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**CERFAM**  
CENTRE D'EXCELLENCE REGIONAL  
CONTRE LA FAIM ET LA MALNUTRITION

# Promotion of Sustainable Food System for Zero Hunger: Good Practice on Post-Harvest Loss Management from China and Africa

**South-South Knowledge Product**



Photo Credit: Sinograin Chengdu Storage Research Institute/Mr. Lan Shengbin

## Table of Contents

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I.	Foreword.....	3
1.	Context .....	3
2.	The China’s Experience and the Implication of South-South Cooperation .....	4
3.	Contribution of Post-harvest Management to Sustainable Food System.....	4
II.	Policy & Strategy in Post-harvest and Reserve Management .....	7
1.	Coping Strategy on National Food Security and Grain Reserves: Experience from China .....	7
2.	Storage Reserve System at Local, National and Regional Level: Experience from ECOWAS .....	9
III.	Grain Trade & Food Market: Experiences and Practices in China and Africa.....	12
1.	Perspective from China .....	12
2.	Perspective from Africa.....	13
IV.	Application of China’s post-harvest Grain Loss Reduction Technology .....	15
V.	Recommendations for preventing PHL and for contributing to stronger food systems .....	22
	Biography.....	23
	Acknowledgement .....	24
	Special thanks .....	24

## I. Foreword

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The COVID-19 outbreak since early 2020 has had serious consequences on food systems, and the path to the recovery of food supply chain remains highly uncertain. COVID-19 pandemic may add between 83 and 132 million people to the total number of undernourished in the world in 2020 depending on the economic growth scenario. According to the latest SOFI<sup>1</sup>, released in June 2020, although the agri-food sector is likely to show more resilience to the pandemic crisis than other sectors, in Africa, the existing vulnerabilities in its agricultural and food systems, combined with demand and supply shocks likely to result from COVID-19 present high risks with major impacts on food security and nutrition unless mitigating actions are taken now.

Food Loss is an urgent problem that presents clear opportunity for impact, which brings 15% income reduction for 470 million smallholder farmers, 1.6 billion could be fed with food lost each year and 25% of freshwater and 20% farmland wasted on unconsumed food. Post-Harvest Loss Is Particularly Acute in Sub-Saharan Africa: 50% of fruits and vegetables, 40% of roots and tubers and 20% of cereals has been lost, but it brings the new opportunity: Post-Harvest Agro-Processing (PHAP). PHAP is at the heart of Agricultural Value Chain development, addressing food loss and promoting industrialization along the agriculture value chain, which has implications for curbing stunting, malnutrition and food wasting in children and women, and the base of industrialization of any nation, both developed and developing. In addition, PHAP is tied to socio-economic advancement and vice versa. During PHAP, all value chain activities congregate around value added products, and guarantees export promotion and import substitution. PHAP could provide the platform for job creation and foreign exchange earnings, a purveyor of true independence in nation building, the link between production and consumer satisfaction and guarantor of linkages between farmers and industry.

### 1. Context

COVID-19 has a great impact on food processing, as many processing factories have shut down to protect staff from infection. Decreased processing capacity results in the increase in post-harvest losses (PHL), especially for nutrient-dense foods such as vegetables and fisheries. Supply chains for processors are disorganized, due to inaccessibility to areas of production. Food supply has also been greatly affected. Market closure coupled with transport restrictions degenerated into food shortage, especially for fresh foods. Due to the disruptions of food supply, retail food businesses have been interrupted, leading to loss of income and job. In addition, the disruption of food supply has caused a high amount PHL. Fresh foods such as milk, meat, fish, fruits, and vegetables suffered not only from loss of quantity, but also from degraded quality. Poor storage practices have led to increased aflatoxin contamination of

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<sup>1</sup> FAO (2020). Global food markets still brace for uncertainty in 2020/21 because of COVID-19 says FAO. <http://www.fao.org/news/story/en/item/1287515/icode/>

cereals.

In West Africa alone, the COVID-19 pandemic has revealed not just the fragility and weaknesses of the supply chains, but also and above all the challenges of limiting food losses and wastes. On top of logistical failings, a lack of technology and high dependence on imports to meet local demands, the coronavirus crisis has exacerbated what was already a worrying situation. Nevertheless, the picture is not all back. Many regional markets in Africa have actually suffered very little from supply shortages. Certain traditional value chains have proven their resilience, notably by switching to local distribution circuits, demonstrating the importance of locally durable solutions.

## 2. The China's Experience and the Implication of South-South Cooperation

China's successful experience in reducing PHL and transforming its agriculture –through ambitious reform policies, promotion of technological innovations, massive investments in infrastructure and machinery, and establishment of supervisory and support institutions at national, regional and local levels – is a convincing illustration of public-private partnerships and a holistic approach. The China's experience could help Africa overcome the challenges brought by PHL in food systems and rural development, by transferring new technologies and innovative solutions. An effective post-harvest losses management encompasses the development of standards and regulatory frameworks that promote an enabling environment and strengthen institutional capacity at local, national and regional levels.

South-South and Triangular Cooperation could be an effective and efficient avenue to support national and regional efforts, enabling countries and their development partners to promote good practices by learning from each other, maintaining dialogue and identifying solutions to cope with emerging challenges in food supply chains with the aim to mitigate the anticipated negative impacts on national food security and smallholders' farmers wellbeing. It is believed that policy dialogue, technical discussions, experience sharing and good practice showcasing have the potential to play such an important role within the framework of South-South and Triangular Cooperation. <sup>2</sup>

## 3. Contribution of Post-harvest Management to Sustainable Food System

Food systems (FS) encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded.

A sustainable food system (SFS) is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised. Concretely speaking,

1. It is profitable throughout (economic sustainability);

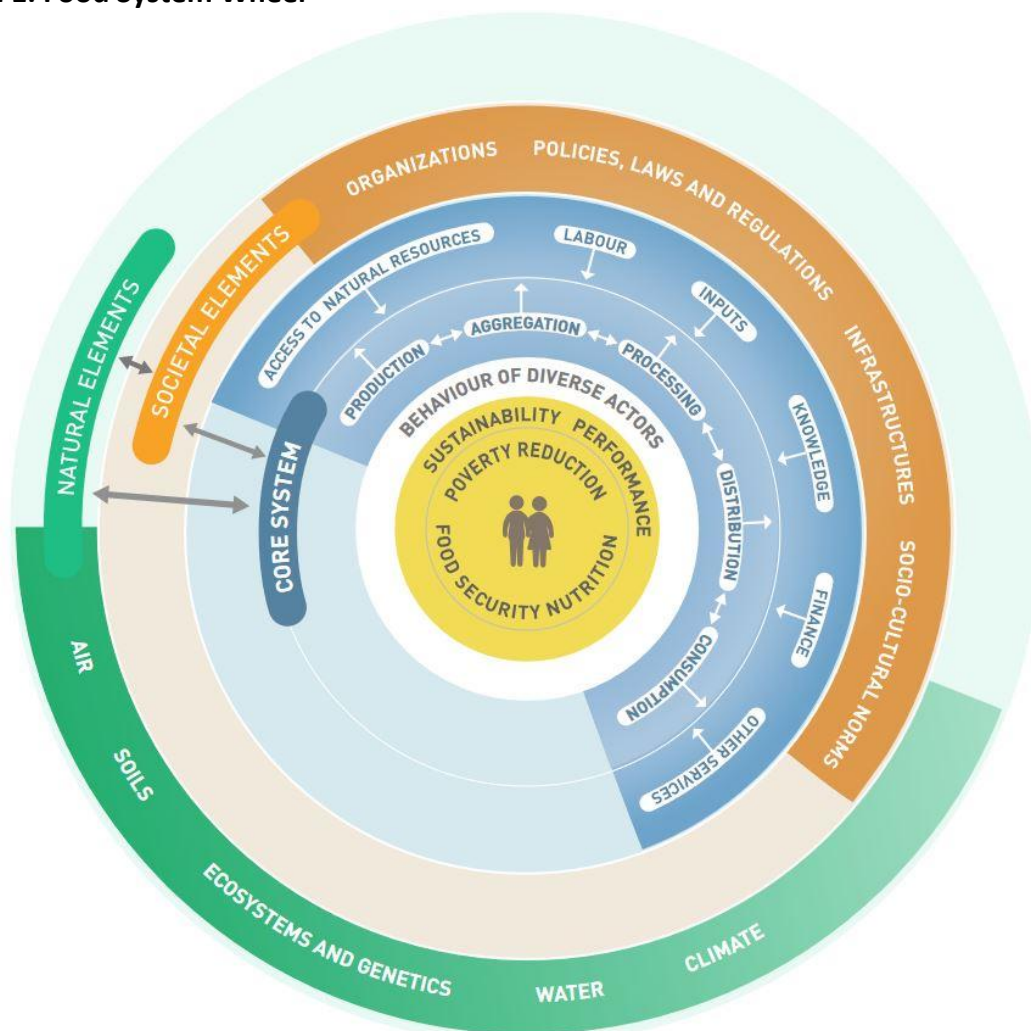
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<sup>2</sup> Chediek, J. (2020). Speech on Webinar on Post-Harvest Loss Management under COVID-19.

2. It has broad-based benefits for society (social sustainability) and;
3. It has a positive or neutral impact on the natural environment (environmental sustainability)

According to the Food System Wheel of FAO<sup>3</sup> (See graph 1), the economic, social and environmental performance is determined by behaviour of different actors, or the conduct of stakeholders in the food system. This conduct in turn take place in the structure of the system, which consists of a core system, societal and natural elements. The core system consists of a series of activities through which food products flow (production, aggregation, processing, distribution and consumption, including waste disposal) and a layer of services supporting the flow. These activities are embedded in a societal context and a natural environment. The former includes all related policies, laws and regulations, socio-cultural norms, infrastructures and organizations. The latter includes water, soils, air, climate, and ecosystems and genetics.

**Graph 1. Food System Wheel**



Source: FAO

As shown in the graph 2, post-harvest loss management (PHLM) can contribute to a

<sup>3</sup> FAO (2018). Sustainable Food Systems Concept and Framework. <http://www.fao.org/3/ca2079en/CA2079EN.pdf>

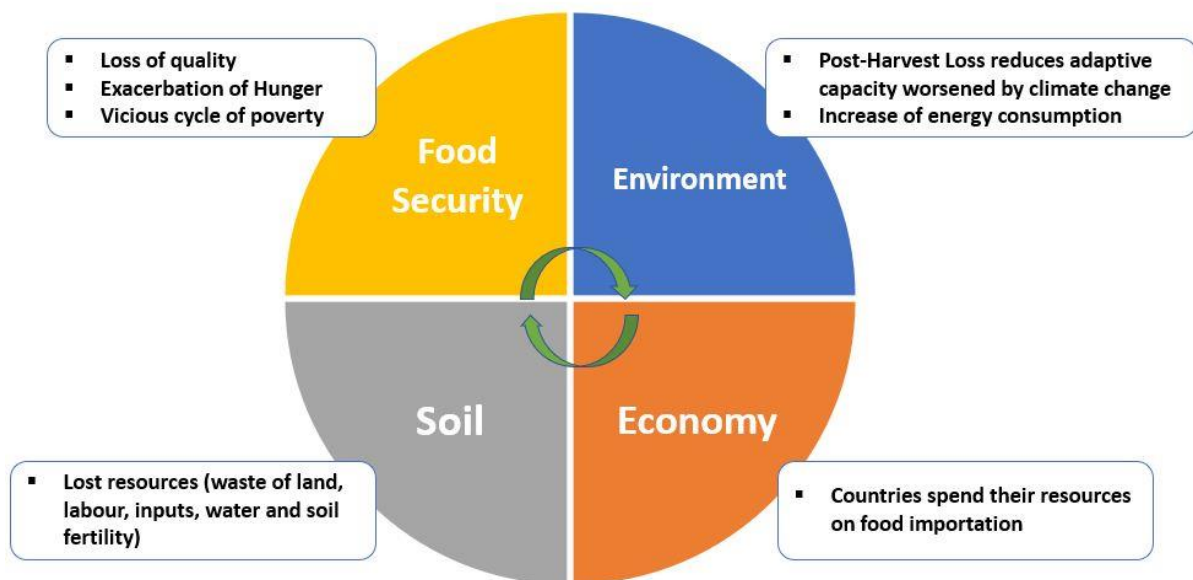
sustainable food system by addressing a few elements of the system. First, it can enhance the quantity and quality of food, reducing hunger and malnutrition and thus ending vicious cycle of poverty for the most vulnerable.

A better PHLM can reinforce the adaptive capacity of developing countries, which have been facing more and more challenges caused by climate change. For example, food reserve at local, regional or national level could guarantee food availability in situations of extreme weather or other disasters. In addition, reducing loss and waste throughout the food supply chain is an effective solution to mitigate the greenhouse gas emissions of agriculture and improve global food and nutrition security

On the natural dimension, the waste and loss of resources can be prevented by PHLM. In some regions, such as Sahel, arable land and water are scarce. A great amount of food loss translates into lost scarce resources (such as water, soil fertility, land, inputs as well as labour), for which different groups and people have been fighting in some developing countries.

Economy is also an aspect of sustainable food system. Some developing countries are dependent on imported food to satisfy the demand of their local population, as local production is not sufficient for the need of the country. Reducing post-harvest losses can increase the local food supply, boost the income of smallholder farmers and therefore stimulate local economy.

**Graph2. Post-harvest management and elements of food system**



Source: Presentation of Dr. Damian Ihedioha in the webinar “Good Strategy for Food Security, Good Practice for Storage Management” on 19 August 2020

## II. Policy & Strategy in Post-harvest and Reserve Management

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Appropriate policies and strategies on post-harvest and reserve management are required for countries to quickly response to emergency or crisis and alleviate the negative impact. In this aspect, West Africa and China have been adopting relevant strategies for a better food reserve management, ensuring food security for their own population.

After the severe food crisis in all Sahelian countries in 2005, some governments in West Africa have decided to undertake initiatives in building public stock for mitigating impact of future food crisis. Due to another food crisis caused by the upsurge of rice price in international market in 2008, the idea to create a regional food reserve was born to mitigate the effect of market fluctuation, which causes lower affordability of imported rice for the countries<sup>4</sup>.

In early 2020, the outbreak of COVID-19 could have a great impact on food security in China. Through its coping strategy, imminent actions along food value chain have been taken by the Chinese government to alleviate the impact of the pandemic. Given its high effectiveness, the Chinese strategy and measures for grain reserve and food security could serve as lessons learnt for other developing countries to ensure food security during different crisis.

### 1. Coping Strategy on National Food Security and Grain Reserves: Experience from China<sup>5</sup>

COVID-19 is bringing significant risks to China's food security. The risks include reduction for food production, difficulties in selling grain for farmers, market price fluctuation, reduced processing capacity, logistics and trade constraints, short term demand surge etc. However, currently, China's food security situation is relatively stable. There's continuous bumper harvest in grain production, enough grain reserves, good development of food industry and smooth operation of grain market. During COVID-19, more than 5,000 grain and oil emergency processing enterprises, more than 6,500 emergency distribution centers and more than 49,000 emergency supply outlets are ensuring the food security.

Despite the demonstrated resilience of Chinese food system during COVID-19, a few challenges for national food security in China have been identified:

1. The resource and environmental carrying capacity of China has been stretched
2. The ability to resist and reduce disasters needs to be improved

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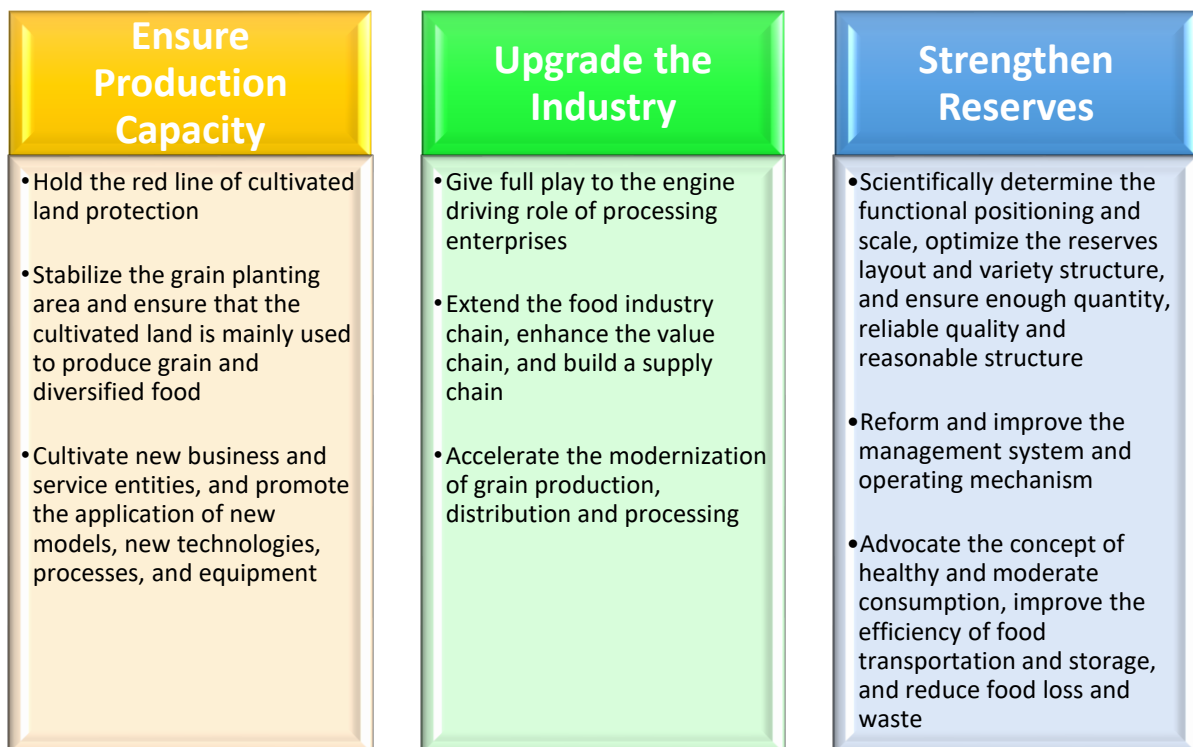
<sup>4</sup> Frank Gaultier (2019): Can the ECOWAS Regional Reserve Project improve the management of food crises in West Africa? CIRAD & DAI

<sup>5</sup> Wang, S.H. (2020). COVID-19 Coping Strategy on National Food Security and Grain Reserves

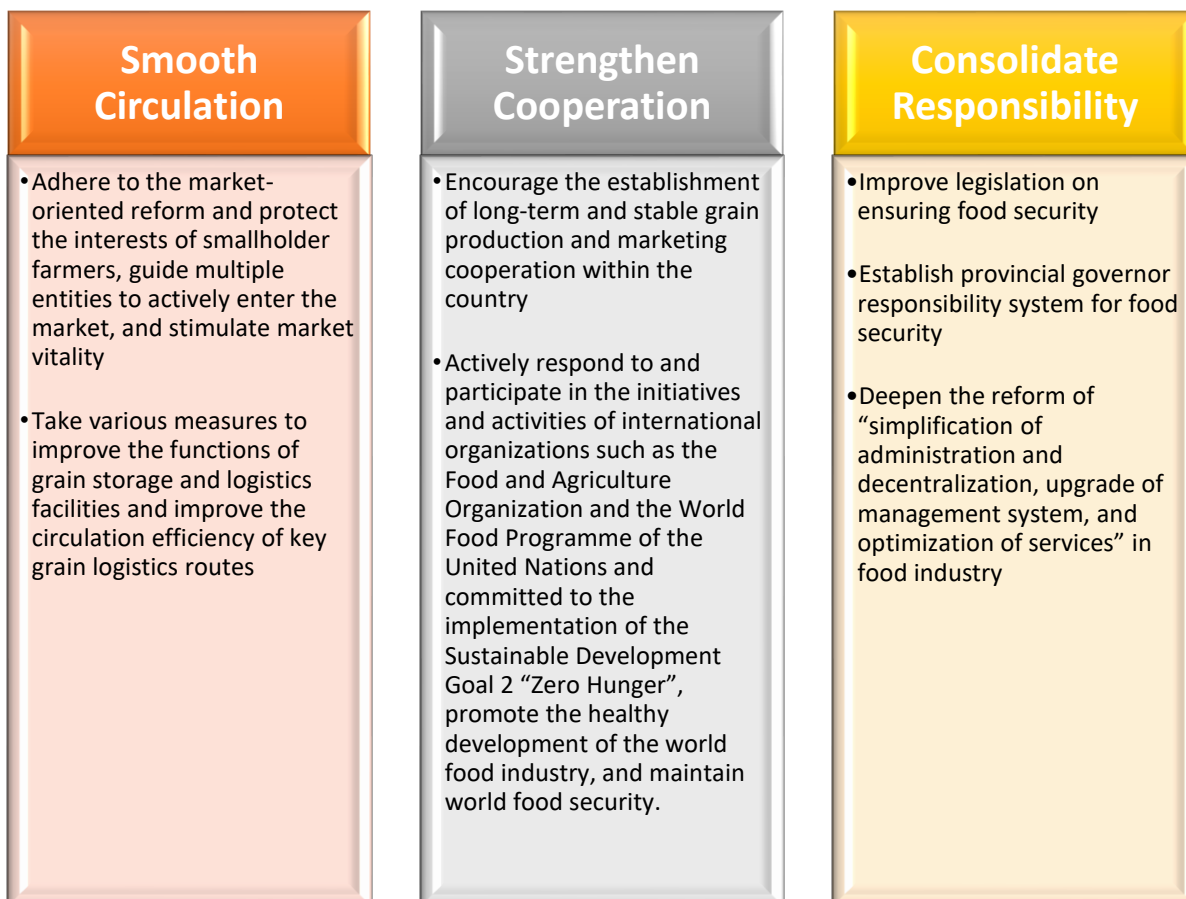
3. There is greater pressure for stable food production
4. The structure of grain consumption continues to upgrade. As the consumption of feed and industrial grain continues to increase, the total grain consumption grows rigidly.
5. There is still a lot of room for improvement in agricultural supply-side structural reforms, food technology, reduction of loss and waste as well as use of non-grain food.

Given the challenges identified, the Chinese government has undertaken a series of measures, which can be divided into the following six categories, to ensure her national food security:

### **China's measures to ensure national food security**







## 2. Storage Reserve System at Local, National and Regional Level: Experience from ECOWAS



Photo credit: ECOWAS

The Regional Reserve Project is a project developed by the Economic Community of Western African States (ECOWAS) with the aim of improving the management of food crises in the region. The general objective of the Regional Reserve Project is “to effectively respond to food crises alongside State governments and stakeholders whilst contributing to the implementation of ECOWAP/CAADP with a

regional food security and sovereignty perspective”<sup>6</sup>. The Regional Reserve Project encompasses three components:

- A. Building a Regional Food Security Reserve;
- B. Increasing the level of national public stock; and
- C. Improving the cooperation between national public stock.

The Regional Reserve Strategy is formulated at three levels: Local/Community stocks, national stocks and regional reserve. The strategy for each level is composed of different elements as follows:

- A. Local/Community stocks, which seek to improve food security in the community
  - Group supply systems
  - Group marketing systems
  - Livestock supply systems
- B. National stocks
  - National storage policies
  - Institutional components and stock categories
  - Management tools for food crises
  - Network of national structures – RESOGEST, which aims to develop technical support between the public stock agencies and promote loans of grain between public stock agencies to mutualise the risk<sup>7</sup>
  - Code of conduct for stock management
- C. Regional reserve
  - The main technical characteristics
  - The governance of Regional Food Security Reserve
  - Procedures
  - Status of the intervention tools as of 1 March 2019

Actions and measures on food reserve are currently in place or achieved at different level:

- A. Local community level
  - Dialogue is ongoing to increase the capacity of farmer organisations on the ground, including farmers and breeders, as well as their national and regional networks.
  - Regional frames of reference have been creating as follows:
    - a) Reference tools on governance, management and finance of local reserve are elaborated.
    - b) A multi-stakeholder framework for local reserve is designed in a participatory manner.
    - c) Farmer organizations elaborate a repository of good practices on local reserves.
    - d) Syllabus of training on local reserve is being designed.
- B. National level
  - Dialogue is ongoing with the member states of ECOWAS to identify priorities. Support to public institutions for capacity strengthening is provided in a) National policy on storage b) Instrument for storage governance and c) training for storage managers

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<sup>6</sup> ECOWAS (2012). *Regional Food Security Reserve*. ECOWAS, WAEMU, CILSS, RESOGEST. July, 108 p. + annexes.

<sup>7</sup> Frank Gaultier (2019): Can the ECOWAS Regional Reserve Project improve the management of food crises in West Africa? CIRAD & DAI

- Support is provided by ECOWAS to its member states for elaborating and updating contingency/response plans.
- The capacity of the “Regional Network of Food Security Stock Offices” is strengthened, and support for operationalizing the mechanism of storage sharing is provided.
- Good practices are capitalized and a code of conduct for storage management is created.

C. Regional level

- In terms of governance:
  - a) A Regional Food Security Reserve (RRSA) has been created through an additional article to the agreement of ECOWAS
  - b) A management committee and an executive bureau have been established as decision-making organ of RRSA
  - c) The unit “Info-stocks” of RRSA will assist in the decision-making process based on the information provided by the Regional Integrated Agricultural Information System
  - d) A manual of procedure of RRSA and a monitoring and evaluation system, which is integrated into the M&E system of the Regional Agency for Agriculture and Food, are developed as governance tools.
  
- Procedures in the following aspects have been developed:
  - a) Procurement of physical reserve (which is composed of its modalities, procedure, quality control and engagement of farmer organisations), such as nutritional produce and grains.
  - b) Receipt, quantity, and quality control
  - c) Food storage, grain conservation and stock tracking
  - d) Technical rotation
  - e) Interventions of response to crisis: national request and criteria for eligibility
  - f) Rebuilding of reserve Financial reserve at the Regional Funds for Food and Agriculture (BIDC)

### III. Grain Trade & Food Market: Experiences and Practices in China and Africa

Due to the movement restriction and market closure in the beginning of COVID-19 outbreak, food supply chain was disrupted in many countries. While the market access for smallholder farmers were limited, the supply from rural areas to urban areas was reduced. Moreover, in Africa, most countries are food importers. The disrupted supply chain lead to lower food supply, raising the price of commodities in local markets. To response to the challenges, various initiatives and actions have been taken by governments, regional and international organisations to support grain trade and stabilise food price in local market, contributing to food and nutritional security especially during crisis.

In the following sub-session, three cases are presented to showcase the practices undertaken by relevant stakeholders, namely the Chinese Government, the African Development Bank and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), for ensuring food security in China and in Africa.

#### 1. Perspective from China<sup>8</sup>

Since the outbreak of COVID-19 this year, the Central Committee of the Chinese Communist Party and the State Council of the People's Republic of China have addressed the epidemic as a top priority. The National Food and Strategic Reserves Administration (NAFRA) has taken swift action and set up a working group for fighting COVID-19 and securing food supply and price stability with the following measures:

- A. Strengthen grain market monitoring and source distribution  
Market fluctuations are monitored - there are more than 1,000 national-level direct reporting points for grain market information, and nearly 10,000 information monitoring points in the local grain markets. Contingency plans have been elaborated to deal with changes. The responsibility mechanism has been put into place for ensuring supply and stabilizing the market - the provincial governor responsibility system for food security has been established. Market distribution of grain sources are strengthened and a linkage guarantee mechanism for grain and oil supply in neighbouring provinces has been set up. Moreover, the one-time reserve corn bidding transaction was carried out, and the transaction amounted to 1.32 million tons. Minimum-price-purchased wheat and rice were released into the market during the Spring Festival, and a total of 3.67 million tons of grain was sold. The bidding and sales of mid-late Indica Rice was organized in Hubei Province, 800,000 tons of grain was organized every week.
- B. Actively coordinate and guide grain and oil enterprises to resume work and production  
During the COVID-19 epidemic, domestic grain and oil markets continue to operate normally. More than 5,000 grain emergency processing enterprises have completely resumed work and production. 2,315 key enterprises for COVID-19 prevention and control received preferential loans of more than 10 billion Chinese yuan.
- C. Continuously adjust and optimize grain production and planting structure  
The total grain output has reached more than 650 million tons, including 340 million tons of paddy and wheat. The per capita grain output is 470 kg. The policy of eating full has been shifted to that

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<sup>8</sup> Luo, W.J. (2020). Grain Trade, Food Market Strategies, Experience and Practices to Secure Food Supply Against COVID-19.

of eating well, nutritiously, and healthily. The “Quality Grain Project” has been implemented, and the grain and oil e-commerce mall has been built up, including an e-commerce trading platform and a cloud exhibition hall.

## 2. Perspective from Africa

### 2.1. Feed Africa Response to COVID-19 by the African Development Bank <sup>9</sup>

Feed Africa Response to COVID -19 (FAREC) is the Agricultural Framework of the African Development Bank to respond the COVID-19 pandemic through immediate, short, medium-and long-term measures targeting nutrition and food security. It aims to use budget support instruments created under the Bank’s COVID-19 Rapid Response Facility (CRF) for quick disbursement. FAREC allowed re-structuring and realignment of ongoing Feed Africa portfolios, and fast-tracking operations under 15th Replenishment of the African Development Fund, providing opportunities for collaboration with multilateral partners and donor organizations; especially those who deliver quickly on the ground. There are 8 strategic priority areas of FAREC:

- A. **Supporting Food delivery for the poor and vulnerable:** The Bank works with governments and partners to mobilize delivery of safe and nutritious food for the poor and vulnerable.
- B. **Stabilizing food prices:** The Bank contributes to stabilizing food prices through the targeted release of food reserves. Also support policies to build effective and responsive national food replenishment systems.
- C. **Supporting Services:** To reduce disruptions to on-farm activities, safety, advisory and other production support to farmers.
- D. **Promoting localized food production:** Via targeted provision of agricultural inputs (fertilizer, improved seeds and agro-chemicals), the Bank promotes localized food production through smart input subsidies targeting smallholder farmers.
- E. **Optimization of food processing and storage capacity:** Interventions to support the processing of highly nutritious food staples that can be stored for longer periods, reducing post-harvest losses.
- F. **Provision of Policy support:** The Bank promotes policies that advance the free flow of food and inputs distribution (“green channels”) and increased food production.
- G. **Establishing Food security task forces:** The Bank assists African countries and regions in setting and operationalizing food security task forces as support to COVID-19-related food security responses.
- H. **Supporting regional initiatives:** In collaboration with continental bodies and regional economic communities, the Bank coordinates and monitors regional initiatives.

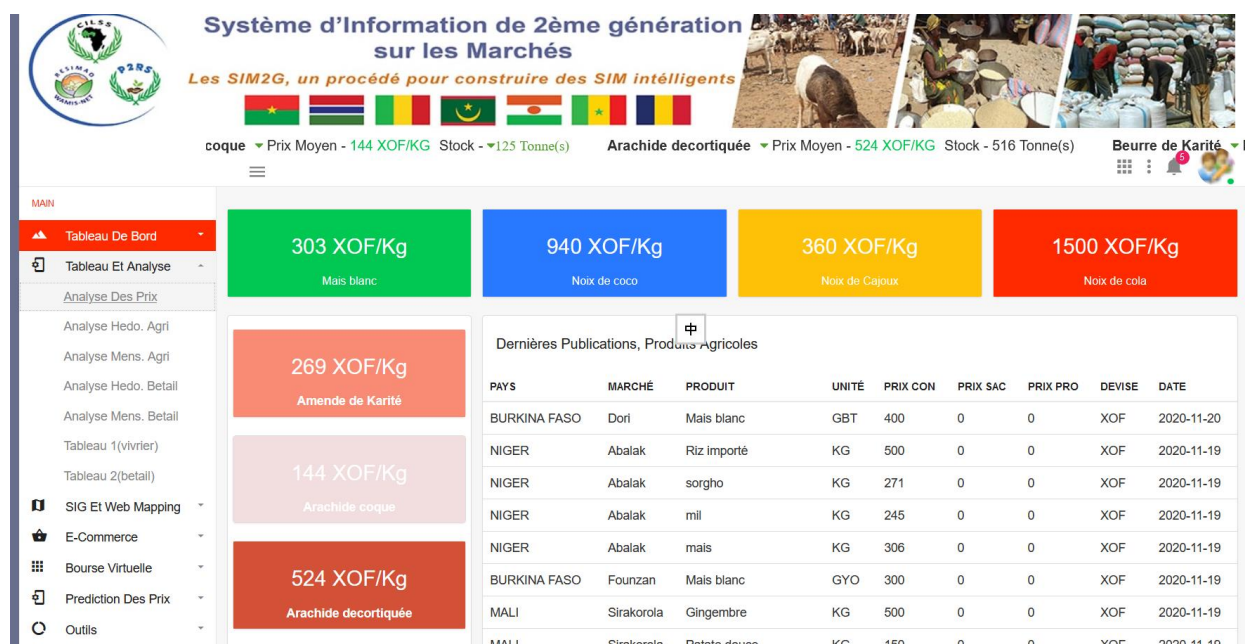
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<sup>9</sup> Ihedioha, D. (2020). Webinar on Post-Harvest Loss Management under COVID-19.

## 2.2. An online tool for access to market: Regional Program for Market Access in Sahel<sup>10</sup>

The Regional Program for Market Access (PRAM) of the Inter-State Committee for Drought Control in the Sahel aims to increase trade in agricultural and agri-food products in the Sahel and West Africa, providing market players with the information necessary to promote trade in agricultural and agri-food products in the Sahel and West Africa and improving trade policies for agricultural and agri-food products. There are some main actions/activities including Support for Market Information Systems (MIS).

The MIS has been migrated to MIS 2G <http://plateforme.sim2g.net> (including daily, weekly and monthly data) and [www.sim2g.net](http://www.sim2g.net) (including e-commerce), and there are seven beneficiary countries including Burkina Faso, Mali, Mauritania, Niger, Senegal, Chad, covered by 15 2G MISs (7 for agricultural, 7 for cattle and 1 for fishing) and 15 national platforms with African Development Bank financial support (end of March 2021). The cross-border Flow Monitoring System and Mechanism for road harassment monitoring (collection and processing of data, dissemination of information; development and dissemination of laws and regulations) have achieved progresses and successful stories. There are facilitation and linking of actors contributing to the organization of the African Agricultural Fair (SAFAGRI 2019), CORPAO, etc. And market infrastructures are constructed (cross-border livestock markets, training of actors in infrastructure management).



Source: Système d'Information de 2<sup>ème</sup> génération sur les Marchés

<sup>10</sup> Ebbe, M.A. (2020). Grain Trade, Food Market and Financial Supporting Strategies to Secure Food Security and Food Supply Chain against COVID-19.

## IV. Application of China's post-harvest Grain Loss Reduction Technology<sup>11</sup>




In China, to reduce farmers' grain storage losses, it is generally required that the grain should be dry, full and clean. Another requirement is the separation of grains: 1) grains with insects or pest and those without, and 2) newly harvested grains and aged grains. Combined with different approaches, such as trainings and innovative methods, a series of facilities & equipment have been developed to strengthen smallholder farmer's grain storage safety. A few granaries used in China are presented in the following parts with their basic features.

Color steel plate assembled granary	Steel-framed rectangular granary	Skeleton steel mesh round granary
		
<p>Basic information:</p> <ul style="list-style-type: none"> <li>Material: colour steel plate of 0.4 mm thick</li> <li>Hard polystyrene foam board recommended for dampproof mat</li> <li>Price per unit: 55USD</li> <li>Volume: about 1.5m<sup>3</sup></li> <li>Grain storage capacity: 1000Kg</li> </ul> <p>Characteristics:</p> <ul style="list-style-type: none"> <li>The granary can be standardized and produced at large scale</li> <li>Foldable</li> <li>Easy to clean</li> </ul>	<p>Basic information:</p> <ul style="list-style-type: none"> <li>Material: square steel, steel wire mesh, color steel plate.</li> <li>Price per unit: 495 USD</li> <li>Volume: 12m<sup>3</sup></li> <li>Grain storage capacity: 6000kg</li> <li>It is used in Northeast China and suitable for storing corn with high moisture content (less than 30%)</li> </ul> <p>Characteristics:</p> <ul style="list-style-type: none"> <li>It can store high-moisture corn, and use natural ventilation to reduce the moisture to safe level</li> </ul>	<p>Basic information</p> <ul style="list-style-type: none"> <li>Material: angle steel, steel wire mesh, color steel plate</li> <li>Price per unit: 510USD</li> <li>Volume: 12m<sup>3</sup></li> <li>Grain storage capacity: 6000Kg</li> <li>It is used in Northeast China and suitable for storing corn with high moisture content (less than 30%)</li> </ul> <p>Disadvantages:</p> <p>It can store high-moisture corn, but the ventilation is</p>

<sup>11</sup> Lan, S.B. (2020) China's Grain Storage Loss Reduction Technology for Smallholder Farmers.

Zhang, C.Z. (2020) The Management Concept and Experience of China's Grain Post-harvest Loss Reduction.

		not as good as the rectangular granary
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Cement-board assembled granary	Staircase-embedded granary	Polyethylene sheet assembled granary
		
<p>Basic information:</p> <ul style="list-style-type: none"> <li>• Material: cement board</li> <li>• Price per unit: 55USD</li> <li>• Volume: about 3m<sup>3</sup></li> <li>• Grain storage capacity: 2000Kg</li> <li>• It stores grain with safe moisture content</li> </ul> <p>Disadvantage:</p> <ul style="list-style-type: none"> <li>• The granary can be standardized and produced at large scale</li> <li>• Foldable</li> <li>• Easy to clean</li> </ul>	<p>Basic information:</p> <ul style="list-style-type: none"> <li>• Material: bricks and cement board</li> <li>• Price per unit: 62-93 USD</li> <li>• Volume: 2-3 m<sup>3</sup></li> <li>• Grain storage capacity: 1500-2000g</li> <li>• It stores grain with safe moisture content</li> </ul> <p>Disadvantage:</p> <ul style="list-style-type: none"> <li>• No standardised design and construction</li> </ul>	<p>Basic information</p> <ul style="list-style-type: none"> <li>• Material: polyethylene sheet</li> <li>• Price per unit: 31USD</li> <li>• Volume: 1.5m<sup>3</sup></li> <li>• Grain storage capacity: 1000Kg</li> <li>• It stores grain with safe moisture content</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• Poor rodent resistance</li> <li>• Easy to age</li> </ul>

PVC soft granary




Basic information:

- Material: PVC canvas
- Price per unit: 31USD
- Volume: 1.5m<sup>3</sup>
- Grain storage capacity: 1000kg
- It stores grains with safe moisture

Disadvantage:

- Poor rodent resistance
- It is not convenient to load grain

**In the north of China**, based on the ecological characteristics of grain storage, **the moisture content of corn is reduced to a safe level through natural ventilation with steel mesh warehouse**, so as to realize the safe storage of grain. **Steel-framed rectangular granary** is the main solution.

**In other areas in China**, **color steel plate assembled warehouse** is the main solution to store grains with safe moisture content.

A national standard plays a vital role in fostering effective usage of storage equipment. "**Standard for small-scale farm bin construction**" (LS/T8005-2009) , which has been compiled and implemented since 2019, serves to foster and standardise the small-scale farm bin construction. It also aims to instruct smallholder farmers in constructing small-scale farm bins by themselves. The main content of the standard includes:

- i. classification,
- ii. technical requirements,
- iii. installation and maintenance requirements,
- iv. inspection rules,
- v. transportation and loading and unloading,
- vi. qualification certificates, etc.

The standard determines the technical indicators of various small granaries, stipulates the naming principles of small granaries, and makes the construction of small granaries more standardized.

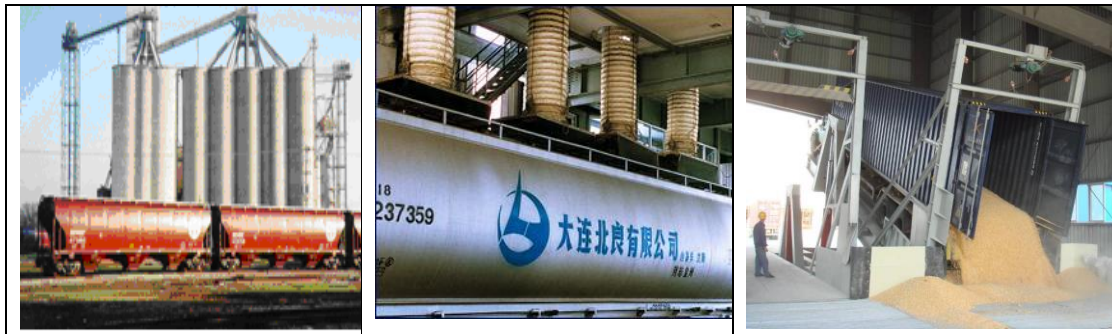
Apart from moisture, pest can represent an important threat for grain storage. Therefore, materials against insect is essential in this aspect. **Grain storage pesticides** for farmers have also been developed in China to reduce post-harvest losses during storage. As powerful pesticides, they cover broad insecticidal spectrum and are valid for a long period. The characteristics of these pesticides are high efficiency and low toxicity, which are in line with national health standards. Plants sources are used to prevent insect, such as prickly ash, tree leaves, calamus and wormwood, etc.

**Plant are also used as pesticides** to prevent insects, such as prickly ash, tree leaves, calamus and wormwood, etc.

- **10 to 20 tons of medium-sized rural drying and handling equipment**



- **Technology in the field of grain logistics**



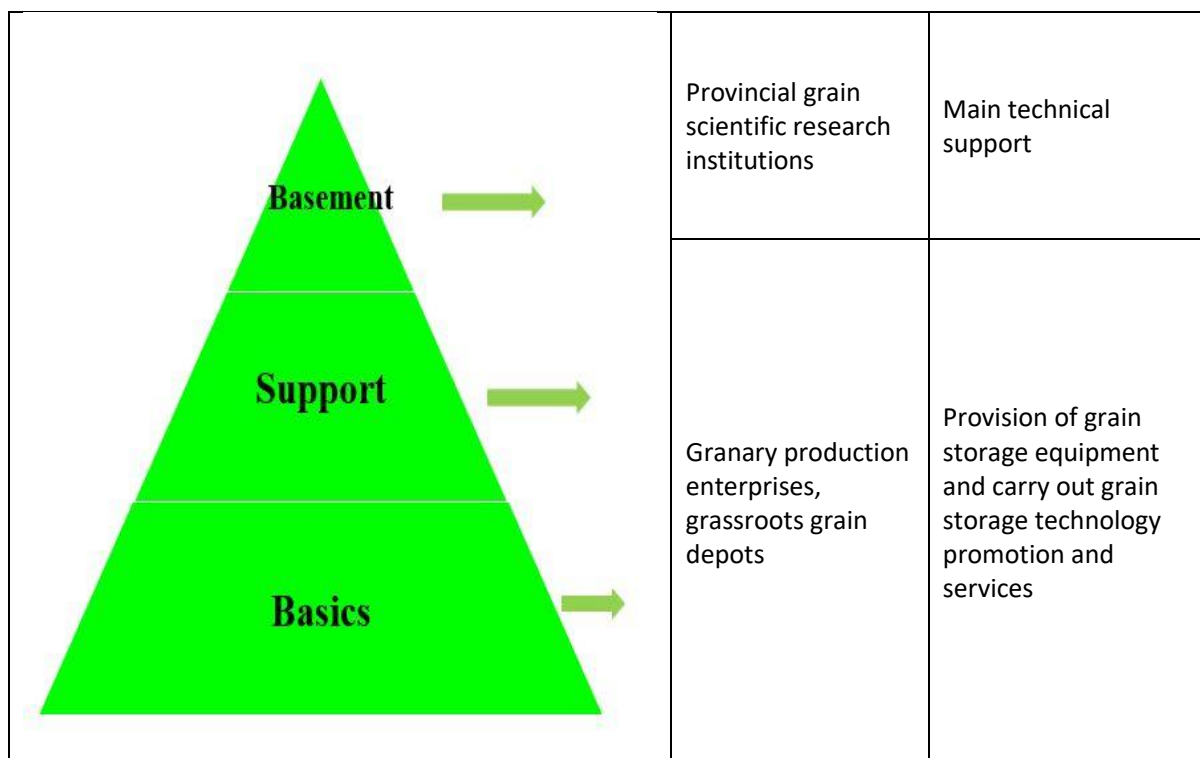
- **Technology in the field of processing**



- **A three-level technical service system has been established**

A three-level technical service system has been established for scientific grain storage of farmers based on national grain scientific research institutions and universities, supported by provincial grain scientific research institutions, granary production enterprises and grassroots grain depots.

	<b>Stakeholder</b>	<b>Responsibilities</b>
	National grain scientific research institutions and universities	Technology research and development, technology integration and standard formulation



- **Promotion and training have been carried out** to strengthen the knowledge and capacities of smallholder farmers in grain storage.
- **Information technology has been developed to provides convenience to farmers. A few examples are illustrated as follows:**

A. Farmers' grain storage expert consultation system

The system provides essential information in different aspects in grain storages. Theses aspects includes a) Equipment and tools for food storage, b) Quick check on food quality and moisture, c) methods of food storage, d) methods of grain storage, e) identification of pests, f) prevention of pest, h) identification of rat, and i) prevention of rat.

B. Hui Sannong<sup>12</sup> App

Developed by SINOGRAIN Group, the application provides the following services: a) policy inquiry, b) appointment for grain sales, c) appointment inquiry, d) query for grain sales, and e) payment estimation. By providing relevant data on grain sale and facilitating the process of grain sales, smallholder farmers can undertake the grain sale in a more efficient way with lower cost.

<sup>12</sup> Hui Sannong is the transliteration of benefiting agriculture, rural area and farmer.



Photo credit: Sinograin Chengdu Storage Research Institute/Mr. Lan Shengbin  
 In the left image: Sales appointment (售粮预约), Appointment inquiry (预约查询), Sign in (现场签到), Preview (排队预览), Estimated payment (粮款估算), Query for grain sales (售粮查询), Assistance (帮助)

C. SINOGRAIN Group has developed an "all-in-one card" system for grain sales

When the grain seller enters the granary of SINOGRAIN, an IC card is issued, and the card is used to complete all aspects of business from the acquisition and registration, quality inspection, weight inspection, settlement, capital payment, etc. This system enables a more transparent and efficient process for grain sales.



Photo credit: Sinograin Chengdu Storage Research Institute/Mr. Lan Shengbin

- **Technological scheme for short-term emergency storage for high-moisture corn**

In response to the short-term temporary storage of some newly harvested high-moisture corns in Northeast China, a combined short-term storage granary for high-moisture corns has been developed.

The newly harvested high-moisture corns are stored off the ground. The natural low temperature in Northeast China freezes the corn kernels in a short period of time for further threshing, drying and storage.

Example: Combined short-term storage granary for high-moisture corn



Photo Credit: Sinograin Chengdu Storage Research Institute/Mr. Lan Shengbin

## V. Recommendations for Preventing Post-Harvest Losses and for Contributing to Resilient Food Systems

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The previous food crises and covid-19 have brought some lessons learned for developing countries how to adopt various policies, strategies, and technologies for strengthening their national food securities. A few recommendations in the short, medium, and long term have been concluded for policy makers to cut PHL and therefore contribute to a more sustainable food system

In the short term, it is recommended:

- To strengthen the activities of the Task Force on the free movement of goods and people.
- To implement complementary actions to support the Mechanism for monitoring of road harassment and cross-border flow and transhumance.
- To strengthen joint mission (for example in Sahel with CILSS, WFP, FAO FEWS NET) to assess market and consider the impact of COVID-19 on markets.
- To establish national social protection programs (social safety nets).
- To set up trade information offices at borders.

In the medium term, it is recommended:

- To strengthen the activities of the product transformation component, standards, and quality
- To revitalize the network of researchers and market analysts to take into consideration the exogenous and endogenous shocks to the dynamics of the markets in the sub-region.

In the long term, it is recommended:

- To stabilise and sustain the regional reserve system by:
  - i. ensuring proper functioning of governance tools and bodies, and by strengthening information and communication on rules, modalities, and organs of governance
  - ii. constructing the system step by step
  - iii. mobilising resources for funding the activities (from own resources, financial and technical partners), and by developing and implementing innovative funding tools (such as funding tools with the Bank for Investment and Development and Risk coverage systems).
  - iv. ensuring the concomitant reinforcement of the three lines of response (at local, national, and regional level) because they are interdependent, and by formalizing relations between reserves at three levels, especially between local storage and national security stock.
  - v. implementing tools (such as M&E system and ECOAGRIS in West Africa) which contribute to the transparency and efficiency of the regional reserve system.
  - vi. identifying the areas where performance can be improved and costs reduced (such as procurement, quality control, monitoring etc.)
  - vii. clarifying the goals of food reserves at each level, and the interactions among different types of storage progressively.
  - viii. establishing partnership with the private sector, which can increase efficiency, foster innovation, and provide additional source of financing<sup>13</sup>.

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<sup>13</sup> ECOWAS (2020). ECOWAS Regional Storage Strategy

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# Promotion of Sustainable Food System for Zero Hunger: Good Practice on Post-Harvest Loss Management from China and Africa

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## South-South Knowledge Product



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