketing?*

Rationale: *For smallholder farmers, achieving the large volume of crops required by many wholesale and retail buyers presents a barrier to gaining market access. Aggregation often falls to middlemen who introduce additional layers of transactions in the value chain, which contribute to high rates of loss and low farm-gate prices. Increasing bulking and group marketing—such as through the example given—can improve value chain efficiency and open market opportunities for smallholders.*

Description:

Aggregation is a key strategy for reducing post harvest loss, as it provides a way for off-takers such as wholesalers and retailers to gain centralized access to smallholder produce, which is often highly dispersed. Aggregation proves especially important for perishables like mangoes that must be consumed soon after harvest or transformed into shelf-stable products like purees and juices. Marrying bulking with a ready market for aggregated crops, Project Nurture is a 3.5-year \$11.5 million project funded by the Bill and Melinda Gates Foundation and Coca-Cola to increase the incomes of over 50,000 small-scale mango and passion fruit farmers in Kenya and Uganda. Working back from a specific demand expressed by the market, Project Nurture facilitates an integrated value chain development approach that engages farmers, farmer-based organizations, processors, retailers, and other actors. The ultimate aim of the Project is to aggregate high quality mangoes and passion fruit as inputs into juices and other value added products.

Using organized groups as the entry point, farmers receive technical assistance on good agricultural practices and improved business practices, as well as high quality inputs to support their production efforts. The trainings are instrumental in ensuring that farmers capture the full value from their crops, as well as ensuring the buyers receive the quality and quantity of the product they anticipate. Market service centers serve as a central focus of the bulking and group marketing approach taken by Project Nurture. These centers organize multiple farmer groups into larger bodies, providing a ready source of fresh produce by buyers. They also offer centralized services to farmers, such as for input distribution, dissemination of best practice, grading, and repackaging. While an important resource, the market service centers sit dormant for many months of the year given the highly seasonable nature of mango crops. Determining how these centers might be better utilized in efforts to aggregate other crops presents an opportunity.

To date, Project Nurture has engaged over 53,000 mango and passion fruit farmers in Kenya and Uganda. Experts estimate this number could easily double as long as the project continues. Mango farmers specifically have seen their production costs reduced by more than half, and their marketable volume jump from 36% to 89% in just three years. Project Nurture officially closed in late 2013, though it continues to operate on a no-cost extension through June 2014.

Resources currently available:

- **Technological:** inputs (seeds, fertilizer) that improve quality and quantity of fruit; processing equipment
- **Human:** over 13,000 highland farmers and over 7,000 coastal farmers who have participated in the project; farmer groups willing to aggregate their crops at the market service centers; training in agronomy, best practices, and business skills; multiple local processors that meet Coca-Cola standards
- **Institutional:** partnership with a multi-national company that serves a large scale buyer; market service centers used as aggregation hubs; technical and staff support from TechnoServe; transportation of fruit from farm gate to center and center to processor
- **Knowledge:** farmer understanding of the proper use of inputs and best practices for handling fruits; market demand for mango and passion fruit products

Resources needed to achieve impact at scale:

- **Technological:** transport logistics; better technologies for fruit handling and increasing shelf life; improved cool storage options for raw mangoes, increased farm efficiency
- **Human:** more extension staff in the field to reach a larger number of farmers; sensitization about market opportunities; government and private sector partners to enable expansion of transportation and processing services
- **Institutional:** better access to finance for farmers; consistent weight metrics across the industry; expanded (local) market demand for fruit products
- **Communication:** logistical coordination along the value chain to get fruits safely and efficiently from smallholders to market; mobile tech platform to inform value chain actors when crops are available, in what quantity and at what price
- **Knowledge:** increased understanding of quality standards and processing requirements; understanding of value chain dynamics (e.g., seasons, pricing, varietal preference) by up and downstream actors



Photo credit: snvworld.org

SNV Kenya

Potential big win: *How might we facilitate bulking and group marketing?*

Rationale: *For smallholder farmers, achieving the large volume of crops required by many wholesale and retail buyers presents a barrier to gaining market access. Aggregation often falls to middlemen who introduce additional layers of transactions in the value chain, which contribute to high rates of loss and low farm-gate prices. Increasing bulking and group marketing—such as through the example given—can improve value chain efficiency and open market opportunities for smallholders.*

Description:

Farmers face barriers to accessing markets that include limited business management capacity of producer enterprises, inadequate knowledge in good agricultural practices, and insufficient information on market demand for produce. Understanding these constraints, the SNV Netherlands Development Organisation implements a multi-faceted program aimed at boosting smallholder farmers' access to commercial horticulture markets.

SNV Netherlands Development Organisation is a nonprofit that works to alleviate poverty through increased access to employment and basic services. Working in Kenya since 1967, SNV focuses on pro-poor value chain approaches that target smallholder farmers with the goal of increasing productivity, incomes, and employment. Within the horticulture value chains, SNV performs market analysis to assess opportunities and gaps that hinder effectiveness and efficiency. This analysis demonstrates the need for, among other things, collection centers that facilitate smallholders' bulking of horticulture produce and enhances their ability to access market information and business development services. The collection centers facilitate aggregation for high value crops such as mango, banana, passion fruit, and vegetables for which there is expressed market demand. This market orientation, among other features, has helped achieve positive impacts in terms of increases in buyer procurement rates, farmer adoption of good agricultural practices, improvements in production quality and quantity, and more farmers contracted as out-growers by commercial farms.

To date, SNV has developed many collection centers including 10 managed by local farmer organizations and traders where farmers bulk, sort, and grade produce for marketing, enabling premiums over farm gate prices. The collection centers have established marketing units led by marketing sub-committees that were coached on marketing management including trade negotiation and best practices to successfully engage markets and compete favorably. The result has been an increase in inclusive business relationships between smallholder organisations and large firms, leading to increased prices (on average 30%), stability of markets, and private sector investment in smallholder supply chains through extension services and infrastructure. In addition to serving as an aggregation hub and training center, the collection centers are used as focal points for "crowding in" other value chain services (i.e., extension service providers, financial institutions, and input suppliers), providing farmers more streamlined access to these assets. They also serve as the backdrop for knowledge exchange between farmer organizations and buyers.

These positive outcomes have helped facilitate further change, for instance by attracting the support of local governments and spurring partners such as development organizations (donors and implementers) and county governments to spread this model to other contexts. While this model has great potential for impact at scale for high value crops with clear market demand, SNV cautions the application of this model to crops without consistent market potential (e.g. highly bulky crops). SNV advisors see potential in equipping the collection centers with ever greater capacity in transportation, storage, and value addition technology, especially for highly perishable crops.

Resources currently available:

- **Human:** local staff connections with value chain actors and local development organizations; business plan and management structures for producer organisations; farmers who can collectively meet business volumes; extension officers; network with large firms in the industry for engagements in business to business (B2B) and PPPs
- **Institutional:** 10 collection centers; funding from local government for inputs such as processing equipment; partnership with government agencies (e.g., export authority); engaged buyers including exporters, financial institutions, and agro-chemical producers; local ownership of collection centers; support from development partners (e.g., Embassy of the Kingdom of Netherlands, EU and IFAD)
- **Knowledge:** farmer-buyer knowledge of value chain roles; farmer understanding of market opportunities and requirements to meet demands

Resources needed to achieve impact at scale:

- **Technological:** additional technology for production, storage, and value addition, such as fruit processing plants; expanded network of collection centers
- **Human:** development actors to help assess program impacts, providing input on what improvements can be made; marketing, agronomy and agricultural engineering experts
- **Institutional:** increased investment for program expansion; additional private sector partnership and investment in the collection center model, especially co-investment to expand into new crops
- **Communication:** new ways to communicate project recommendations; approaches to demonstrate the potential for certain crops that do not yet attract private sector investment (e.g., potatoes)
- **Knowledge:** market intelligence; enhanced knowledge base of extension workers to support farmers engaged in collection centers



Photo Credit: unocha.org

East African Growers (EAG)

Potential big win: *How might we improve contract farming?*

Rationale: *Contract farming represents an opportunity to create more direct linkages between smallholder farmers and buyers who off-take food crops. In this way, the distance between the smallholder farmer and the market shrinks, and farmers gain more regular, often more profitable opportunities to sell their outputs. Improved contract farming mechanisms such as the example provided help mitigate the risks that can come from these arrangements, such as side selling (by farmers) and unbalanced leverage (by buyers).*

Description:

Market access poses a serious challenge for smallholder farmers, especially if they are working independently to sell their produce. That said, large-scale companies are increasingly investing in smallholder sourcing schemes, such as through contract farming. These schemes typically work best with high value commodities (e.g., export goods) that provide sufficient margins that merit the provision of inputs and technical support often included in contract farming arrangements. For the past three decades, East African Growers has been a regional leader in growing, processing, packing, and exporting high quality vegetables, fruits, and flowers to European markets. EAG sources much of its crops from out-growers, though the extent of smallholder sourcing varies by commodity. For example, EAG sources about 80% of its mango and passion fruit crop from out-growers, but only 20% of its French beans from out-growers.

In all cases, EAG works closely with its out-growers to enhance productivity and post harvest management practices. EAG actively translates best practices used at the commercial farms to out-growers, such as using crates for packing produce, keeping crops in the shade and out of direct sunlight, and enabling farmers to understand how each step in the production and post harvest process has monetary value. EAG also has invested in packing houses and collection centers for crops to enable more efficient aggregation of smallholder outputs. Sourcing from out-growers enables EAG to cover downside risks of weather variability and crop failure, as they are able to work with farmers from a diverse spread of geographies and climatic zones. Additionally, out-growers enable EAG to source a larger volume of crops than they could produce on their own commercial farms, though consistency of quality and quantity of supply remains a challenge. EAG values long-term relationships with its out-growers given the amount of resources it expends to support their operations. For this reason, EAG focuses investment on lead farmers who then employ and aggregate crops from surrounding farmers. Approximately 80% of EAG out-growers have worked with the company for over a decade.

In terms of taking contract farming to the next level, EAG welcomes partnership with donors and other partners that can help greater numbers of farmers operate efficient, high quality farming businesses. While progress has been made on some crops (e.g., mango and passion fruit), considerable investment is still needed in other crops (e.g., avocado). Making these cross-sectoral partnerships work, however, requires strong market signals that drive change.

Resources currently available:

- **Technology:** inputs and post harvest management tools for farmer use in maintaining best practices (e.g. plastic crates and harvesting nets); vehicles for transporting goods along the value chain
- **Human:** out-grower schemes; lead farmers to grow high quality crops and invest in post harvest improvements such as on-farm collection centers; large-scale wholesale/retail buyers based in Europe; farmer trainings on environmental conservation, green waste, water harvesting and soil conservation
- **Institutional:** funding from the US Agency for International Development to implement post harvest programs and smallholder sourcing schemes
- **Communication:** long-term relationship building with out-growers

Resources needed to achieve impact at scale:

- **Technology:** cool chain technologies / shade covers for transportation from rural areas to Nairobi
- **Human:** daily monitoring of collection centers; expanded numbers of out-growers able to deliver high quality crops
- **Institutional:** better approach for distribution and collection (i.e. more locally controlled collection centers) and the investment for those remote centers; financial support for mini processing centers and mini aggregation centers; funding for additional input supply to farmers
- **Communication:** strategic coordination and value chain development for neglected commodities (e.g., avocado)
- **Knowledge:** better understanding on the part of value chain actors of monetary impact of poor post harvest practice



Ghana Grains Partnership (GGP)

Potential big win: *How might we improve contract farming?*

Rationale: *Contract farming represents an opportunity to create more direct linkages between smallholder farmers and buyers who off-take food crops. In this way, the distance between the smallholder farmer and the market shrinks, and farmers gain more regular, often more profitable opportunities to sell their outputs. Improved contract farming mechanisms such as the example help mitigate the risks that can come from these arrangements, such as side selling (by farmers) and unbalanced leverage (by buyers).*

Photo credit: www.ifdc.org

Description:

Ghana regularly suffers a national shortfall of 200,000 to 400,000 metric tons of maize and other grains. GGP found that value chain development for market access through public private partnerships offered a sustainable way to address this challenge. Specifically, GGP brings together a network of partners—private sector actors Yara (an international fertilizer company) and Wenco (a Dutch and Ghanaian company that specializes in the import and distribution of agro-inputs); the Africa Enterprise Challenge Fund (AECF, which provides matching grant funding); farmers and farmers' association Masara N'Arziki; the Ministry of Food and Agriculture; commercial banks; staple crop buyers and traders; and non-governmental organizations—to mobilize a full value chain approach to boosting the quantity and quality of grains produced in Ghana. Prorustica, an organization focused on building public private partnerships for African agricultural growth, serves as the 'relationship broker' across this network of partners to help maintain momentum and reach targets for impact.

Focused on grains value chains in northern Ghana, GGP aims to ensure a ready market for grain producers through an integrated approach that includes providing: (1) access to affordable inputs throughout-grower schemes and bank-led financing; (2) training on good handling and post harvest management practices; (3) centralized storage facilities; and (4) a guaranteed purchase price for outputs. The program builds on a maize farmers' association called the Masara N'Arziki Association. Farmers join the association by forming joint liability groups in which members take responsibility for the actions of other group members, which helps reduce the risk of side-selling often faced in traditional contract arrangements. The Association purchases the total maize produced by the farmer groups and pays them for the maize supplied minus the cost of inputs received. Yara supplies fertilizer and Wenco supplies hybrid seeds and chemicals. The project has rented four large and eight small warehouses where the maize is initially stored before it is bulked and transported for processing. With inputs and farmer training, outputs have improved from 1.5 tons per hectare to 6 tons per hectare in a matter of years. With the Association now producing 120 thousand tons of maize, big market players are able to purchase from these smallholder farmers. In 2012, the Association was Ghana's largest maize producer with 8,300 farmers on 11,600 hectares of land. Given the "closed loop" nature of the value chain approach used, the program has the potential to scale across various countries and grain value chains. For example, program coordinators are currently evaluating the potential for expansion into the rice value chain in Burkina Faso.

Resources currently available:

- **Technology:** fertilizer, hybrid seeds and chemicals for improved maize yields
- **Human:** partners from Yara and Wenco (private sector input suppliers); the Africa Enterprise Challenge Fund; farmers/farmers' associations; commercial banks; buyers and traders; NGOs; Prorustica (relationship broker)
- **Institutional:** Masara N'Arziki Association; Ministry of Food and Agriculture; rented warehouses for bulking; Yara and Wenco co-financing the association with financial institutions; AECF donation of \$1 million matching grant with an interest-free loan component of \$250,000
- **Communication:** relationship broker to coordinate and facilitate members of the public private partnership
- **Knowledge:** Good Agricultural Practices and market access information for farmers; business mindset focus

Resources needed to achieve impact at scale:

- **Technological:** additional agricultural inputs
- **Human:** additional input providers with clear understanding of roles and incentives in partnership; expanded training for new Association members
- **Institutional:** funding to purchase/rent warehouses; financing institution that can provide short-term working capital for the Association (i.e., credit guarantee/credit enhancement products are necessary at the beginning of the scale up when risk is particularly high); additional funding that, like the AECF funding, has few strings attached and can allow the project to expand quickly; additional buyers that offer clear market signals to farmers
- **Knowledge:** indicative business cases to address thousands of farmers at various knowledge levels, inclusive of clear market signals that incentivize productivity increases



Photo Cassava processing equipment in use in Nigeria; Credit: International Institute of Tropical Agriculture via Creative Commons license

Mapping resources to address PHL across organizations and projects

Gaining a meta-level perspective

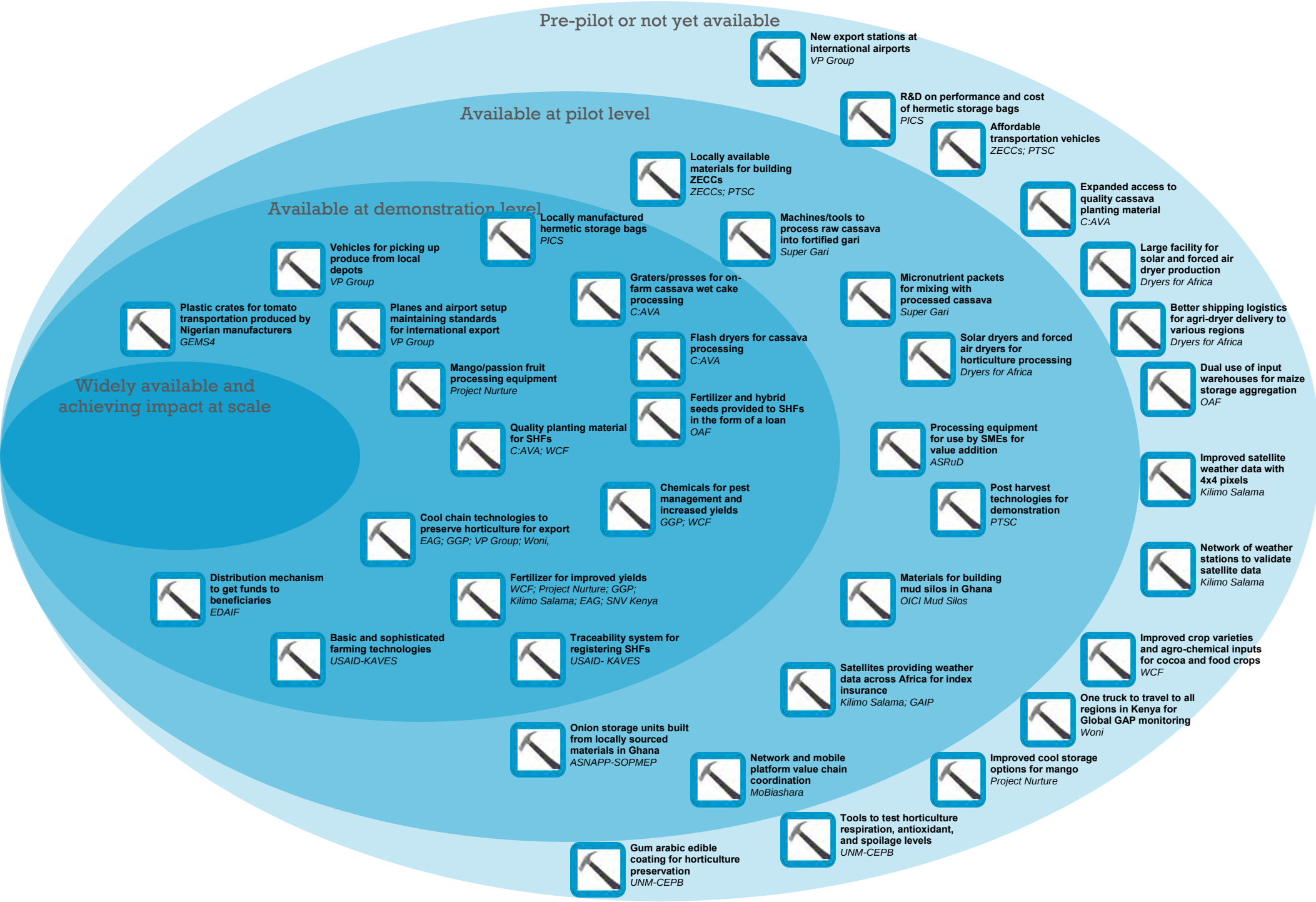
Creating visual maps of resource needs and availability

The cases studies featured in this resource assessment reveal an abundance of resources — technologies, human, institutional, communication tools, and knowledge — that can inform the design of an integrated innovation solution for reducing PHL in Africa. As well, the resources available and needed by the highlighted organizations and projects represent an initial baseline against which to begin constructing an integrated innovation solution. Designing such an integrated innovation initiative merits considering how to best maximize existing assets and build connections among ongoing efforts to reduce PHL. The maps that follow are intended to help the Rockefeller Foundation Waste and Spoilage team do just that. Each map visualizes those key resources emphasized by interviewees as either instrumental to or still needed by the initiative featured in the case study. The resources are organized by THICK categories then they are further arranged in rings based on the scope of their availability, as described in the table below. Please note: the placement of a specific resource into a ring was based on qualitative assessment, and thus subject to further refinement. Additionally, some resources represent those available beyond the scope of a particular case study (e.g., extension workers) and are coded accordingly.

Resource Map Ring	Resources listed in this category ...
Widely available and achieving impact at scale (center ring)	Are readily available in the market, broadly adopted practices, and fully implemented models / policies impacting hundreds of thousands of new beneficiaries / users per year
Available at demonstration level	Are representative of those resources available through established programs with significant (i.e., thousands, if not tens of thousands) of beneficiaries / users
Available at pilot level	Cannot be readily found outside of the organization's / project's direct sphere of influence, and thus are available to relatively small pockets (i.e., hundreds or fewer) of beneficiaries / users
Pre-pilot or not yet available (outer ring)	Have yet to be implemented in the field, or still need to be developed and thus require new forms of investment

TECHNOLOGY RESOURCES

for reducing post harvest loss in Africa



HUMAN RESOURCES for reducing post harvest loss in Africa

Pre-pilot or not yet available

Available at pilot level

Available at demonstration level

Widely available and achieving impact at scale



Partnership with new clients
MoBiashara



Agronomic experts
SNV Kenya



Master trainers instructing farmers in building onion storage units
ASNAPP-SOPMEP



Consultant testing onion storage products and onion storage trainings
ASNAPP-SOPMEP



Onion storage demonstrations in new communities in Ghana
ASNAPP-SOPMEP



Cassava processing staff exchange program
Super Gari



Pilot projects in two regions testing gum arabic on various perishables
UNM-CEPB



Country assessments for program expansion
Dryers for Africa



South African government input on locations for program expansion
Dryers for Africa



Outreach to markets to determine tomato standards
GEMS4



Capacity building for good handling practices at tomato collection centers
GEMS4



Analysis of local resources in mud silo expansion areas
OICI Mud Silos



Increased capacity of young scientists to conduct field/lab research on agricultural technologies
Africa RISING



Expanded actuarial services and project management
OAF



Farmer education on insurance products
GAIP



Extension officers to educate farmers on grant/loan applications
EDAIF



VC-specific farmer trainings
USAID- KAVES



Sourcing from 500 farmers
Woni



Distributors, retailers, and farmers using the info sharing app
MoBiashara



Professors/PhD students conducting research on gum arabic and other technologies
UNM-CEPB



Employees selling tools and packaging materials
PTSC



Thousands of SHF participants
USAID- KAVES



ToT program for tomato transport and handling
GEMS4



Thousands of farmers to build mud silos
OICI Mud Silos



Over 5,000 individual program participants
ASRuD



Thousands of Ghanaian farmers purchasing maize/soya insurance
GAIP



Local vendors selling hermetic storage bags
PICS



Improved hermetic storage bag vendor management
PICS



Master trainers instructing farmers in building cool chain technologies
ZECCs; PTSC



Thousand of farmers /farmer groups providing raw cassava for processing
C:AVA



Flash dryer fabricators for cassava processing
C:AVA



25 SME program participants in Nigeria
C:AVA



Trainings on GAP for cassava
C:AVA



Over 20,000 farmers
Project Nurture



Thousands of SHF outgrowers across countries of operation
VP Group



Support from NEPAD, the private sector, and SMEs
WEF- Grow Africa



Over 1,800 staff members
OAF



Scientists conducting field tests on technologies
Africa RISING



Trainings on entrepreneurship development/business management
ASRuD; GEMS4; SNV Kenya



Demonstration plots comparing OAF and non-OAF maize
OAF



Over 180,000 farmer participants
OAF



Thousands of tomato farmer participants in Nigeria
GEMS4



Flash dryer fabricators for cassava processing
C:AVA



Thousand of farmers /farmer groups providing raw cassava for processing
C:AVA



Local vendors selling hermetic storage bags
PICS



Improved hermetic storage bag vendor management
PICS



Partnership with new clients
MoBiashara



Pre-pilot or not yet available



VC-specific farmer trainings
USAID- KAVES



Sourcing from 500 farmers
Woni



Distributors, retailers, and farmers using the info sharing app
MoBiashara



Over 180,000 farmer participants
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Thousands of tomato farmer participants in Nigeria
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Trainings on GAP for cassava
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25 SME program participants in Nigeria
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Flash dryer fabricators for cassava processing
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Local vendors selling hermetic storage bags
PICS



Improved hermetic storage bag vendor management
PICS



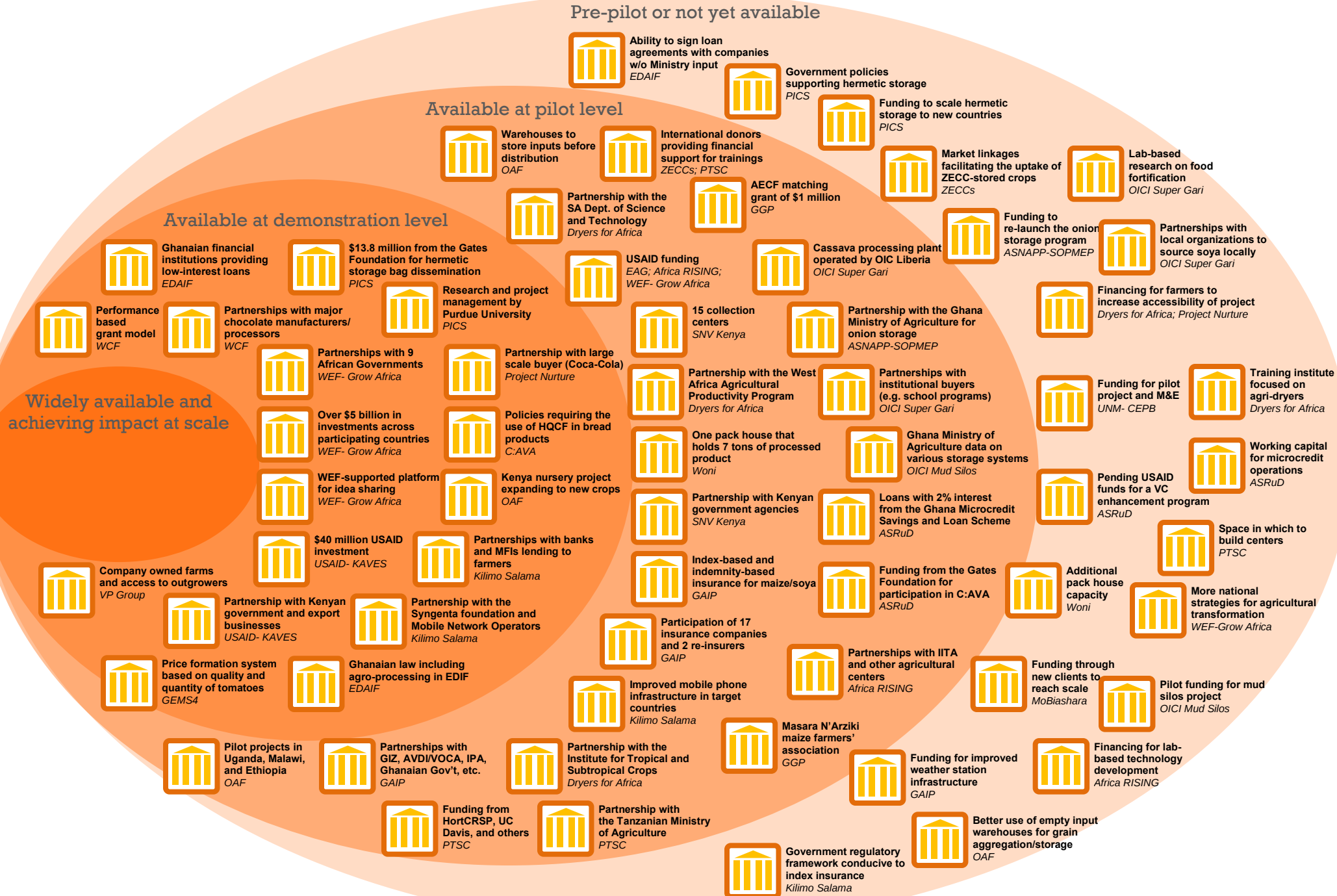
Partnership with new clients
MoBiashara



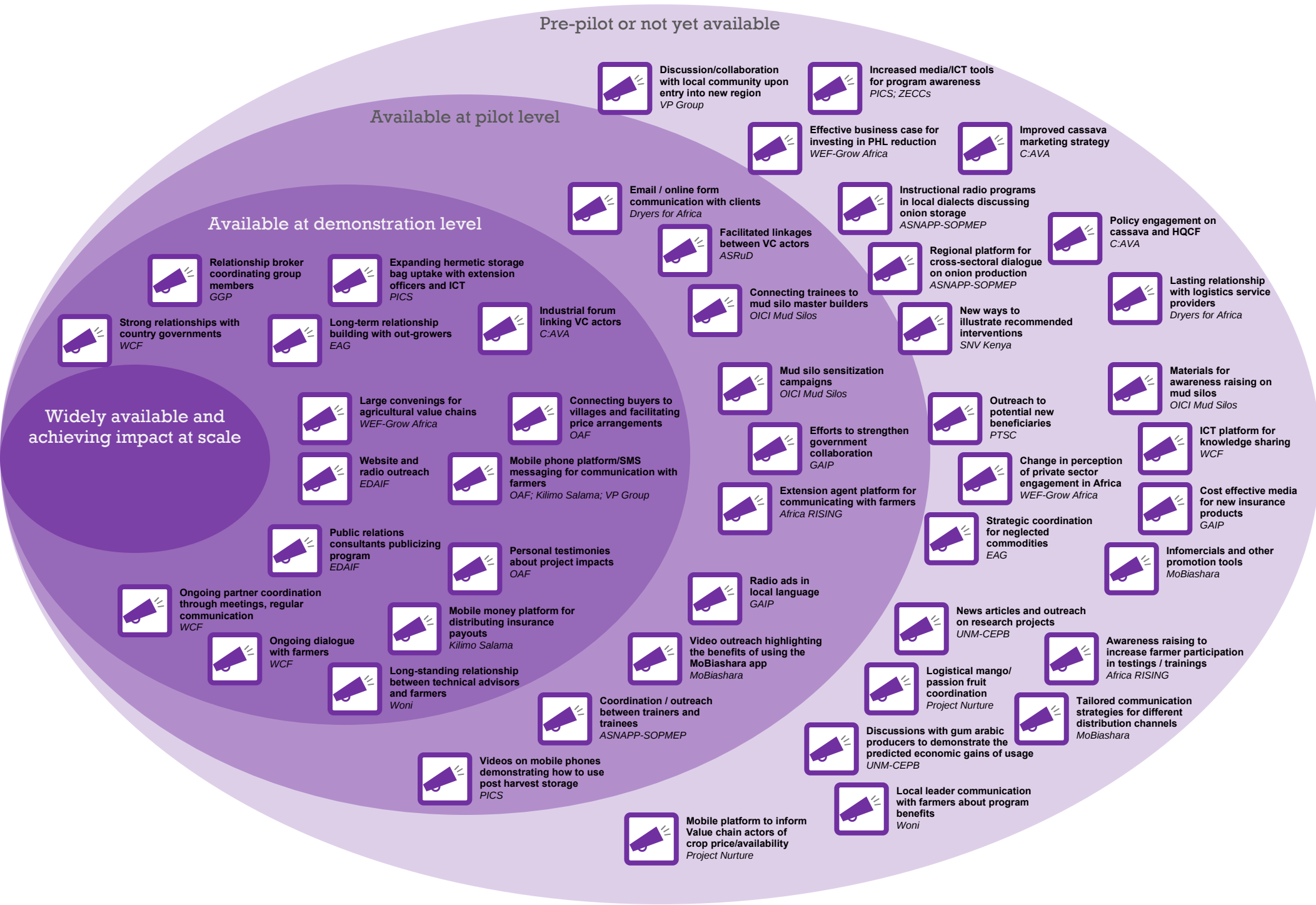
Pre-pilot or not yet available

INSTITUTIONAL RESOURCES

for reducing post harvest loss in Africa



COMMUNICATION RESOURCES for reducing post harvest loss in Africa



KNOWLEDGE RESOURCES

for reducing post harvest loss in Africa

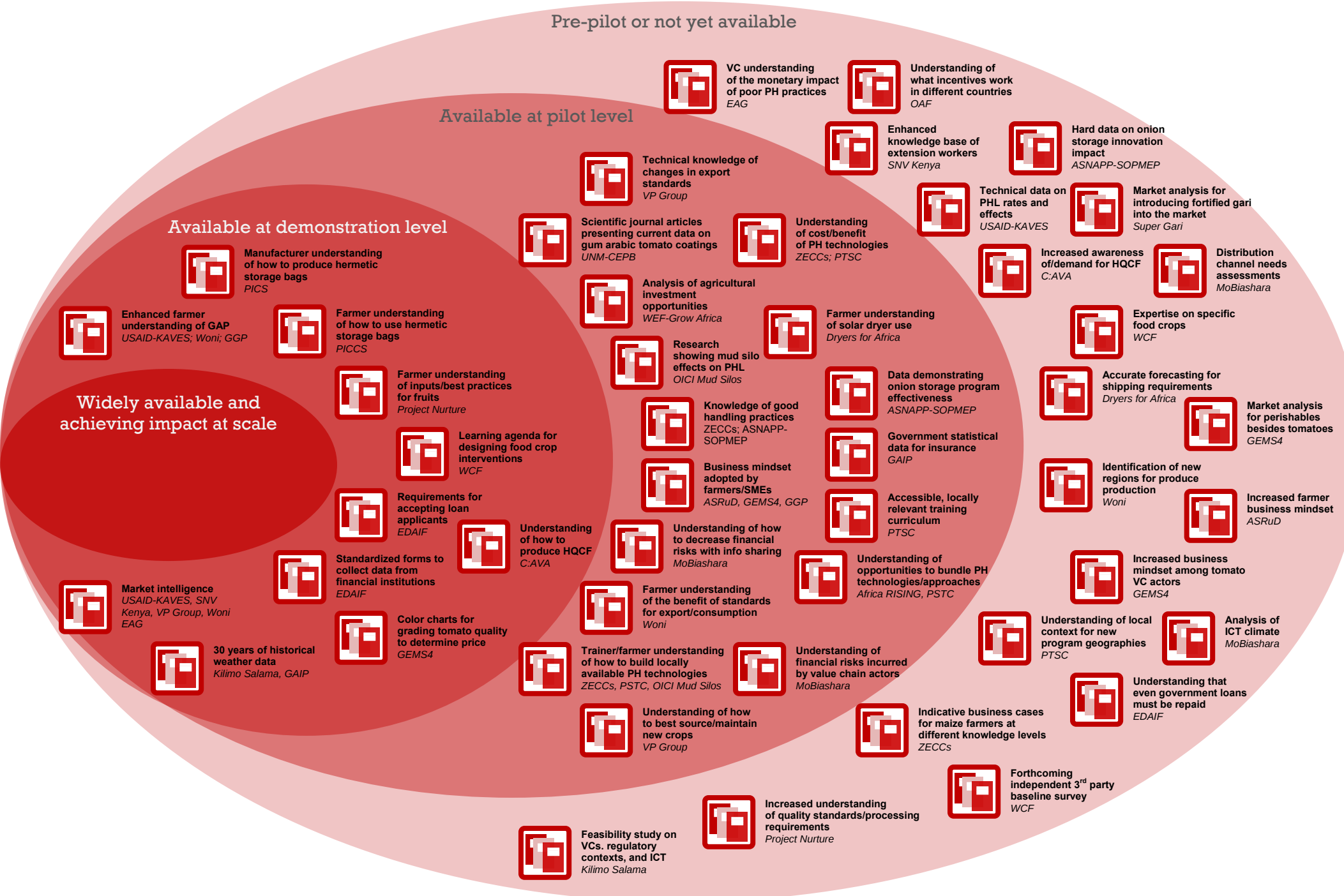




Photo: An agricultural family looks to the future.
Credit: World Bank via Creative Commons license

Enabling more effective
resource mobilization to reduce
post harvest food loss

Conclusions and next steps

Conclusions from the meta-level resource analysis

The resource assessment provides a fruitful opportunity to delve deeply into some indicative case studies highlighting various aspects of the PHL challenge. A number of conclusions from this research inquiry can be drawn that have implications for shaping an integrated innovation strategy for reducing PHL in Africa.

1. **The THICK resource maps show the rich potential of threading the needle between existing efforts to reduce PHL and boost agricultural value chain efficiency.** For example, how might gari micronutrient fortification efforts active in Liberia be translated to cassava processing programs in Nigeria? How might post harvest technologies tested and demonstrated by Africa RISING be incorporated into the training curriculum at the Post Harvest Training and Services Centers? How might export companies active in perishable crops (e.g., East African Growers, VP Group) learn about and test the use of Gum Arabic coatings? These and many other opportunities to bridge the gap between resources currently available and those needed by distinct programs represents low-hanging fruit in terms of reducing post harvest loss. In this way, efficiencies can be maximized, and impact can be amplified. Actions needed entail devising new types of cost-sharing mechanisms, collaboration models, and other approaches aimed at more effectively sharing resources across existing initiatives.
2. **In addition to “threading the needle” between existing resources, efforts are needed to generally increase access to available assets above the baseline recorded by specific programs profiled in the case studies.** In designing an integrated innovation solution to PHL, a reasonable short-term target to demonstrate gains may be devising creative strategies for systematically increasing the resources available (e.g., at pilot level) to a graduated status (i.e., to demonstration level). Better understanding of market “pull” dynamics and user demand for these resources will clarify decision making on availability of resources already in use to reduce PHL in Africa.
3. **As of yet, none of the available resources highlighted in the cases are delivering impact at scale per the definitions given (hundreds of thousands of new users/beneficiaries per year each year).** Even among the organizations and projects demonstrating tremendous progress — PICS bags, GEMS4, Cocoa Livelihoods Program of WCF, Grow Africa, to name a few — interviewed staff acknowledge that more resources are needed to help them reach their full potential. This realization should come as a wake up call for stakeholders aiming to reach audacious levels of impact in compressed timelines: while possible, achieving impact at scale in such an integrated challenge space requires keen attention to factors either enabling or impeding adoption of new technologies, practices, and models proven to reduce PHL and boost efficiency of agricultural value chains.

4. **This resource assessment provides an initial but incomplete evaluation of the full scope of resources available and needed to reduce PHL in Africa.** As noted previously, the 26 case studies featured are but a small percentage of the many organizations and projects aimed at reducing PHL and boosting agricultural value chain efficiency across Africa, and more broadly around the world. Opportunity exists to build on this initial resource assessment, and dramatically grow the inventory of available and needed resources under consideration. Most immediately, this could be done by inviting the other stakeholders active in The Rockefeller Food Waste and Spoilage initiative to complete similar stock-taking efforts based on their ongoing research and outreach efforts. A simple intake form that could be used by these stakeholders follows in Appendix 1.

Shaping integrated innovation solutions to reduce PHL in Africa

All told, many creative, potentially transformative opportunities exist to amplify the global resource base being put to use to reduce PHL in Africa. Moreover, understanding what is available and what is needed – even among a small sample of existing initiatives – offers insight into what an integrated initiative on PHL might comprise, and how its various components might be brought together to achieve what has never been achieved before. To this end, The Global Knowledge Initiative, with support from The Rockefeller Foundation, will convene a high-level “Solutions Visioning” workshop aimed at shaping an integrated strategy for reducing post harvest food loss in Africa. The workshop will draw on the information and insights relevant to the Top Ten Potential Big Wins and the case studies featured in this resource assessment. Expected outputs of the Solutions Visioning workshop include expert-developed solution components that could be brought together into an integrated innovation initiative, and prioritized actors, resources, and activities that comprise those potential initiative elements.

Appendix 1: Resource Stock-taking Template

What THICK resources do we need? Where are they located? How do we connect our efforts to them?	
TECHNOLOGY RESOURCES:	
What resources do we have that can be used to solve this challenge?	What resources do we still need to find to solve this challenge?
HUMAN RESOURCES/TRAINING OPPORTUNITIES:	
What resources do we have that can be used to solve this challenge?	What resources do we still need to find to solve this challenge?
INSTITUTIONAL AND INFRASTRUCTURE-RELATED RESOURCES:	
What resources do we have that can be used to solve this challenge?	What resources do we still need to find to solve this challenge?
COLLABORATION & COMMUNICATION RESOURCES:	
What resources do we have that can be used to solve this challenge?	What resources do we still need to find to solve this challenge?
KNOWLEDGE RESOURCES:	
What resources do we have that can be used to solve this challenge?	What resources do we still need to find to solve this challenge?

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