

# INTRODUCTION



Postharvest losses caused by damage to grains and pulses are particularly evident in local and export markets.

## The importance of postharvest losses (PHL)

Ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture is second among the 17 Sustainable Development Goals (SDGs) set by the United Nations (UN) for the year 2030. To meet this target, much effort has been directed towards increasing food production by 50-70 percent but often to the neglect of an important complementary challenge—reducing food losses and waste.

Most countries of Sub-Saharan African (SSA) experience chronic food insecurity, resulting from problems that include low agricultural production, high food prices, limited access to credit and climate change impacts. Over the last decade, postharvest losses have also gained recognition as a major contributor to food insecurity and low incomes among smallholder farmers. The Comprehensive Africa Agriculture Development Programme (CAADP) of the African Union (AU) responds to this concern in its 2014 Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods. One of the Declaration's main goals is to end hunger by doubling agricultural productivity, reducing PHL by at least half, and lowering stunted human growth to 10% by 2025.

According to a recent World Bank report (2011), 13.5% of the grain produced across SSA is lost after harvest each year. With an estimated value of USD 4 billion, this is enough to meet the annual calorie requirements of 48 million people. The value of total annual food losses in SSA equals that of the region's annual cereal imports and exceeds that of all the food aid it has received over the last decade.

## A focus on postharvest management (PHM)

In 2008, the Swiss Agency for Development and Cooperation (SDC) started supporting PHM initiatives in SSA. These built on the successful POSTCOSECHA Programme Central America, which prompted more than 400,000 smallholder households to adopt the metal silo. Currently, four SDC-funded PHM projects are in their final phase, while one concluded a few years ago. All of these projects have had similar objectives and a shared thematic focus, using much the same approaches. Their common goal has been “to increase food security of smallholder farmers in SSA through reduced postharvest losses at farm and community level.”

Through these projects, SDC together with other donors and stakeholders has contributed significantly to increasing Africa's knowledge base on PHM. Focusing on particular regions or countries, the SDC-funded projects have been implemented by several UN agencies—the Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), and World Food Programme (WFP)—and other international agencies as well as local NGOs and government partners. Three projects under SDC's Global Programme Food Security (GPFS) entered their second and final phases in 2017-2018. In 2017, GPFS decided to phase out PHM as a core thematic focus by 2020-2021.

# The capitalisation of experiences exercise (CAPEX)

The objective of the CAPEX was to compile and analyse key insights and lessons learned from PHM projects. The exercise consisted of two parallel studies, with two teams applying the same methodology<sup>1</sup> to five SDC-funded PHM programmes in eight countries (Benin, Burkina Faso, Democratic Republic of the Congo, Ethiopia, Kenya, Malawi, Mozambique, and Tanzania). HELVETAS – in view of its planned future engagement in postharvest management – played a leading role in developing the conceptual framework of the CAPEX and in implementing the learning process. HELVETAS also coordinated the stakeholder consultation and analysis of learnings in Tanzania, Mozambique and Benin. The outputs include two CAPEX reports and this folder. Their objective is to inform future PHM interventions by SDC partners and others, based on best practices and lessons learned for successful PHM initiatives.

## Main insights from the CAPEX

### 1. Benefits from market systems development (MSD)

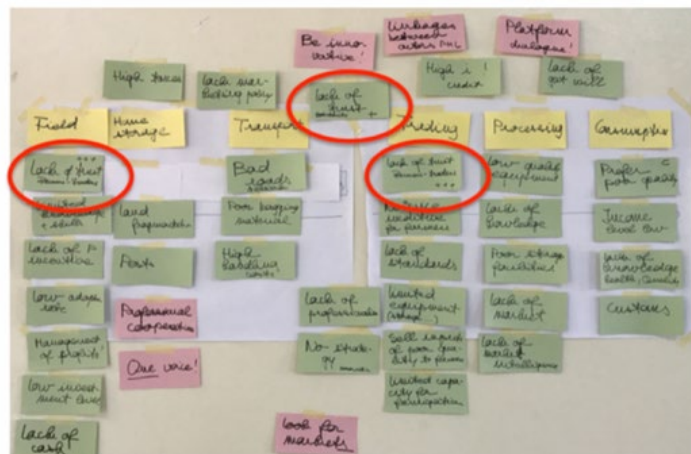
The MSD approach offered important benefits, helping to identify and assess the functions and roles of actors in the PHM market system, design interventions that address the root causes of market failure, and develop PHM business cases. The systems approach also gave project partners and PHM actors greater insight into what worked and what did not.

### 2. Clarity about PHM system stakeholders

Many stakeholders are directly or indirectly involved in PHM, and they are also interlinked, particularly with respect to the quantity and quality of PHL. This is evident, for example, from the shared concern of value chain actors in all countries about the implications of aflatoxin for the quality of grains and pulses.

### 3. Economic and business cases for PHM mainstreaming

Improving PHM to reduce food losses can alleviate seasonal hunger, enhance food quality and taste, improve incomes and livelihoods, lower health risks and limit the ecological footprint of food systems. To mainstream PHM successfully, future projects must seek a good understanding of these benefits (which accrue to specific stakeholders in PHM and to society as a whole) as well as their relationships and relative importance in various contexts and countries. It is particularly important to identify each stakeholder group's motivation for engaging in PHM. This information reveals differences between stakeholder groups in terms of the benefits that different actors perceive and prefer, and is thus highly relevant for inducing change.



A CAPEX workshop in Uganda identified barriers to coordination in the grains and pulses value chains. All stakeholder groups perceived lack of trust (circled in red) to be a negative factor.

### 4. The importance of trust for value chain coordination

Lack of trust among stakeholder groups in the value chain, by straining business relationships, poses a major barrier to improved coordination. Many tools, including several involved in the MSD approach (e.g., multi-stakeholder workshops, information dissemination, and coaching), have proved effective for enhancing business trust.

### 5. No single solution

Because PHM projects are carried out in different contexts and time frames, they can offer no single solution. To achieve successful interventions, project staff must instead work with flexibility toward clear and appropriate outcomes, relying on strong analysis and facilitation, and using combinations of the various assets listed below. Clear economic and business cases are also critical for effective engagement with the public and private sectors.

### PHM assets

The following list of PHM assets or innovation outputs is based on a review of documents from SDC-funded PHM projects and of the PHM literature generally. It also draws on the FAO community of practice (CoP), various interviews, an online survey and field visits. An initial list included over 100 innovations. This was then reworked to eliminate duplication (e.g., similar innovations given different names in distinct regions or projects). The final list records all the innovations found, grouping them based on Kehl and Nano (2014).

<sup>1</sup>See the CAPEX reports.

<sup>2</sup>The list of programmes are given in the CAPEX reports.

## GROUPING

## ASSET

### Farm-level PHM

#### Pre-storage

- Improved/adapted seeds
- Aflasafe<sup>3</sup>
- Adequate timing for planting
- Adequate timing of harvest
- Humidity analysis at harvesttime (using a plastic or glass bottle, hygrometer, etc.)
- Aflatoxin crop analysis (rapid or extensive)
- Improved cribs for drying (e.g., EasyDry M500<sup>4</sup> and solar dryers)
- Low-energy cooling
- Shattering, threshing equipment
- Packaging and transport

#### Storage

- Traditional or improved individual storage facilities (e.g., with gum arabic coating, fumigation or insecticide powder), including improved traditional granaries, such as the wire crib
- Use of pallettes to hold bagged grains in storage
- Options for improved individual storage facilities without pesticides (e.g., metal silos, plastic silos<sup>5</sup>, triple bags, PICS<sup>6</sup>, solar portable, AgroZ bags, GrainPro brand bags<sup>7</sup>, SuperGrain bags<sup>8</sup>, ZeroFly bags<sup>9</sup>, Elite bags, and GrainSafeTM bags<sup>10</sup>)
- Improved collective storage facilities, such as stationary or mobile grain distribution logistical infrastructure (GDLI)
- Sealed plastic tanks/buckets

#### Post-storage

- Market channel analysis
- Market channel segmentation
- Contract farming
- Premium for quality

<sup>3</sup>Aflasafe is a biological product developed by the Nigeria-based International Institute of Tropical Agriculture (IITA). Burkina Faso's Institut de l'Environnement et Recherches Agricoles (INERA) produced a local version (Aflasafe BF 01) in cooperation with IITA, which is distributed in Burkina Faso by Elephant Vert.

<sup>4</sup>EasyDry M500 is a portable maize dryer for smallholder farmers. An open-source technology available for commercial adoption, it lowers maize moisture from 20% to 13.5% in 3 hours, with the capacity to dry three 500-kg batches per day in one location. The technology has been piloted in Kenya, Tanzania and Rwanda.

<sup>5</sup>Metallic silos preceded the PHM projects (FAO 1994). They are a key post-harvest technology in the fight for food security, consisting of a simple structure that allows grains to be kept for long periods and prevents attack from pests such as rodents, insects and birds. If the grains have been properly dried (<14% moisture for cereals and <10% for pulses and oilseeds) and the household metal silo is kept under cover, there are no problems of moisture condensation inside. Household metal silos generally hold between 100 and 3,000 kg. A household metal silo with a capacity of 1,000 kg can conserve the grain needed to feed a family of five for one year. A small or medium-scale farmer with more than one silo can store surpluses for off-season sale when prices are more attractive, thus increasing household income (FAO 2008)

<sup>6</sup>Developed by Purdue University, USA, PICS bags are produced in various countries of SSA. They have two liners fitted inside a woven sack.

<sup>7</sup>Produced by GrainPro, this bag is imported into Kenya duty free. Made with patented plastic technology, the bag must be placed inside another bag and on a pallet.

<sup>8</sup>Commercialised by GrainPro, these bags are made of a single layer of high-density polypropylene, with a thickness of about 78µm. They are used as a liner along with normal woven polypropylene bags.

<sup>9</sup>Product of Vestergaard, Switzerland.

<sup>10</sup>Produced by GrainPro and imported into Kenya duty free, this bag is made with patented plastic technology and placed on a custom frame. It is also called GrainPro Cocoon.

## GROUPING

## ASSET

### PHM delivery (extension) strategies

- Training curriculum on PHM strategies delivered through farmer training centres
- Farmer field schools on PHM
- Training before introducing improved storage facilities
- Opening ceremonies for silos and/or PICS bags
- Pilots and demonstrations
- Awareness raising through loss assessment and visual PHL mapping
- Pluralistic rural advisory services
- Schools that link agriculture and education
- Portfolio of improved storage facilities
- Grants for training
- Multi-stakeholder platforms
- NGO delivery
- Use of media (magazines, radio and television) in local languages
- Use of IT for dissemination and training
- Socio-economic feasibility studies on solutions

### Quality service providers

- Extension communication of products and tools
- Standards for PHM extension
- Appraisal of PHL
- Promotion of technologies and good practices

### Providers of improved handling and storage facilities

- Licensing/accreditation
- Certification of improved PHM facilities

### Mechanisms for private sector cooperation

- **Partnerships with buyers:** premium prices for good quality, direct sourcing, contract farming, central collection and marketing centres, warehouse receipts system, warrantage, improved packaging and transport, extension services, payment in grain, value chain coordination, revolving funds, Purchase for Progress (P4P), etc.
- **Partnerships with storage facility providers for improved quality:** after-sale services, buying facilities, extension services, certification, accreditation, licensing, credit assistance, leasing, payment in grain, revolving funds, etc.
- **Partnership with finance providers** for credit provision, revolving funds, warehouse receipt system, merchandising credit model, extension services, etc.
- Training at key loss points
- Competitive awards in the PHM market
- Distributor-led rural demonstration events
- IT tools (e.g., an IT platform for storage data management and IT tool to pilot agriculture and venture capital)
- Business models

## GROUPING

## ASSET

### Capacity building infrastructure

- Academic education and research
- Private training providers
- FAO community of practice

### Institutionalisation (into policy)

- Inter-ministerial task force approach
- Institutionalisation of PHM in training and advisory services
- By-laws and norms and standards (e.g., for standardisation of hermetic storage equipment)
- PHL data in national statistics
- National multi-stakeholder PHM workshop
- National plan and/or strategy (including taxes and duties)
- Inclusion of PHM in country strategies
- Regional harmonisation
- National PHM focal point
- National government subsidies (partial or full) for local training and/or improved storage facilities
- Policy dialogue and advocacy
- PHM policy briefs
- Technical assistance for governments

### Concepts and resources

- Curricula and training for diverse occupational profiles (extension, buyers, financial institutions, artisans, etc.) in the form of modules, courses, booklets (free or not), etc.
- Subsidies
- Grants and revolving funds
- PHL mapping (FLA reports)
- Business models
- Cost-benefit analysis
- Voluntary guidelines
- Conferences (e.g., an international congress on PHL prevention and Africa-wide PHL reduction congress and exhibition)

## GROUPING

### Project implementation approaches

## ASSET

- Systemic approach to PHM
- Market-driven or market system development (MSD) approach
- Applied research
- Value chain approach
- Enterprise platform module
- Joint-project approach
- Policy dialogue and advocacy
- Technology demonstration and dissemination
- Institutionalisation of PHM at national and regional levels
- Pluralistic rural advisory services
- Joint project/programmes
- Results-based incentives or pull mechanisms
- Pay-for-results approach
- Joint development and review of communication materials
- Working approach and culture
- Focus on outcomes at farm level
- Programme steering committee
- Gender inclusion
- Focus on outcomes for both female and male farmers
- Programmatic approach<sup>11</sup> (with support from SDC)
- Improved FAO food loss and waste methodology and dissemination
- SDC disbursement flexibility and review planning
- Partnerships
- Targeting beneficiaries

Sources: **Authors**

<sup>11</sup>Programme-based approaches are a form of development co-operation based on the principles of coordinated support for a locally-owned development entity, such as a national development strategy, a sector or thematic programme or one within a specific organisation. Programme-based approaches share the following features: i) leadership by the host country or organisation; ii) a single comprehensive programme and budget framework; iii) a formalised process for donor coordination and harmonisation of donor procedures for reporting, budgeting, financial management and procurement; iv) efforts to increase the use of local systems for programme design and implementation, financial management, monitoring and evaluation (OECD, 2008).

# KNOWLEDGE MANAGEMENT AND DISSEMINATION FOR PHM



According to a project stakeholder, hardly any information on PHM was available at the start of the projects analysed during this CAPEX. Nor was there much awareness of the importance of PHM in SSA. In response, the projects funded by SDC gathered a wealth of **information and data** through studies, exchanges, desk reviews and on-farm research. This activity continued throughout the projects, contributing to a wide range of studies and materials, including manuals, fact sheets, posters, training manuals and videos.



An Ethiopian farmer presenting PHM solutions.

Knowledge dissemination proved most successful, contributing to increased awareness of PHM in SSA, when the information materials were produced, adapted, and validated through a **collaborative and inclusive multi-stakeholder process**. The knowledge objects created or adapted in consultation with researchers, extension agents, private sector actors, and training officials and then translated into local languages proved **relevant** and were **widely used**.

Rural settings present special challenges for knowledge dissemination. Because of the great distances involved, reaching farmers in these areas requires different distribution strategies from those used in more densely populated urban areas. To this end, the projects used a variety of communication channels, ranging from mass media to interpersonal contacts, including extension agents, private company representatives, artisans, farmer-to-farmer discussions, and local leaders serving as champions. The projects also relied on modern technologies, such as SMS and web-based communication. The use of **diverse strategies** to channel similar messages in a timely manner accounted for the projects' **success in disseminating information and increasing awareness**.



Smallholder farmers in Tanzania demonstrating the benefits of a metal silo to store grains.

Farmer organisation also proved to be a key factor in knowledge dissemination. **Organized farmers were easier to reach and communicate with than individuals**. Farmer groups served as an effective platform to introduce innovative PHM solutions.

The projects' awareness raising and training activities addressed **gender roles and household responsibilities** in PHM and food storage for home consumption and sale. Extension workers, project staff and agro-dealers, for example, made more progress in raising awareness when they used gender-sensitive communication (e.g., through local radio) to market their services and products.

Project stakeholders noted that **vocational and academic education** is also an effective means to disseminate knowledge. Knowledge holders during this CAPEX process highlighted the importance of including PHM modules in the curricula of vocational training for extensionists, incorporate PHM standards into national compendia and use academic PHM modules in university courses on agriculture.

The projects attempted to disseminate knowledge more widely via the PHM Community of Practice (CoP) hosted by FAO and via WFP's Global Post-harvest Knowledge & Operations Centre (KNOC). The success of such efforts depends on **clear objectives** for the platform as well as **ease of access and navigation**.

Given the diversity of materials in **different languages** and countries, setting up a **common knowledge management system** proved difficult. Instead, individual projects managed the knowledge they had created in various repositories, files and libraries. The CoP should have provided a central repository for all information on PHM but did not fully achieve this aim within the projects' lifetime.

## Conclusions

The PHM projects **increased awareness** among policymakers, extension workers, researchers, private sector actors and producers about the importance of PHL and PHM strategies. The online survey conducted during the CAPEX revealed important shifts in perceptions about PHM. As shown in the diagram, survey respondents perceived a greater understanding that PHM must address both the quantity and quality of food losses and follow a systemic approach, based on multi-sectoral and multi-actor strategies. In general, SDC-funded PHM projects have succeeded in communicating and building awareness about PHL and have opened various pathways to innovation.

PRINCIPLES OF THE BELLAGIO DECLARATION AND PERCEPTION OF THE CURRENT SITUATION BY THE ONLINE SURVEY RESPONDENTS



Changes in perceptions with regard to Bellagio declaration principles.



Producers, agro-dealers and members of a farmer association discussing PHM solutions in the Democratic Republic of the Congo.

Several projects, however, achieved less success in creating awareness that MSD approaches are more effective than technology promotion to achieve sustainable innovation. In an ideal market system, **agro-dealers** play a key role in **disseminating knowledge**. To sell more products and increase market share, they need to identify innovative solutions that appeal to producers but are also profitable for themselves. All of the PHM projects assisted agro-dealers in building awareness, and they even supported marketing campaigns (via print media, leaflet, radio and in some cases Television) to trigger demand for solutions. The idea was that private sector actors would eventually take over such activities, investing their own resources and capacities in marketing. They will do so, however, only if they have a **sound business case**, built on accurate cost information and knowledge of the potential market. Businesses need to do well in doing good.

One cannot underestimate the importance of **cultural and historical** factors for successful communication. At the start of the projects, farmers believed that **PHL could not be avoided**, or they did not consider these losses important enough, compared with other constraints, to warrant changes entailing risk. Farmers further observed that these losses have always occurred and in the past efforts to reduce them have received less priority than increased production. In order to change such perceptions among producers and policymakers—and then change their behaviour—communication must be ongoing, and messages must be repeated in a coherent manner. Innovation thus requires long-term knowledge dissemination, using multiple channels and relying on champions, pioneers and first movers to help achieve massive uptake.





# EFFECTIVE ADVOCACY TO SHAPE PHM POLICIES



Farmers, local government officials and private sector representatives attending a PHM event in Tanzania.

In 2008, when SDC started funding PHM projects in SSA, few national agricultural policies or strategies gave priority to PHL for boosting food and income security. In most countries of the region, agricultural policies focused on increasing production rather than reducing PHL. This situation has changed, so that today elected leaders and senior public officials are well informed about PHL and have designed strategies to reduce losses, backed by national and regional policies. SDC-funded projects have advocated effectively for introducing PHM into national policy development and have also helped shape the regional policy dialogue. Countries have implemented new policies to varying degrees. Kenya, for example, has action plans and strategies in place; while Tanzania has not yet translated policy change into action, and in the Democratic Republic of the Congo, a draft PHM policy has yet to receive official endorsement. This section addresses key success factors in advocacy to shape PHM policies.

One such factor is the facilitation of **multi-stakeholder policy** dialogue at the national level. This approach has helped position PHM in policymaking, resulting in either standalone policies or the integration of PHM into current policies. Involving all relevant stakeholders early in the process has **helped create space for learning and knowledge sharing**. This has also provided the building blocks for a solid base of support for policy change and ownership of policy development. This sense of ownership is reduced when the policy dialogue does not include all relevant stakeholders and when by-laws and strategies are drafted mostly by external consultants.



A farmer showing the quality of her grains after storage.

Another obvious success factor in shaping policy is **strong political will**, which can be improved through effective advocacy. If the political will to implement new strategies is lacking, however—or if the electoral cycle disrupts the policy process—then funding to develop or implement the policies will not be allocated.

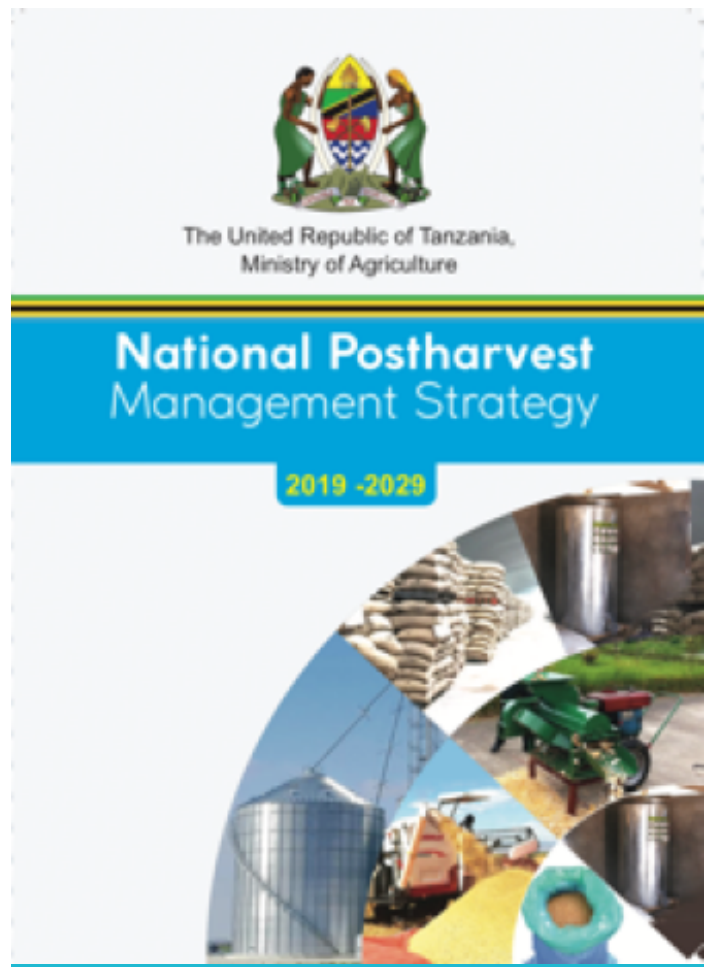
Advocacy and policy development must take place at both the regional and local levels to ensure success. **Regional politics has influenced decisions about PHM in SSA.** Such decisions were shaped not only by PHM findings from countries but also by the AU, which recognized PHM as means to strengthen food security. Under the 2014 Malabo Declaration, AU Member States are committed to implementing measures that reduce PHL at the national level. This has undoubtedly contributed to strong government ownership of those measures.



Ethiopian farmers participating in a discussion of PHM policies.

However, it is difficult to gauge success in their implementation, since many AU Member States face problems in reporting PHL data.

Project stakeholders have also worked hard **to share PHM experiences** with other institutions, resulting in the dissemination of PHM concepts beyond project areas. The projects alone could not have achieved the results we see without the **involvement of regional institutions.** The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), for example, played an important role at the local and regional levels, using its research and advocacy network to disseminate PHM and related policy messages to other governments and policy stakeholders in the region. During the network's Regional Policy Dialogue in Maputo (November 2018), PHM figured prominently, with over 200 experts attending from 15 countries. Sharing experiences under PHM-SSA with a wider audience through FANRPAN and the African Forum for Agricultural Advisory Services (AFAAS) has raised awareness and promoted action.



To advocate and shape national policies that affect farming communities, it is also essential for **local government and rural communities to be involved.** In many countries of SSA, local governments are decentralized and focused on local economic development, giving high priority to the food security and livelihoods of farming communities. Local governments also support community participation and the use of local resources. In all the PHM projects, representatives from sub-national government institutions took part in training and became advocates for PHM. **Involving, informing and facilitating the engagement of rural communities** in policy dialogue is an effective way to advocate for policy change at the local level.

The projects shared **research and study results** on PHL, and referred to these regularly in policy dialogue and policy briefs. Evidence-based materials proved **useful to governments** and other stakeholders, contributing to more relevant and effective policies. Efforts to strengthen the capacity of policymakers and public officials fostered the inclusion of gender and climate change in policies and by-laws. The projects have made good use of specific assets to foster commitment to PHM amongst policymakers. **PHL mapping**, for example, not only increased awareness of the issue but willingness to change policy.

## Conclusions

While all of the key success factors described here are necessary, **political will is the overriding determinant** of success in shaping and implementing public policies on PHM. Ownership of the policy process goes hand in hand with **political commitment and accountability**. One way to ensure ownership of policies and commitment to funding them involves providing governments with demand-driven support, such as reporting of accurate data on PHL. Where policy ownership and commitment are evident, the selection of target countries should be based on official requests for support of policy development.

This CAPEX concluded that **SDC-funded projects contributed effectively to building momentum behind PHM across Africa**, as expressed at the 2nd All Africa Postharvest Congress and Exhibition (held in Addis Ababa, Ethiopia) and elsewhere. Through knowledge dissemination and advocacy, partners in these projects played a crucial role in bringing PHM to politicians' attention.



A farmer association, named **Femme Debout pour le Développement**, participated in PHM activities in the Democratic Republic of the Congo.

The success of the PHM movement in SSA bears witness to the dedication and effectiveness of project partners. The PHM projects proved to be timely, winning support from governments focused on transforming subsistence agriculture into commercial production. This shift has clear implications and creates excellent opportunities for PHM, implying that farmers' output has value and requiring PHM to take into account quality issues.

The **political and economic** context influences perceptions about the importance of PHM and determines opportunities to shape PHM policies. Insecurity and conflict, for example, and the resulting massive displacement of people, create pressure to increase local production in countries that host refugees, leading to less priority for PHL.

SDC-funded projects have given rise to a PHM movement in all the countries where they were active. During the final CAPEX learning workshop, held in October 2019, participating institutions were asked to present on how they will maintain this movement. The response was overwhelmingly positive. Government representatives said they will continue to advocate for funding of PHM policies and for action where policies have not yet been endorsed. Some NGOs said they had already secured funding from other sources, and private sector actors promised to continue investing in marketing technologies, based on sound business cases. Such actions guarantee a place for the PHM movement in the agricultural policy landscape.

2016

MoA acknowledges proposal to develop strategy, MoU signed with MoA, taskforce established incl. representatives of MoA, Helvetas and ANSAF

2017

Zero draft shared in TPMP annual general meeting for consultation, opinions collected in 6 zonal meetings (supported by AGRA), "first draft" shared and endorsed by MoA management Team.

2018

Draft strategy expected to be expected to be shared for wider stakeholder validation incl. other Ministries and donor communities early 2018 before being finalised & approved by MoA mid 2018

2019

The NPHMS approved mid 2019

*Timeline for the development of a national postharvest management strategy.*

## Some do's

- In advocacy and policy work, engage at all levels, ensuring the participation of local governments as well as rural communities and seeking support from national and regional organisations.
- Establish and engage multi-stakeholder platforms for effective policy dialogue.
- Do not push a project agenda when engaging in advocacy and shaping PHM policies but rather focus on building good relations and keeping ownership of policy development in the government.
- Encourage evidence-based policy dialogues by regularly sharing research and study results and by using policy briefs to inform government and other stakeholders.
- Help governments monitor PHL and ensure that these losses are reported to the Biennial Review Report of the AU Commission on the Implementation of the Malabo Declaration.

# INSTITUTIONALISING PHM



All PHM projects have had the institutionalisation of this approach as an implicit objective, acknowledging weaknesses in human and institutional capacity as well as gaps in the regulatory framework. These shortcomings account for limited support of national regulatory and policy efforts to reduce food loss. In response, the SDC-funded projects have focused on embedding PHM in policy instruments and public institutions, giving less emphasis to private organisations and other non-public actors. Project efforts to institutionalise PHM began with whole grain and pulse systems, using a combination of interventions, approaches, and tools and following an MSD approach. These efforts have taken various forms within different organisations, achieving different degrees of institutionalisation within the system generally and in particular organisations. The CAPEX further confirmed that the system requiring attention does not consist only of postharvest practices and technologies but the whole market for agricultural outputs and inputs as well as its accompanying functions and institutions. In addition, the CAPEX highlighted that successful PHM strategies require a clear and common vision of what institutionalisation is about. The challenge is to move from constant pressure for increased agricultural production to better management of PHL and from the loss of quantity to also include the loss of quality.



**Maize is very sensitive to aflatoxin, with effects that are not always visible. Photo by: International Institute of Tropical Agriculture (<https://flickr.com/photos/iita-media-library/10851911984/>) / CC BY-NC-SA.**

Several factors influence the success and duration of institutionalisation. The first, already mentioned, is the system to be considered. All the stakeholders playing a direct or indirect role in the grain and pulse value chains must be included in order for PHM to be institutionalised successfully. The emerging aflatoxin

threat in almost all CAPEX countries demonstrates how some elements of the system can change over time, requiring projects to adjust. Aflatoxin was their main reason for factoring loss of grain and pulse quality into PHM.

Leadership is another factor that strongly influences institutionalisation. Leaders' commitment and support are critical for organisations aiming to make change happen. To this end, the project staff must be able to select the right partners from heterogeneous stakeholder groups.

Institutionalising PHM also depends on capacity and willingness to invest. The CAPEX showed that successful pioneers in selling post-harvest technology were those who already had a business and wished to diversify it through an established marketing channel—not those intent on creating a new business. Lack of capital may also be relevant. Access to finance from banks or in the form of advance payments from contractors may reduce this constraint.

## Box 1

Partnerships with PHM champions are important for overcoming resistance to change or speeding the process. These are leaders or other individuals who foster change by incorporating PHM into their organizations and by helping spread the word within the system. A former project coordinator, for example, started developing a university course on PHM (see box 1). Two other requirements for reducing resistance to change are increased awareness of PHL and a better understanding of stakeholders' needs and preferences. PHL mapping has proved to be a powerful instrument for establishing the location and extent of losses. Stakeholders must perceive gains from the change, hence the need for organisations to have a business case and for the public sector to have an economic case for change. The gains may differ between stakeholder groups. For example, women farmers, whether as household heads or farmers' wives, cited two main reasons for institutionalising PHM. First, the taste of grains and pulses remained the same during storage when they used hermetic bags and/or silos, since the stored grains no longer required chemical treatment. Second, once the women acquired hermetic storage technology, they were freed from the burden of guarding family grain and pulse stocks and of building or maintaining traditional storage structures. Businesses principally gain income, among other benefits. These can take the form of reduced business or price risks through diversification into a new activity, service or product. Diversification may further improve the workload in production and/or marketing throughout the year, since demand for various products or services might differ.

Demand for hermetic storage technologies (and services), for example, is highest just before and during harvest over about 2 months. Evidence underlines how critical it is for various stakeholders to correctly assess their business case. An importer engaged in PHM, for example, incorrectly estimated the selling window, leaving him with a stock of hermetic bags for several months and tying up financial capital.



**The availability of different hermetic storage facilities allows for more inclusiveness. Here a plastic silo.**

Engaging early on with the public sector at various levels offers clear advantages. At the national level, this can foster collaboration between ministries, which is critical for institutionalising PHM. The emergence of aflatoxin in grains and pulses is a case in point. To cope with this problem required collaboration, which served to drive the institutionalization of PHM. In some countries, the Ministry of Education showed interest in PHM as a tool for improving children's health. A further reason for engagement with the public sector early in the project is high levels of staff rotation, which hinder the project's efforts.

## Box 2

Multi-stakeholder meetings have proved to be a powerful means of fostering change at the system level. They help raise awareness of PHM and also increase trust among participants. These meetings proved especially useful for improving coordination of the grain and pulses value chains. This better enabled value chain actors to negotiate and agree on quality standards. The effectiveness of such meetings depends on skilled facilitation to stimulate engagement and building trust as well as sufficient resources, particularly in countries where participants are compensated for travel and lodging.

## Box 3: PHM champions in action

The director of a primary school in Kenya heard about metal silos and decided to acquire two for the school canteen. At first, she bought grains and pulses through traditional public procurement. Then, she decided to ask parents to provide these staples instead of paying school fees in cash. Even parents from marginalised families got to see the silos and began asking questions about them. The director usually asked boys to help fill the silos. Discussions during the CAPEX visit emphasized how the silos can be used to teach children about nutrition, while raising awareness of PHM among their parents.

The former coordinator of a PHM project in Burkina Faso decided to create a course on PHL, building on new knowledge the project had generated. Since the course's establishment in 2016-2017, this topic has been the subject of several MSc theses. Students had the option of writing their theses within the course creator's institution. The course also helped reach a common definition of PHL within and outside academia. Before the project, academics had considered only the losses in farmers' fields.

Choosing the right combination of approaches and intervention strategies is critical at the project level. Adaptive management is also important for enabling projects to respond to changes. This requires strong leadership and a common vision of project impacts and flexibility.

## Conclusions

- PHM should address both the quantity and quality of grain and pulse losses.
- Institutionalising PHM is not only about post-harvest practices and technologies but about embedding the approach in **grain and pulse market systems**, including all value chain and supporting actors.
- Institutionalising PHM requires the participation not only of the public sector but of **all relevant stakeholders**. Participation at the individual, institutional and system levels is essential for institutionalisation to be successful and sustainable.
- Institutionalising PHM within the system takes **time**, involves careful coordination at the organisational level, and requires change in values and behaviour with respect to agricultural production, storage, marketing and losses.
- Organisations have **different degrees of leeway** for institutionalising PHM. This depends on their knowledge, preferences, ability, leadership, normative consensus and other factors. Most countries in SSA have only limited resources for rural advisory services.
- Increased **awareness** of PHM is necessary but not sufficient for institutionalisation. Value chain actors must also gain opportunities to act on their new awareness and knowledge.
- The wide portfolio of hermetic solutions contributes to **greater inclusiveness**. PICS bags, for example, are readily accessible to small-scale farmers.
- The choice of an **entry point** for institutionalising PHM depends on the socio-economic and political context.
- Clear and convincing **business cases** for the private sector and **economic cases** for the public sector are key prerequisites for institutionalising PHM.



### Box 4: Guaranteeing the quality of technology

Accreditation and certification may have significant impact on policy decisions and are thus important for institutionalising PHM. In Ethiopia, for example, artisans are accredited, with the government covering the cost. The private sector can also easily provide accreditation. It already certifies PICS bags in all countries where there are available, and this forms an important part of the business case.

## Some do's

- Clearly differentiate the **PHM system** from postharvest practices and technologies. They are not the same!
- Define **clear and measurable outcomes** that give the project flexibility. These must also be realistic, based on an understanding of stakeholders' interests. The private sector, for example, is motivated more by its own interests than by society's concerns or by the need to reduce negative externalities.
- Use approaches and tools that are not too complex and are tailored to country needs.
- Formulate a **clear exit strategy**. Institutionalisation is a process or movement. Any PHM project should aim to create this movement and encourage it to develop and mature during and after the project.
- Identify and cooperate with **champions and leaders**. These can be organisations or individuals willing and able to foster change.
- Make **realistic predictions** about system changes. To this end, the project must gain a clear understanding of what motivates individuals and organisations to change.

- When cooperating with the private sector, **choose your partners carefully**. The CAPEX showed that this cooperation is more successful when projects partner with well-established input suppliers and output traders who have the capacity to take risks, are willing to change and diversify, and are able to assess new clients, specifically for:
  - Metal silos: Training well-established artisans, who then diversify their products and income, gives better results than partnering with young individuals trying to create a metal silo business.
  - Hermetic bags: Medium-scale distribution agents who already have distribution channels are able to test new products, especially if they also have a proven capacity to diversify.
- **Engage early** on with public and private sector actors, who all form part of the PHM system.
- Aim for **government endorsement** of the PHM strategy documents.



### Box 6 : A Learning workshop

Fifty representatives of partner organisations in an SDC-funded PHM project in SSA gathered for a learning workshop in Arusha, Tanzania, during October 2019. From governments, the private sector, NGOs, academia and the United Nations, participants took stock of the project's successes and constraints, and assessed the factors that positively or negatively influenced PHL reduction.

The results were encouraging. Participants agreed that PHL can be significantly reduced, given reasonable investment, government commitment, and private sector engagement. Several proven and affordable technologies are available for this purpose and can be promoted through appropriate approaches and business models aimed at achieving systemic changes in post-harvest market systems. This has notable side benefits with regards to food safety and security. Lessons learned from the meeting will help reduce PHL, contributing to SDG 2 (Zero Hunger) and also helping to reach the goal of the AU's 2014 Malabo Declaration to halve PHL by 2025.



Well-established input suppliers are in a better position to enter a new market as with PH technologies

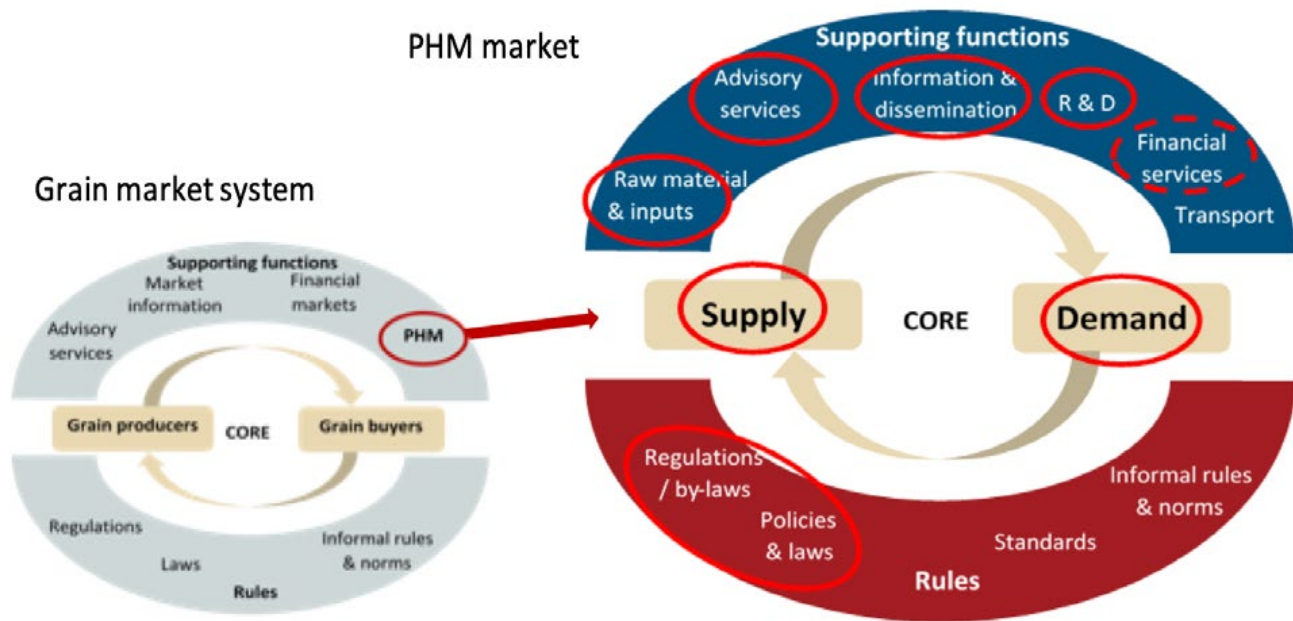
### Box 5: PHM and education

Aflatoxin emerged unexpectedly during the PHM projects, resulting in the imposition of export bans on several countries. Other dire consequences included deaths from toxicity, particularly in areas where human diets depend on aflatoxin-sensitive foods, such as maize. In some countries, this problem prompted the Education Ministry to take an interest in PHM. Its aim was to reduce aflatoxin ingestion in children by storing food for school canteens in hermetic bags and/or silos.





# PHM MARKET SYSTEMS



Most agricultural development initiatives in SSA aim to increase grain and pulse production. One result is wide neglect of PHM, which provides essential support for grain market systems. To strategically implement PHM interventions, different SDC funded PHM projects applied a market systems development (MSD) approach. As shown in the figure, this approach examined the supply and demand for PHM services and technologies, which constitute the core value chain of the market system.

The MSD approach offered projects a systemic way to address specific challenges and aspects of the PHM market system, as distinct from the many challenges posed by the broader grain market system. The approach helped projects identify and assess the functions and roles of actors in the PHM market system, design interventions to address the root causes of market failure and develop PHM business cases. The systems approach also gave project partners and PHM actors greater insight into what worked and what did not in the system. In practically all countries, the projects faced from the start:

“Our core business is roofing and iron tubes. We deliver large orders with upfront payment. We can deliver galvanized sheets to make metal silos, but agro-dealers are too small and need to find wholesalers who can buy in bulk from us and store.” - Mr. Hemant, GM MMI Kiboko Steel, Mozambique

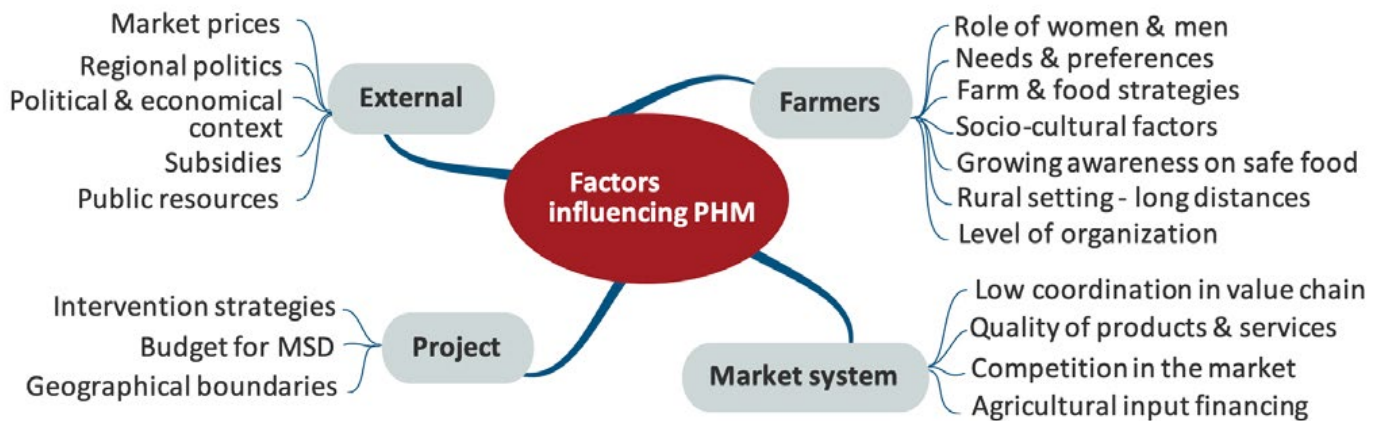
- A lack of demand for improved PHM, due to limited awareness amongst farmers, and hardly any demand for postharvest technologies, of which there were no supplies in the core value chain
- A lack of or weak supporting functions, such as public or private advisory services for PHM, and a lack of raw material and inputs
- No supporting PHM policies and regulations



Making metal silos was a new experience for local artisans. Those able to buy inputs such as metal sheets, can now produce and sell the silos directly to farmers. In the case of small-scale artisans, agro-dealers place orders with them, based on farmer demand, then provide the metal sheets and pay the artisans for their labour. Such arrangements for financing input supplies are common.

## Success factors

Success in changing a PHM market system depends largely on the design and approach used, although many other factors contribute as well. The main ones are shown in the diagram:



Farmers and their communities are not homogeneous, and **women and men play different roles** in PHM. Even within a community, individuals have different **needs and preferences**, which influence the uptake of postharvest practices and technologies. No household opts for just one storage system but rather combines these according to need (e.g., storing grain for home consumption versus sale). **Socio-cultural factors** can strongly influence the adoption and success of a new technology, as illustrated by the effect of farm households' status in northern Benin on their preference for traditional storage systems. In various countries, **growing awareness** of the risks involved in chemical use, the effects of aflatoxins on health, and the importance of safe food for the family, especially amongst women, has contributed to the uptake of PHM and hermetic storage technologies.

In rural areas, reaching farmers involves **large distances**. **Farmer organisations** can help overcome this barrier by serving as platforms to raise awareness and introduce new practices and technologies. For private sector actors, reaching out to farm communities is a new experience, requiring different distribution networks from those in more densely populated urban areas.



“Before, men were not allowed to touch the kihenge [or storage silo]; the family would be cursed. Storage was a woman’s job. When chemicals arrived, men went to town to buy them, so it became men’s work. Now, the silo is family work; everyone can do it, even the children.”

In SSA, **coordination and relations** between actors in PHM market systems are mostly informal and weak. This directly influences the success of projects and these limitations can be addressed through careful choices of their strategies. It is especially important for new technologies to be of **good quality** and offer **value for money**. If artisans have limited capacity and skill, resulting in poor quality metal silos, this will obviously hamper adoption. **Competition** can positively or negatively affect the development of markets for postharvest technology, as occurred with two or three brands of hermetic bags. Competition gives farmers choices and influences pricing. **Financing agricultural inputs** is challenging but key both for farmers and suppliers.

The choices that donors and partners make about **intervention strategies** directly influence projects' evolution and long-term success. To ensure successful outcomes, **MSD** requires an adequate budget that covers the costs of actions such as facilitation, systemic support and actors' participation in the change process. Private sector growth and system change are not restricted to the project's **geographical boundaries**.

**“We embedded PHM in all union work with our 9,000 members. It is very much in line with our advocacy work on safe food without chemicals.” -Armando Enriques, Provincial Farmer Union Cabo Delgado**

The production and prices of hermetic technologies depend on trends in the **world market**, as became evident when the price of metal sheets increased, raising the cost of metal silos. **Regional politics** also influence PHM, sometimes positively, as when the AU Member States committed under the 2014 Malabo Declaration<sup>1</sup> to reduce PHL at the national level. The **political and economic context** matters as well and differs between countries in SSA. In Ethiopia, for example, the state drives PHM, while in other countries, the public and private sector jointly take the lead.

**Subsidies** on agricultural inputs are an important tool used by public and other agencies to influence market systems. Subsidies on metal silos had disturbing effects on the development of a business case for the metal silo technology. This underlines the importance of the call in the 2018 Bellagio statement<sup>2</sup> (see box) for innovative incentives to create demand and not supply for postharvest technologies and practices. Farmer awareness and training are vital to boost demand for PHM, but **public resources for extension** and outreach are limited.

**“To ensure systemic and sustainable market systems changes, we encourage the subsidization of activities aimed at creating demand – such as public awareness campaigns and sustained training opportunities – as opposed to a more isolated subsidization of products and technologies themselves.” - 2018 Bellagio statement**

## Conclusions

The point of departure for any PHM project is its choice of an intervention strategy. The key to success in PHM market development is finding entry points that offer the greatest leverage for addressing the root causes of market system failure. This, in turn, requires a thorough understanding of the market system as well as farmers' circumstances and context. On this basis, projects can identify and develop demand for new postharvest practices and technologies. What triggered demand for PHM in smallholder communities was growing awareness of food safety in rural households, combined with the important role that women play in both PHM and food production. Another good entry point for working with smallholders, offering relatively quick wins, centred on the improvement of postharvest practices, such as drying grain on tarpaulins. Farmers had limited awareness of PHL, but the practices to prevent losses are relatively easy to adopt. The increased attention that PHM has received across SSA has helped increase the awareness and willingness of national governments to invest in a better environment for PHM.



*On the way to the field with a tarpaulin to keep the harvest clean.*

<sup>1</sup>The AU's CAADP, recognizing PHM as a means to strengthen food security launched the Malabo Declaration on Agriculture and Postharvest Losses during its 2014 summit. The Declaration aims to end hunger by 2025, reducing PHL by at least half.

<sup>2</sup><https://www.helvetas.org/en/switzerland/what-we-do/our-topics/economies/economy-expert/bellagio>



Stanslauz Akilimal, agro-dealer

Once smallholder farmers become aware of the benefits of adopting postharvest practices and technologies, a business case can be developed to expand the supply. The private sector will invest once a certain scale of demand comes within reach, as has occurred for tarpaulins, hermetic bags, and simple information on new practices in Kenya, Mozambique, Tanzania, and other countries. Demand for metal silos is growing much more slowly than for bags, since the price of a metal silo is high for smallholder farmers at USD 125 - 155 for a 500-kg silo, compared to about USD 3 for a 100-kg bag. Farmers who buy a metal silo tend to use it mainly to store grain for household consumption.

Working with agro-dealers proved to be especially effective. Those who integrated information about postharvest practices and technologies into their businesses as additional services succeeded in scaling up the PHM business model sustainably. Through networks of lead farmers, agents and employees within farm communities in distant rural areas, agro-dealers were able to extend their outreach well beyond the initial “over-the-counter input sales model” in rural towns. Agro-dealers thus improved their relationships with farmers and knowledge of their needs.

Despite giving little attention to financial services for core value chain actors, the projects still contributed to PHM business cases and to the uptake of postharvest technologies. Financing for agriculture differs from one country to another, and financing for agricultural inputs, still at an early stage, has proved particularly challenging. In PHM, financing for input supply commonly comes from value chain actors such as agro-dealers. If necessary, they can access financing from banks, thus giving them working capital to finance their customers input purchases. This mechanism shows much potential to enhance agro-dealers’ value proposition, enabling them to offer technical and information services combined with financing for farmers’ input purchases. Savings and loan groups offer an important strategy for women farmers’ economic empowerment and involvement in PHM. This approach proved instrumental as an entry point for raising awareness of PHM, especially amongst women farmers. Though it did not lead to direct investment in PHM, the approach still merits further exploration as a means to provide loans for the purchase of farm inputs.

Establishing linkages and building relations of trust between actors are essential steps for MSD. By helping facilitate multi-stakeholder collaboration, this approach has better enabled projects to bring together a wide range of actors for different purposes and at different levels. As a result, actors have gotten to know and learn from each other, while building trust and linkages. Collaboration with national and local government also proved successful, particularly in projects that encouraged government partners to take the driver’s seat in developing policy and regulatory frameworks.

System change takes time, since increasing demand for PHM services requires significant shifts in farmers’ behaviour. Experience in various countries suggests that concern about safe food for the family is a key driver of slow change. Another contributor to change is the slowly increasing demand among market actors for safe, high-quality grains and growing private sector investment in different postharvest technologies, particularly hermetic bags. To build on these gains, each new PHM intervention strategy must be developed carefully, taking into account the political, economic, socio-cultural and agro-ecological differences between and even within countries.

