Partnerships IQ

A product of handshake

Grain Storage

Public-Private Partnerships

India has a number of early lessons to offer in the development of grain storage PPPs: from specific bid requirements and clauses in draft contracts, the importance of ensuring early understanding and acceptability of project structures by investors, to the critical role of transparency.

INTELLIGENCE AND INSIGHTS ON PUBLIC-PRIVATE PARTNERSHIPS

WORLD BANK GROUP
Public-Private Partnerships

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Supplemental short videos and a webinar can be found at the following links:

Video on the Madhya Pradesh silo project by Sheo Shekhar Shukla, ex-MD, MPWLC, India, is available at https://www.kaltura.com/tiny/l4gdf

Video on the Punjab silo project by Jai Sheel Oberoi, Associate Director of LT Foods Limited, India, is available at https://www.kaltura.com/tiny/nx1kg

Webinar on Global Trends in PPP in Grain Storage by Shyamala Shukla and Neeraj Gupta is available at http://einstitute.worldbank.org/ei/webinar/public-private-partnerships-grain-storage

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ACRONYMS & ABBREVIATIONS

AALL	Adani Agri-Logistics Limited
AFMA	Agricultural and Fisheries Modernization Act, Philippines
ATA	Agriculture Transformation Agenda
BAFPS	Bureau of Agricultural and Fisheries Products Standards
BOLT	Build-Own-Lease-Transfer
BOO	Build-Own-Operate
BOOT	Build-Own-Operate-Transfer
BOT	Build-Operate-Transfer
BSF	Bulk Storage Facility
CAP	Cover and Plinth, Common Agriculture Policy
CIF	Cost Insurance and Freight
CPI	Consumer Price Index
CWC	Central Warehousing Corporation, India
DA	Department of Agriculture, Philippines
DBFOO	Design-Build-Finance-Own-Operate
DBFOT	Design-Build-Finance-Own-Transfer
DCP	Decentralized Procurement
DSCR	Debt Service Coverage Ratio
EPC	Engineering, Procurement, and Construction
EU	European Union
FAO	Food and Agriculture Organization
FCI	Food Corporation of India
FMA & RD	Federal Ministry of Agriculture and Rural Development, Nigeria
FMA & WR	Federal Ministry of Agriculture and Water Resources, Nigeria
FRA	Food Reserve Agency
GDP	Gross Domestic Product
GEAPS	Grain Elevator and Processors Society
GOI	Government of India
ICRC	Infrastructure Concession Regulatory Commission
IGC	International Grain Council

IFC	International Finance Corporation
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
INR	Indian Rupee
IRR	Internal Rate of Return
LGU	Local Government Unit
MFI	Multi-Lateral Financial Institution
MOF	Ministry of Finance
MPWLC	Madhya Pradesh Warehousing and Logistics Corporation Limited
MSP	Minimum Support Price
MT	Metric Ton
NABCOR	National Agribusiness Corporation, Philippines
NFRA	National Food Reserve Agency
OBC	Outline Business Case
PASFR	Public Authority for Stores & Food Reserve
PASSCO	Pakistan Agricultural and Storage and Services Corporation
PDS	Public Distribution System
PEG	Private Entrepreneurs Guarantee
PHPTC	Post-Harvest Processing and Trading Centre
PPP	Public-Private Partnerships
PUN-GRAIN	Punjab Grains Procurement Corporation Limited
RBOT	Rehabilitate-Build-Operate-Transfer
RFP	Request for Proposal
RFQ	Request for Qualification
SGR	Strategic Grain Reserves
SWC	State Warehousing Corporation
US	United States
USAID	United States Agency for International Development
VGF	Viability Gap Financing
WACC	Weighted Average Cost of Capital

All dollar amounts are U.S. dollars unless otherwise indicated.

INTRODUCTION

BACKGROUND

Global attention was focused on food price volatility in the aftermath of the global financial crisis. Governments initiated policy measures to ensure food security of populations, which included increasing food reserves as well as measures to reduce food wastage, including wastage due to poor storage and handling. One solution identified by countries running large food security programs was to introduce public-private partnerships (PPPs) in food storage, especially for storage of grain.

The positive impacts of PPPs in this sector could be huge given the inefficiencies in grain storage and the large proportion of post-harvest wastage especially in the handling and storage of grain in developing countries. A 2007 study estimated up to $4 billion in post-harvest losses in Sub-Saharan Africa alone, which is equivalent to the annual calorific requirements of 48 million people[1].

PPP projects for grain storage can be done in a variety of PPP modes based on policy imperatives of governments and the demand for storage, which is often a natural corollary to policy. While the benefits of PPPs are undeniable in many sectors, given the efficiencies that the private sector can bring in, there has been little experience in PPP in grain storage. Globally, only a few projects have been successfully implemented in this sector, with other projects being explored in various countries. There has been some recent activity in this sector in the PPP space in countries like India, Pakistan, Oman, Nigeria, Philippines,

[1] World Bank, Natural Resources Institute and Food and Agricultural Organization (2011), Missing Food: The Case of Post-Harvest Grain Losses in Sub-Saharan Africa.

and Zambia. However, not all of these countries have ended up adopting the PPP mode.

Given substantial work in this sector in India and interest expressed by other client countries to understand more about PPP models and projects in the sector, the World Bank Public-Private Partnerships Group, jointly with IFC Advisory Services in Public-Private Partnerships, undertook this review and analysis of global trends in PPP in grain storage. The methodology has consisted of: (a) interviews and discussions with public and private individuals and organizations involved in work in this area as well as IFC and World Bank staff who have been involved in such projects at upstream, midstream, or downstream implementation phases in different countries; (b) examination of procurement and contract documents available in the public domain; and (c) a broad literature review to supplement (a) and (b).

The paper is divided into three sections. The rest of Section I deals with the issues of global food prices, strategic reserves, and food policies within countries to the extent that these provide the context for PPPs in the sector. Section II deals with public-private partnerships in grain storage with a discussion of the rationale for PPP, strategic considerations, and PPP models seen globally with examples from various countries. Section III details a silo project case study from Madhya Pradesh in India that will be helpful to practitioners working on structuring silo projects in other developing countries. Section IV is the concluding section, and its two sub-sections include lessons learned from current experience and a list of the documents, contracts, and references examined by the authors, along with other material which can serve as a source of knowledge for practitioners. The Appendix at the end contains a brief guide to modern silos and silo operations—a "must read" for policy makers and PPP practitioners not fully conversant with these.

To supplement this paper, the World Bank Group has organized a face to face session with government and World Bank experts to discuss global trends and project cases. In addition, the authors have conducted a webinar that can be accessed at http://einstitute.worldbank.org/ei/webinar/public-private-partnerships-grain-storage. A set of videos on the Madhya Pradesh and Punjab cases have been prepared with the help of the World Bank's e-institute, featuring practitioners from the public and private sectors; these can be accessed at the following links: https://www.kaltura.com/tiny/l4gdf and https://www.kaltura.com/tiny/nx1kg

GLOBAL FOOD SUPPLY

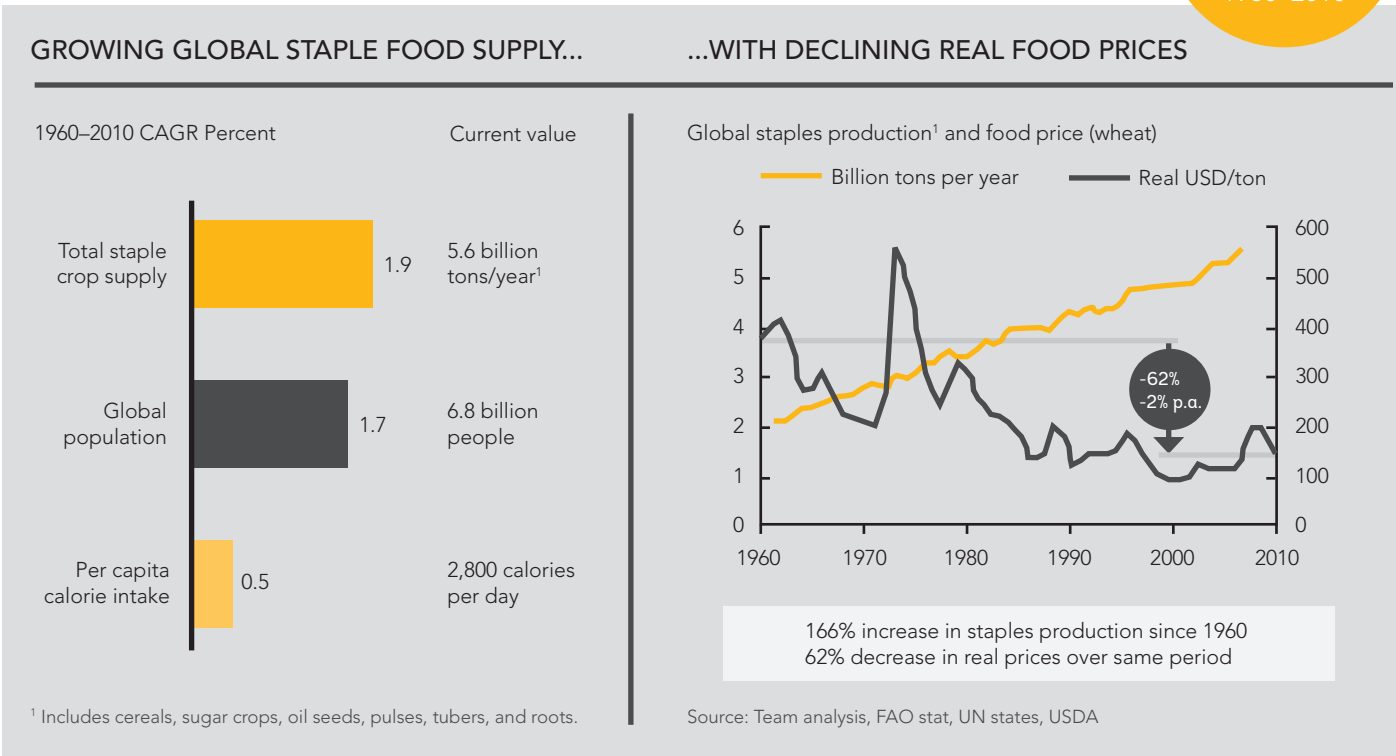
Global food production has risen steadily in the last 50 years, more than keeping up with population growth and allowing for higher per capita caloric and protein intake in most countries and regions. Annual world cereals production now exceeds 2 billion tons per year (see IGC reports)[2]. For decades food prices had fallen steadily as agricultural productivity increased (Figure 1). However, in the global expansion of 2001–2007, food prices rose substantially. On the one hand, farm yields started to plateau in part due to weather and climatic factors; on the other hand, unprecedented quantities of cereals and oilseeds

[2] See International Grain Council, Five Year Demand and Supply Projections, http://www.igc.int/en/downloads/grainsupdate/igc_5yrprojections.pdf for comprehensive statistical information on grain production and consumption.

were diverted to subsidized bio-fuels use, particularly in North America and Europe.

World economic growth reached historic highs in 2007 leading up to the crash of 2008. Higher incomes in some countries also contributed to world food price inflation. The 2008 high for the Food Price Index was nearly double its long-term average from 1991–2004. For barley and wheat the high was closer to triple the long-term average and for rice it was nearly four-fold (Figure 2). The increase in food prices was problematic for many countries.

Figure 1: Global food supply and prices, 1960–2010

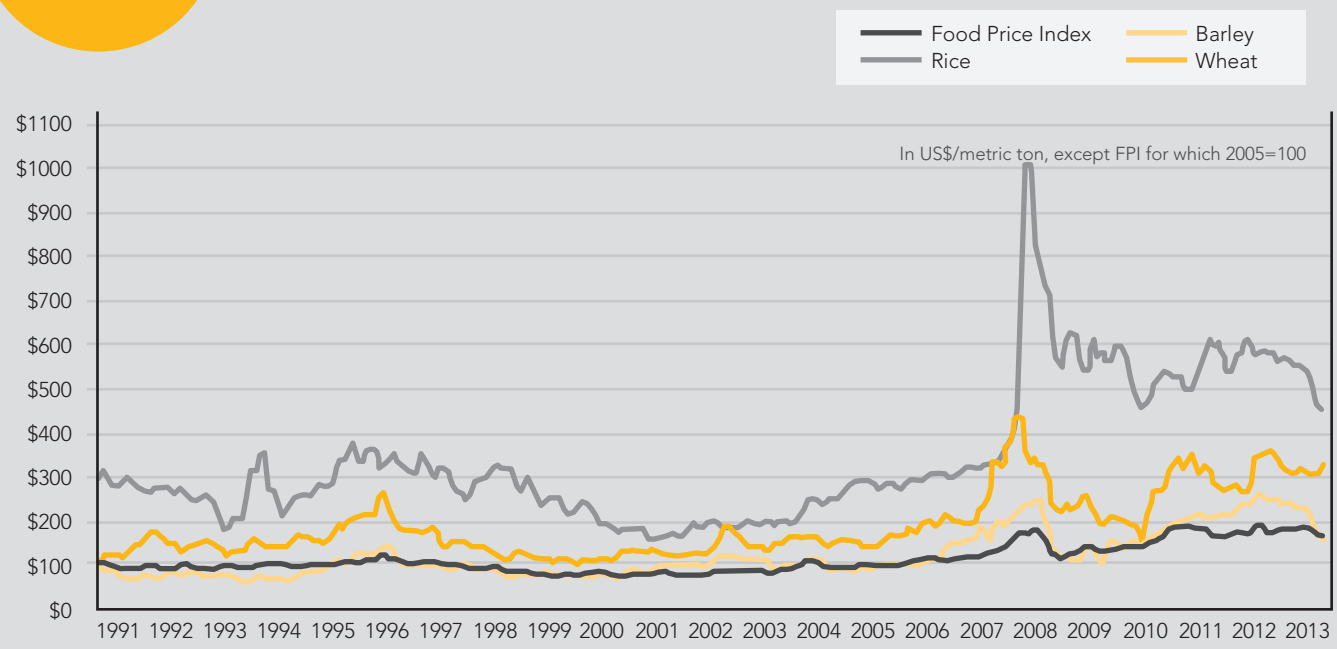


Many governments have responded to the ongoing volatility in staple food prices with more frequent market intervention. This has included establishing or increasing Strategic Grain Reserves (SGR) that can enhance a government's ability to influence and regulate domestic cereals prices. These reserves are relied upon in times of emergencies to feed vulnerable populations affected by natural disasters and conflict. However, SGRs can be even more important to governments to provide a buffer against externally generated food price shocks, such as those that have occurred with increasing frequency since 2007. See Table 1 for countries' planned reserves.

Apart from maintaining emergency reserves, countries such as India have reviewed their long-term ongoing subsidized food ration programs and have approved new legislation. Policy responses have typically also included a review of the government handling and storage practices in some countries. It is estimated that a substantial proportion of the global cereal production is lost through poor storage and handling practices that lead to spoilage and infestation at various stages in the supply chain. Key physical impediments such as

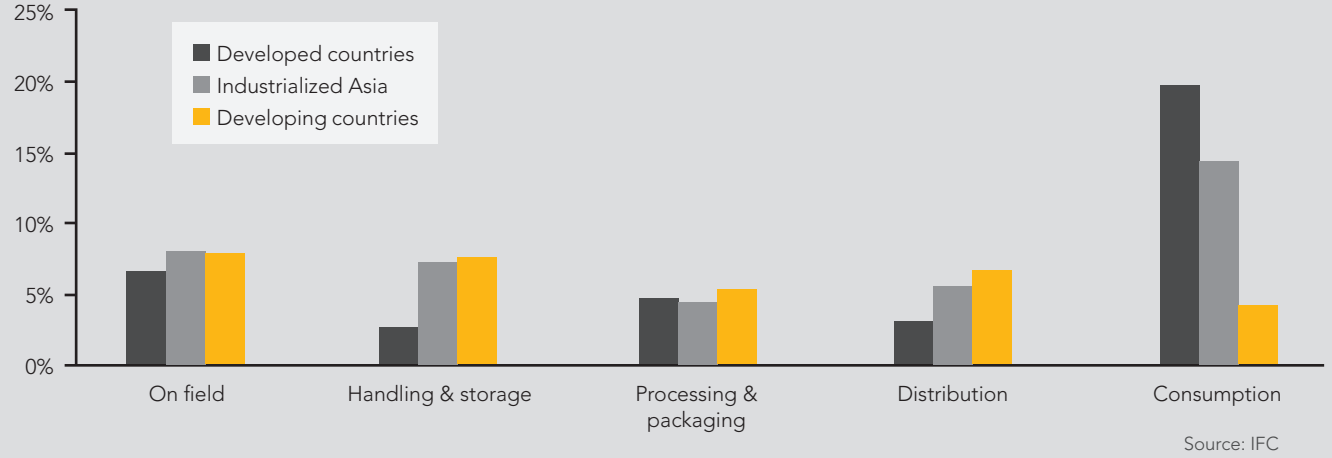
inefficient storage and handling methods, and lack of sufficient storage capacity along the supply chain, contribute significantly to annual losses in food as a proportion of total production. Figure 3 shows global food losses at different stages of the supply chain beginning from the losses on the field during and

Figure 2: Global food prices, 1991–2013



Source: IMF Primary Commodity Prices Database

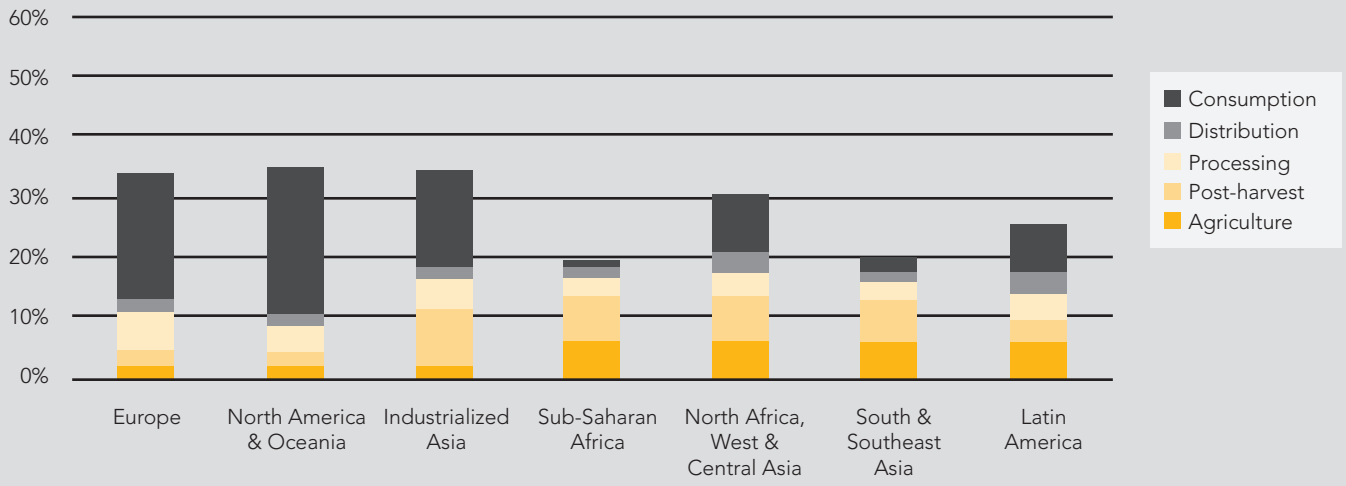
Figure 3: Global food loss stages along the production/ supply chain



Source: IFC

immediately after harvest and going on to storage, handling, processing, packaging, distribution, and consumption in developed countries, industrialized Asia, and developing countries. It is observed that storage and handling losses are substantial in the latter two categories. Figure 4 shows losses in cereals alone along the supply chain with a categorization of regions at a finer level of granularity, supplementing Figure 3. Post-harvest cereal losses are substantial in industrialized Asia, Sub-Saharan Africa, North Africa, West and Central Asia, and in South and Southeast Asia.

Figure 4: Losses in cereals along the supply chain, by region



Source: FAO (2011). Global Food Losses and Food Waste: Extent, Causes, and Prevention

There is a long-standing economic debate on the desirability of maintaining large strategic food reserves. The costs are typically high. They include the budget financing of the government grain purchases, investment in and/or leasing of storage infrastructure, and operating costs, as well as market risk. The longer the cereals are stored the greater the likelihood of quality losses and spoilage, water damage, or infestation. Such costs can be partly managed through stock level adjustments, institutional design, and integration with social safety net programs[3].

Holding large grain reserves also requires strategic planning and demand estimation in order to minimize waste. While we do not look at what the optimal levels of storage could or should be for a country given the limited scope of this paper, it is necessary to highlight that national food policy has important ramifications affecting risk allocation in storage PPP projects. Levels of storage and associated policies can substantially influence contract duration and design decisions. For example, Nigeria may not be able to have the same PPP design in grain storage as India, given that the latter's grain storage underlies social safety net programs while the former has few such integrated long term programs.

Some of the largest developing country governments have been carrying out substantial levels of procurement for maintenance of SGRs. Traditionally they

[3] Strategic grain reserves in four African countries – Ethiopia, Kenya, Malawi and Mali – were studied by IFPRI in 2009. The case studies suggest that the cost of holding a metric ton of food varied from $20 to $46 in these countries and were linked to the factors mentioned.

have either built their own storage or leased space. To increase their flexibility in management of the reserves, lower costs, and reduce the probability of corrupt practices, many government grain agencies have been exploring better storage modalities, including PPP schemes that mobilize private financing and efficiencies that come from marketplace competition.

Table 1: Planned Strategic Grain Reserves of Governments

	COUNTRY	RESERVES/PLANNED RESERVES
	Bangladesh	Planned increase in peak period public stocks of wheat and rice to 2.5 to 3.0 million MT from a previous level of 1.5 million MT
	India	Minimum strategic reserves of 2 million MT of wheat and 2 million MT of rice in addition to the buffer stock norms prescribed based on seasonality[4]. Total procurement by state and federal government much higher at approximately 90 million MT of wheat and rice (2013)
	Jordan	Proposed 33 percent increase in wheat reserves
	Kenya	The National Cereal and Produce Board announced a doubling of reserves to 720,000 MT of maize.
	Nigeria	5 percent of total annual grain harvest to be held in reserves
	Oman	Stated increase from 6 months to 17 months of national consumption after construction of new storages under PPP schemes.
	Saudi Arabia	Stock on hand of imported wheat to be increased to 1.5 million MT
	South Korea	Rice reserves with a record of up to 1.5 million MT
	Zambia	Currently holding about 2 million MT. The reserve target for 2014 is 500,000 MT.

Source: Prepared by the authors based on information from Food Corporation of India; Federal Government of Nigeria; Government of Zambia; Public Authority for Stores & Food Reserves, Government of Oman; IFC.

[4] The buffer stock norms (2005 onwards) require stocks of rice and wheat of 20.6, 16.2, 26.9 and 16.2 million MT in Q1, Q2, Q3, and Q4 respectively.

PUBLIC-PRIVATE PARTNERSHIPS IN GRAIN STORAGE

STRATEGIC CONSIDERATIONS

There are upstream policy related questions to be addressed before a Public Private Partnership-based project can be launched. These relate to the usual strategic considerations for PPPs in any sector: for example, long-term demand for the project, fit of the projects with existing and planned government policies, risk of policy change, and events beyond the control of governments that could result in substantial change. Some of these issues are discussed briefly below:

- While international trade policy is outside the scope of this paper, an important issue with regard to project risks relates to international agreements that might limit the amount of grain a developing country may purchase and store; this would have obvious impacts on the financial viability of PPP grain storage projects dependent upon availability payments from government. A country like India in particular could be affected, since it has recently embarked on an ambitious program to scale up long term food storage PPPs with assured payments to the private operators for storage of guaranteed minimum quantities of food grains over defined periods.
- Another important issue is the level and nature of government demand for grains, which depends on underlying government policies related to food and social safety nets. India, for example, has committed itself to expanding the distribution of subsidized food rations to an even greater share of the population under the National Food Security Act, passed in 2013. Most

states also depend on distribution from public food stocks to operate their mid-day meal programs for schoolchildren, along with other supplementary nutrition programs. Among other countries in the region, Bangladesh operates several targeted feeding and food ration schemes although it no longer operates a comprehensive system of food rations. The public food distribution systems in both countries provide the basis for government grain purchases and can ensure that government stocks can be adequately rotated without distorting markets through intervention sales.

- In contrast, there is a global trend toward the use of cash transfers to replace the distribution of food rations to vulnerable low income groups. This eliminates the need for governments to engage in routine food distribution operations that are better performed by market players. Government's role, in these cases, is restricted to maintaining and positioning adequate food stocks for emergency response in case of natural disasters. In some states of India, efforts are underway to transition poverty programs from in-kind subsidies to cash transfers. Continuing movement towards this would reduce the need for government grain procurement and storage, and thus would need to be taken into consideration while assessing the economic feasibility of long-term PPP projects for grain storage.
- Nigeria is an example of a country where there is no policy for distribution of subsidized food. While Nigeria does have an objective to maintain 15 percent of its grain production as reserves for responding to emergencies, particularly drought, with 5 percent maintained as core reserves, it has not allocated adequate budget for the purpose, resulting in lower than required levels of procurement. Essentially, due to a lack of policy backing and no guarantee of demand, the Nigerian silo storage PPPs will need to be based on a thorough assessment of the commercial viability of rehabilitating and using existing storage through a concession type arrangement with no coverage of demand risk.
- Where the silo storage program is based solely on emergency reserves, there could be other issues of management and rotation of stocks. In addition to price spikes, volatility—significant price fluctuations and cyclic pricing effects—are also of great concern. Given that grain may typically be stored for an extended period in some cases, there are problems in rotating old SGR stocks, particularly with grain quality maintained over the period. Governments such as India that are engaged in food distribution programs will always have some use for grain from storage facilities, including for use as animal feed. But if some countries are storing grain only for emergencies and experience an extended period without major emergencies, they will have stored their grain without benefit and actually at a major loss. So there is need for clear reserve management policies, rotation practices, and quality control for ensuring nutritional value, as well as disaster prediction capacity. This will help determine how grain is cycled through storage facilities and when and how it is released either domestically or internationally.
- The volumes of emergency stocks needed purely for disaster response is normally modest in relation to stocks typically maintained for routine food distribution and market interventions. The emergency reserve calculation is based on the maximum number of disaster affected people that must be

fed during the period before emergency shipments can arrive from outside. Even in the case of Pakistan's historic flooding in June 2010, affecting millions of people, total wheat released from government stocks over one year's time was just 500,000 tons versus annual intervention purchases of 4 to 5 million tons. In the case of Oman, the government has partnered with private sector milling companies for rotation of reserves on regular basis, through the formation of two joint venture companies.

RATIONALE FOR PUBLIC-PRIVATE PARTNERSHIPS IN GRAIN STORAGE

SGRs require physical storage facilities for the cereals owned by governments. Several countries are at various stages of delivering new or improved storage capacity using PPP models. The rationale for the use of PPP arrangements in grain storage is discussed below in some detail. However, it is important to understand that there could be a range of PPP models, some of these almost fully private, for the storage and management of grain reserves (also addressed in detail in sub-section 5 below). Where the government requires storage and management services for grain reserves for national emergencies and food subsidy programs, it is obvious that full privatization with no government involvement is not possible and some form of PPP would be required given the government's involvement as a buyer of services. Where the storage is for commercial purposes, the rationale for PPP is less obvious given that one would expect the private sector to step in where the requirement exists. However, this may not always happen, as is seen in the case of India and other developing countries where the issue of farm-to-market logistics is a persistent problem. India has been exploring PPPs in cold storage as well as associated transport infrastructure to provide a seamless farm-to-market logistics chain. These areas are still developing and PPPs could be an effective solution to market failures in this sector, as in other sectors.

The rationale for grain storage PPPs typically includes the quick scaling up of storage capacity, risk transfer, and mobilization of private sector efficiencies and innovation, and as an additional source of financing when governments lack fiscal space. Given the characteristics of grain projects, would we expect PPP projects in grain storage to have the same benefits as PPPs in other sectors? While there is less experience of PPP implementation in grain storage, the same general problems and issues prevail in grain storage, as in any other infrastructure or service. Some typical value drivers for PPPs are listed below, followed by a discussion of the rationale for PPP in grain storage.

Some of the value drivers of PPP include[5]:

- Risk transfer—Optimal risk allocation with specific risks transferred to the private party can reduce the cost to government.
- Whole of life costing—Bundling of design, construction, operation and maintenance can reduce total project costs as well as provide predictability of costs over project life.
- Innovation—Specifying outputs in a contract provides opportunity for

[5] World Bank Institute (PPIAF). (2012). Public-Private Partnerships Reference Guide (Version 1.0), Pages 161-167, available at: http://wbi.worldbank.org/wbi/Data/wbi/wbicms/files/drupal-acquia/wbi/WBIPPIAFPPPReferenceGuidev11.0.pdf

innovation as private players compete for the best way to deliver the outputs at least cost.

- Focus on service delivery—Management in the PPP firm is focused on service delivery and is free from the objectives or constraints that are typical drivers in the public sector.
- Mobilization of financing—PPPs can provide additional sources of financing.
- Accountability—PPPs can ensure higher levels of accountability given that government payments are conditional on the timely provision of the agreed quality and quantity of outputs.

Figure 5: Rationale for private participation in grain storage

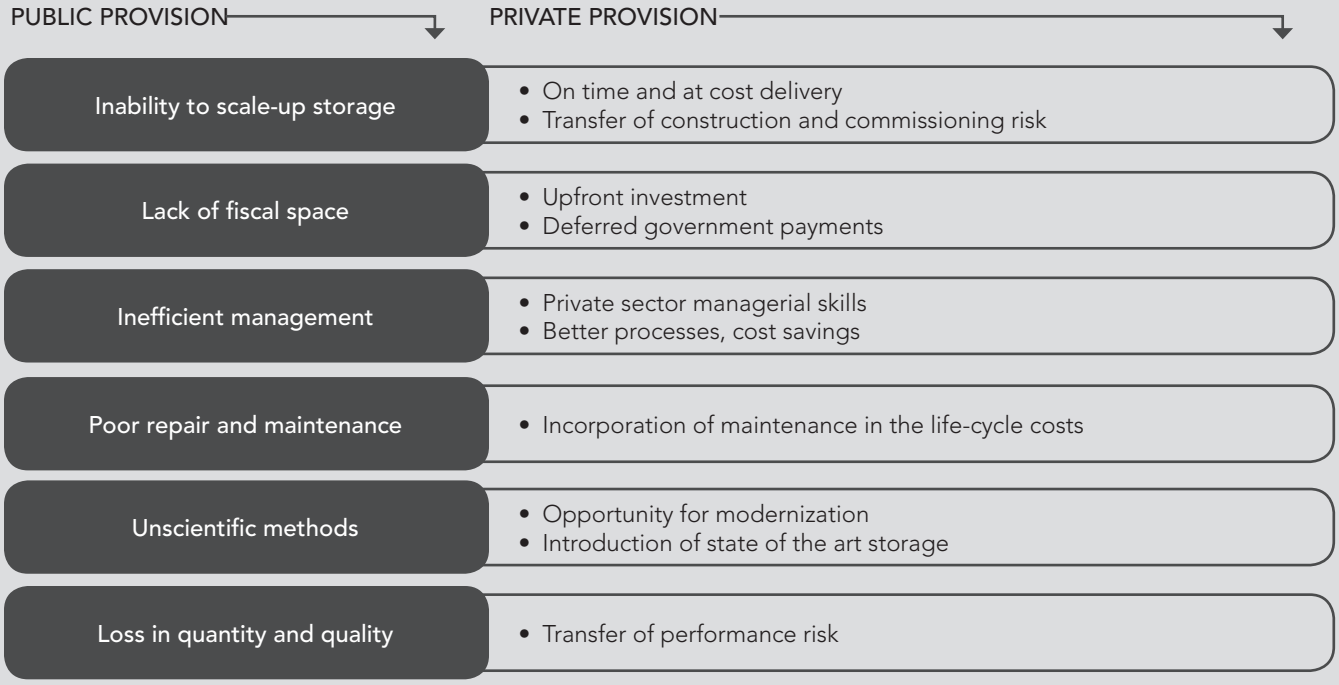


Figure 5 above looks at the value drivers and the rationale for PPP in the context of grain storage, comparing public and private management. Some of the issues highlighted may be more important than others given specific circumstances within countries. These are discussed below in the context of PPP in grain storage.

SCALING UP STORAGE CAPACITY

In many countries, a major policy response to the financial and economic crisis of 2008 and the accompanying food price spikes was to increase domestically held strategic food reserves. Because of its self-sufficiency in cereals, India was less impacted by international food price volatility.

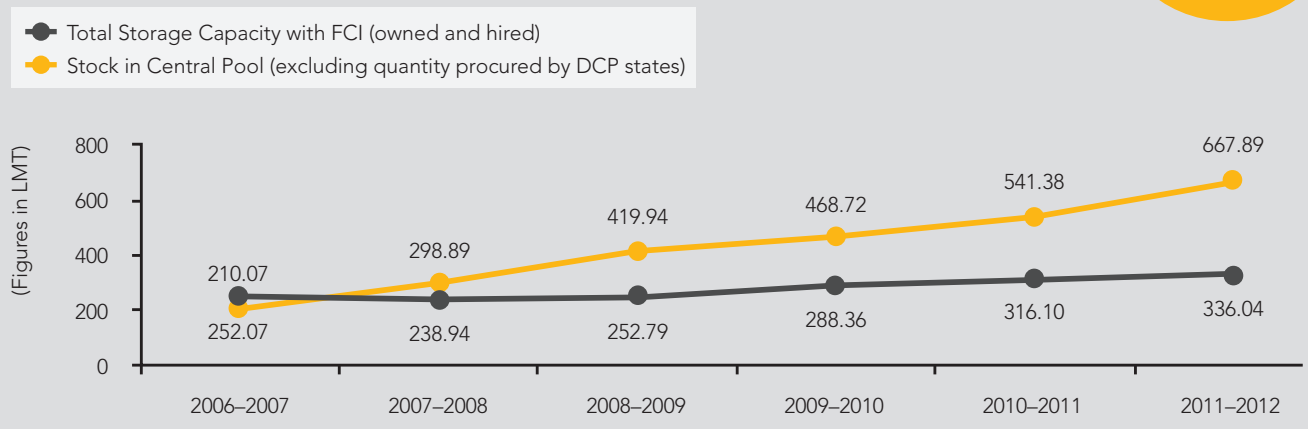
Instead, key issues included the long-standing problems in government grain storage. This was further aggravated by parliament's decision to expand the national program of subsidized food rations under a new Food Security Law. The Food Corporation of India (FCI), which is responsible for coordination at the federal level, has seen increased procurement over the years, but has not been able to bring about proportionate increase in the owned and hired storage space (Figures 6 and 7) due to inadequate budget revenues for the large capital investments required as well as other factors outlined in Figure 5. For example, under the new procurement targets, the state of Madhya Pradesh plans to create storage space for 15 million MT of wheat and rice by 2015 against an available capacity of 9.1 million MT in 2013[6]. (For more information, see the details of the silo project in MP in section III of this paper.)

Nigeria is approaching the PPP model from a different standpoint and with a different set of objectives. The government already owns silo and warehouse storage facilities, but these need rehabilitation and modernization. Some government owned silo storage facilities have been severely underutilized or never used at all, resulting in opportunity cost losses to the government. With a longer term plan to increase rice production in the country and the development of commodity exchanges, rehabilitating the silos through the PPP route for commercial use is considered a good business proposition.

In Zambia, production volumes of white maize for human consumption have greatly increased over the last two decades. To help farmers dispose of their surplus, the national Food Reserve Agency (FRA) has made large intervention purchases over the last four years (Figure 8). Zambia cannot consume all of its maize production and must export the surplus to other African countries. To do this, it needs better storage facilities to receive the harvest from farmers and make it available for commercial sales. The Government of Zambia has estimated that up to 30 percent of maize production is lost due to poor storage practices. Therefore, the government has embarked on a program to invest in a network of new maize storage facilities. While the

[6] Madhya Pradesh Warehousing and Logistics Corporation

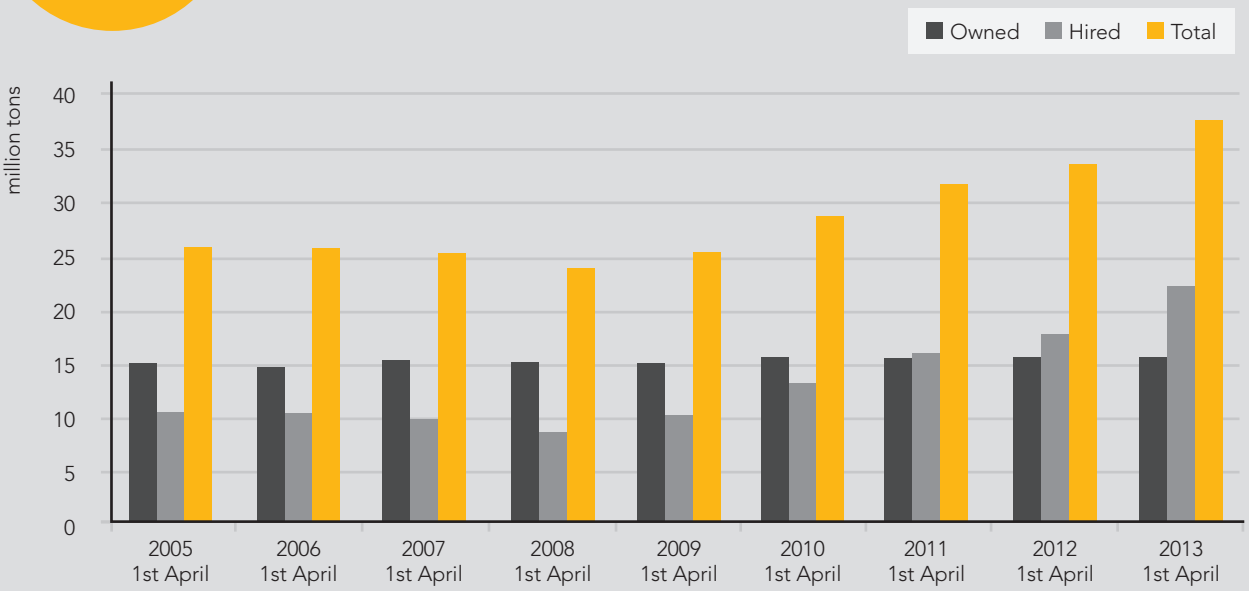
Figure 6: Gap in Storage Capacity of FCI in India



Source: 2013 Performance Audit of FCI, Comptroller and Auditor General, India

arrangement was initially envisaged as a PPP using an unsolicited proposal, government now appears to be proceeding with direct public investments in new storage warehouses for bagged maize. However, the opportunities for private sector engagement remain a viable value proposition.

Figure 7: Owned and hired storage of FCI in India



Source: FCI, available at http://fciweb.nic.in/storages/view/6

Figure 8: Maize production and FRA procurement

Source: Food Reserve Agency, Zambia; World Food Program; University of Greenwich; World Resources Institute

PRIVATE SECTOR EFFICIENCIES

Globally, private companies procure, transport, and store much more grain and oilseeds than government entities. Private sector players have been responsible for advances worldwide in the design, construction, operation, and maintenance of storage and handling facilities, as well as transport innovations throughout their supply chains. A PPP can improve operational efficiencies through competitive design, adoption of modern technologies, provisions for maintenance of building and equipment through complete life-cycle of projects, and through building output-based performance indicators into the contract. These relate especially to handling time, labor and equipment productivity, low loss level tolerance, and other factors. In terms of grain storage, performance indicators may include measurements such as:

- Average acceptance and dispatch qualities;
- Capacity requirements for facility processes; and
- Volume of grain stored or handled per hour, including during peak time or time required to accept or dispatch a specified volume of grain at the facility.

PPP contracts typically link the achievement of certain levels of output with the payment mechanism. For example, there could be an incentive for reduction in grain losses below a benchmark level or a penalty for losses above a pre-agreed level. The MPWLC estimates post-harvest losses at approximately 1 percent annually. However, in its PPP contract, under the performance requirements, it seeks to cap any variance in the prescribed volume to weight ratio to + or - 0.1 percent. In addition, all shortfalls are to be paid for by the concessionaire at the prescribed rate. The FCI draft contract caps dust losses at a maximum of 0.05 percent of the intake quantity if storage is beyond one year. Apart from the savings in terms of actual grain losses and quality deterioration, there are efficiencies in several areas of the process of storage and handling that are likely to generate overall savings for government. According to estimates by IFC, the first Punjab silo alone would result in a savings of $6 million to the government over the term of the concession[7]. Pakistan is another country that is now in the process of procuring private partners for construction and operation of grain silos in Punjab and Sindh provinces. See Box 1 for details on losses under the current system of public procurement of grain in Pakistan.

PPPs are sometimes used as a tool for the modernization and adoption of new technology[8]. This seems to be an important consideration for governments that may not be able to manage modernization either because of lack of fiscal space or simply the inability to keep up with the rapidly moving technologies and skill requirement. Given the proportion of wastage in storage and handling of grain by the public sector, and the lack of updated technology, there is a need for revamping systems and practices. This can be done best by the private grain industry firms, which are much more adept than government at bringing in the most up to date and cost effective technologies.

[7] IFC Success Stories, Punjab Silo Project

[8] Rightly or wrongly, PPPs have been used for the purpose of modernization and adoption of world class technology in the transport, water, and other sectors. The idea is not to advocate that these should be used as such, but this is a practical and easy way of bringing in new methodologies. The public sector typically lacks skills to do this. However, this may not always work if radical change is sought. For further reading on using PPPs as a tool for modernization, see Chapter 3 of the Asian Development Bank's, Public-Private Partnerships Handbook.

Box 1

PAKISTAN: LOSSES IN PUBLIC PROCUREMENT AND THE DECISION TO ADOPT PPP MODE

Annual wheat production in Pakistan ranges from 20 to 24 million tons, roughly estimated at 3 percent of the gross domestic product (GDP)[9]. About two-thirds of the wheat produced is marketed, with the government purchasing 35–50 percent[10]. Current wheat stock estimates in Pakistan range from 3.3 million MT, as assessed by the United States Agency for International Development (USAID), to the State Bank of Pakistan's estimate of 7 million tons[11]. Total wheat consumption in Pakistan is expected to rise to 23 to 24 million tons by 2017[12].

The Government of Pakistan is actively involved in the wheat market with the twin objectives of price stabilization and food security. The Pakistan Agricultural Storage and Services Corporation Limited (PASSCO) and the provincial governments maintain the operational and strategic reserves. The federal government sets the procurement and release prices, with the provincial-level governments also playing an important role. Since the mid-1980s, the government has shifted toward positive market price support for wheat farmers, including during the food crisis of 2008–10, in an effort to increase domestic wheat production to meet food security needs.

Government procurement is financed by commercial loans from approximately 20 banks, including the State Bank of Pakistan, and the high interest rate of the loans adds about 11 percent to the total government cost of procuring[13]. After procurement, wheat transportation is operated by the private sector, often with government financing. The government then stores the wheat in government-owned or rented storage facilities, primarily godowns or open-air ganjis[14]. Financial losses are estimated to be extremely high; however, these losses are not officially recognized or accounted for. As a result, the losses are absorbed by the government or by the millers at sale. The wheat is released from the storage to millers at a previously fixed price. The state's losses from the current processes of procurement, storage, transport and financing are estimated to be up to 13 percent of the total costs[15]. Given the chronic losses in public procurement and storage of grain, governments in the provinces of Sindh and Punjab in Pakistan made the decision to go for PPP-based silo projects, which are currently at procurement stage.

[9] Dmitry Prikhodko and Olekksandr Zrilyi, "Pakistan: Review of the wheat sector and grain storage issues," FAO Investment Center, 2013.

[10] Ibid, viii.

[11] Given that the State Bank of Pakistan, along with other commercial banks, finances the government procurement of wheat, this assessment is likely to be closer.

[12] Ibid, vii.

[13] Ibid.

[14] Ibid, 24. Godowns are horizontal or flat-shed storage facilities and ganjis are open-air storage facilities, often under tarpaulin or other cover.

[15] Ibid, 25.

Examples of areas with potential for improving outputs through the use of modern and scientific methods, paired with private participation, include:

- Change from bag-based storage to bulk storage with mechanical handling;
- Monitoring and removal of foreign matter at reception;
- Inventory monitoring through electronic scales and specialized computer software;
- Aeration and recirculation of grain in bulk storage to equalize moisture and prevent pest infestation;
- Temperature controlled storage and temperature monitoring to prevent infestation; and
- Systems for segregating grain based on quality, such as protein based grain segregation.

In addition, it would be easier to introduce the use of warehouse receipt-based financing as well as modern ICT tools and techniques for supply chain efficiency improvement in areas where the storage systems are already modern and scientific.

ADDITIONAL SOURCE OF FINANCING

Lack of fiscal space in national or state budgets for construction of modern storage facilities, and need for additional sources of financing, has been one of the reasons governments have sought PPP arrangements. Private sector investment can enable governments to spread capital expenditures over many years. For example, the fixed component of the fee for silo services is often used to pay for the amortization of the silo investment cost for the duration of the contract. This could be as long as 20 to 30 years based on several considerations, a key factor being the time required by the private party to recoup its capital investment at reasonable tariff levels. For many governments, fiscal constraints mean that PPP arrangements could be the only way to bridge the infrastructure gap.

RISK TRANSFER

In some publicly owned and operated storage facilities, a substantial proportion of the cereals may be lost in storage and handling. A private operator can reduce these losses through good management practices and the right technology.

However, the private sector company could itself face the possibility of shortfalls in demand and revenue that could raise the risk profile of a storage project significantly. A PPP grain storage contract can effectively allocate financing, construction, and performance risks to the private sector which is better able to manage these, while retaining the demand/ revenue risk with the public sector. This makes for an optimal risk allocation, especially in cases where government is involved in substantial grain procurement.

TYPICAL PPP MODELS

The PPP type adopted is most commonly determined on the basis of the objectives that the PPP desires to achieve, the risk profile of projects, and the ability of parties to take on specific risks. As seen in the earlier part of this paper, most commonly, countries maintain reserves either for the purpose of food security during times of natural calamities, as a result of price stabilization programs, or as a linkage to ongoing social safety net programs. The practice depends on the type of linkage to other programs/ policies:

- Where the reserves are linked to disaster response, there is a requirement of forecasting disasters suitably in advance with early warning systems to be able to rotate and maintain an optimal reserve;
- Where the linkage is to a price stabilization program consisting of procurement by government at a minimum support price, it is difficult to assess storage requirements given that prices cannot always be predicted suffi-

ciently in advance. India's high minimum support prices have contributed to record wheat and rice crops with the state and federal government legally obligated to buy up the surplus, which has contributed to burgeoning reserve stocks and chronic shortages of adequate storage capacity; and

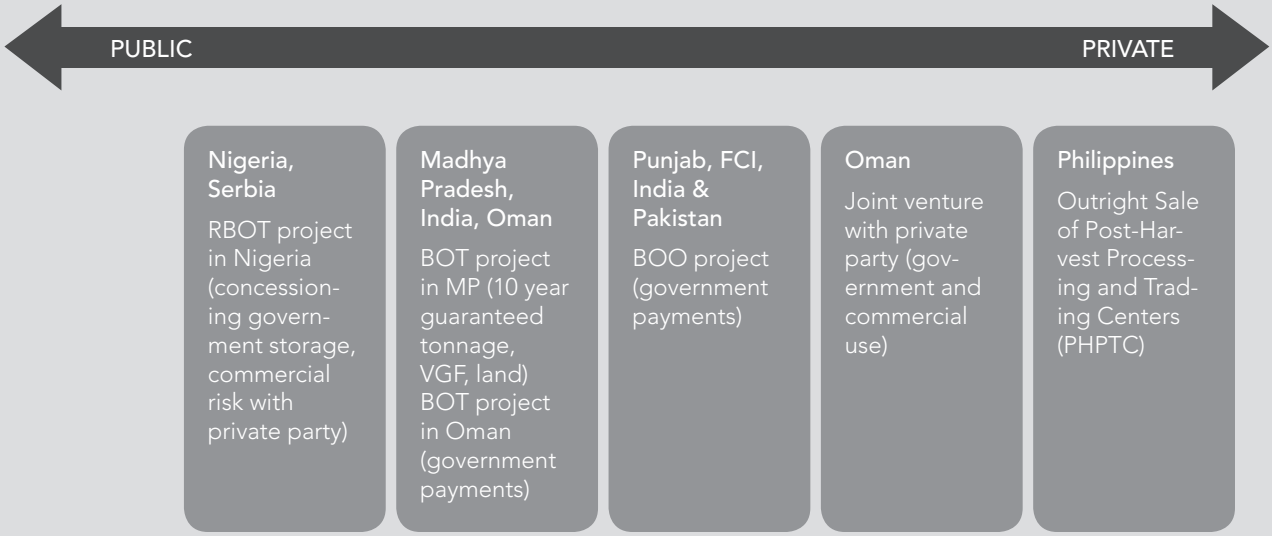
- Where there is linkage to ongoing social safety net programs, there are fewer problems in terms of estimating requirements and maintaining optimal reserves.

Although this discussion pertains to national food security policies, it has important ramifications as far as predictability of demand for storage services is concerned. For example, it could also help determine the best option for storage: public, private, or PPP mode. In addition, it could affect the type of PPP selected, the duration of the contract, and the structuring of the risks of the project.

Overall, similar to projects in any other sector, PPPs in grain storage range from full public ownership projects, which are the norm in most developing countries, to full privatization at the other end, with many variations in between (See Figure 9 below).

Given the above background, we present below a spectrum of PPP models and examples. These models are used globally for grain and agricultural storage for emergency reserves as well as for other purposes. In the case of countries like India, the stocks are associated with national and state food ration and targeted feeding programs, resulting in longer term contracts. In these cases, the private party takes on a larger role in the provision of services and provides land as well as financing for projects[17].

Figure 9: PPP models in projects in grain storage



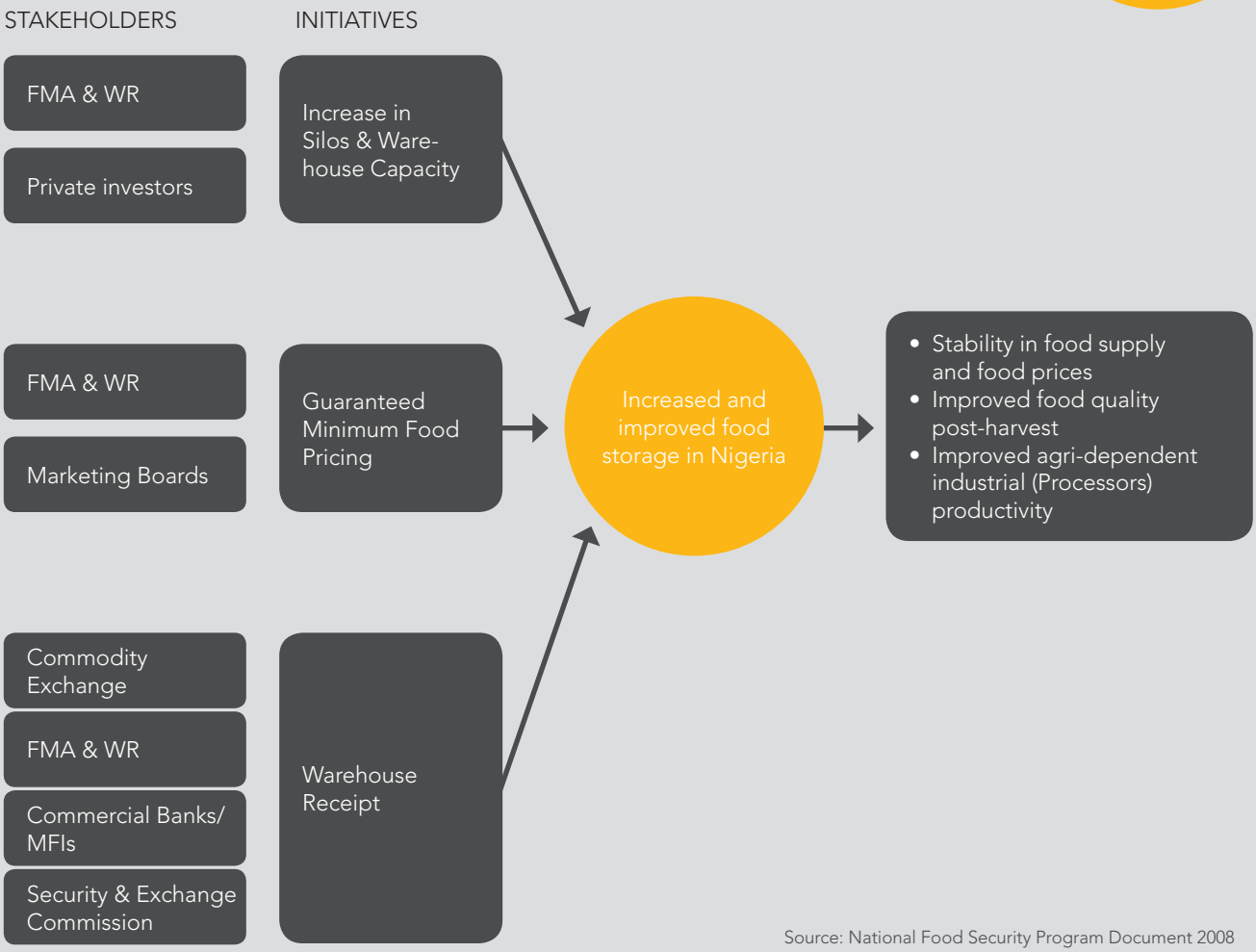
PUBLIC OWNERSHIP OF ASSETS WITH PRIVATE OPERATION

Under this model, warehouses and goods are owned by the state, and a private company operates the storage facility. The state and the company enter into a contract that governs the mutual rights and obligations relating to the storage and restoration of goods and warehouse management. Example: Serbia, Nigeria (with slight deviations).

In Nigeria, a similar but slightly different model is expected to be put to bid. Federal and state governments are offering concessions on 33 state-owned silo facilities and warehouses (Box 2). This has been called the RBOT model, in which the private party will modernize/ rehabilitate the silos and operate them. The assets will revert to the public authority after completion of the contract term. However, in the Nigerian model currently being structured, it is envisaged that the silos will be used to provide storage services to private parties who store and trade in grain and other agricultural commodities. It is also expected that these will be linked to the operation of the commodities exchange.

[17] The categorization is adapted from a presentation by Mirjana Janjic and Alojzij Cerne , "Management of National Emergency Stocks of Agricultural Products in Serbia, Slovenia, Poland, Germany and Models of PPP" made at Kenya PPP Workshop, September 3–4, 2013. This presentation was based on research by Alojzij Cerne of the Zavod Republike Slovenije za blagovne reserve.

Figure 10: Proposed initiatives to increase food storage in Nigeria



Source: National Food Security Program Document 2008

Box 2

CONCESSIONING STATE-OWNED SILO COMPLEXES IN NIGERIA

In Nigeria, agriculture accounts for 40 percent of the national Gross Domestic Product (GDP)[18], employs more than two-thirds of the labor force, and provides 88 percent of non-oil earnings. Eighty percent of the agricultural GDP is contributed by crops (85 percent)[19].

In 2009, Nigeria adopted a policy to hold 15 percent of the total grain harvest as reserves, with the National Food Reserve Agency (NFRA) holding 5 percent as the core strategic reserve and individual states holding another 10 percent as "state buffer stocks.[20]" The government is said to have provided N50 billion ($4.05 billion at 2009 conversion rates) in the 2009 budget and another N96 billion ($7.8 billion at 2010 conversion rates) in 2010 to the Federal Ministry of Agriculture and Water Resources for the construction of government silo storage facilities[21]. This appears to have been in line with the objectives outlined in the National Food Security program document of 2008, which emphasized increased and improved food storage in the country (Figure 10). In addition to the storage capacity of 325,000 tons, which it already held, in 2010 NFRA embarked on the procurement of equipment for the construction of 18 silo complexes at inland sites in different states, in line with stated policy. Seven facilities had 100,000 tons capacity each (20 bins x 5000 tons per bin) and the remaining 11 facilities were 25,000 tons each, bringing the total capacity to 1.3 million MT.

However, only a few of these storage facilities are operational. The rest are not operational and in some cases are abandoned. Reasons include:

- lack of fiscal resources to fill the silos and operationalize the SGR of 15 percent as envisaged earlier;
- government policy to make agriculture a commercial venture with greater private participation in grain and food markets; and
- dissolution of the NFRSA as an independent agency and the transfer of its functions to a ministerial department.

The Federal Government of Nigeria changed its policy of intervention in agriculture in favor of greater private participation, and commenced the implementation of the Agriculture Transformation Agenda (ATA) in 2011 in order to transform agriculture to a profitable business. The ATA seeks to promote agribusiness, attract private sector investment in agriculture, reduce post-harvest losses, add value to local produce, develop rural infrastructure, and enhance access of farmers to financial services and markets[22]. In 2012, Nigeria's Federal Ministry of Agriculture and Rural Development (FMA&RD), which manages the 33 silo complexes built by government under its earlier policy of providing food security through government procurement and stocking, signed a Memorandum of Cooperation with the Infrastructure Concession Regulatory Commission (ICRC) to concession out the silo complexes.

The FMA&RD, in collaboration with the ICRC and the Federal Ministry of Finance (MoF), launched a call in October 2013 for retaining the services of a Transaction Adviser to prepare the Outline Business Case (OBC) for the 33 silo complexes. While the details are being worked out, the ICRC has described the preferred PPP model for the Silo project as rehabilitate-build-operate-transfer (RBOT)[23]. Under this model, the already-built silo complexes will be rehabilitated/ refurbished by the private entity and will be put to use for commercial storage. It is envisaged at this stage that the private entity will take on the demand risk as well as pay government a part of the revenues earned in the form of concession payments.

[18] Oluyemisi Kuku-Shittu, Astrid Mathiassen, Amit Wahwa, Lucy Myles and Akeem Ajibola, "Comprehensive Food Security and Vulnerability Analysis, Nigeria," July 2013, page 4.

[19] National Food Security Program, 2008, Federal Government of Nigeria

[20] Institute for Agriculture and Trade Policy, "Grain Reserves and the Food Price Crisis: Selected Writings from 2008–2010," June 2012, 34.

[21] Theophilius Abbah, "Nigeria: Food Crisis – No Grains in Over N140 Billion Silos," 21 October 2012, www.allafrica.com.

[22] African Development Bank, "Strategic Environmental and Social Assessment," July 2013, 3.

[23] http://www.icrc.gov.ng/project_book.pdf

JOINT OWNERSHIP OF ASSET WITH PRIVATE OPERATION

This model is similar to the public ownership model, except that the storage is co-owned with the company. The state has a contract with the company under which the state pays the costs of storage and management of the grain. In addition to these costs, the state, in proportion to its ownership share, also covers the current costs and maintenance of the warehouse. The model of joint venture companies has been used by Oman to maintain its reserves (Box 3).

Box 3

PASFR JOINT VENTURES WITH PRIVATE FLOUR MILLS IN OMAN

Oman is 0.8 percent[24] self-sufficient in grain production, with low levels of cultivation of land due to lack of water for irrigation[25]. Given this situation, Oman cannot achieve self-sufficiency in food production and will continue to be heavily dependent upon the import of grains for domestic consumption. In addition, with demand showing an increasing trend with population growth, new industrial zones, and greater inflows of foreign workers, it is expected that Oman may have to rely solely on imports to meet food security needs by 2050[26]. In the aftermath of the global financial crisis and continuing food price volatility, given the high import dependence, the government decided to increase its wheat storage capacity from six months to a 17-month supply[27]. In addition to ensuring food security for its population, Oman also envisages itself as a hub for grain trade in the Middle East and North Africa region.

The Public Authority for Stores & Food Reserves (PASFR) was established in 1980 with a mandate to maintain strategic food reserves as well as to ensure domestic price stability of basic commodities. PASFR is also responsible for constructing and maintaining warehousing for basic commodities[28]. PASFR envisages increasing private participation in order to fulfill this mandate, and it has established joint ventures for this purpose with Atyab Investments LLC[29] (with 51 percent government shareholding) and with Salalah Mills Co. (with 4 percent government share).

In Oman, the Ministry of Commerce and Industry is structuring a deal for the construction of steel silo storages at two port sites: 300,000 MT at Sohar port[30] with Oman Flour Mills and 120000 MT in Salalah Port with Salalah Flour Mills. The agreement is a build-own-operate-transfer (BOOT) model.

[24] Domestic production as a percentage of the amount available for consumption

[25] Msafiri Daudi Mbaga, "Alternative mechanisms for achieving food security in Aman, Agriculture & Food Security 2013, 2:3, 1 February 2013.

[26] Ibid.

[27] The World Bank, "The Grain Chain: Food Security and Managing Wheat Imports in Arab Countries," 2012, http://www.fao.org/fileadmin/user_upload/tci/docs/The%20Grain%20Chain_ENG.pdf, 14.

[28] Rice, sugar, separated lentils, tea, milk powder, edible oil and wheat.

[29] Atyab Investments LLC, established in 1977, has a subsidiary Oman Flour Mills which together with the Salalah Mills Company, established later in 1995, has a market share of 95 percent in locally milled wheat flour.

[30] This will be part of the Food Cluster in Sohar Port and Freezone.

PRIVATE OWNERSHIP AND OPERATION WITH PUBLIC FINANCING

In this model, storage is owned by a private company, but the state, based on full or partial financing of the construction, has the right to affordable rental. The private operator provides storage service for state-owned food commodities. This model is similar to the fourth model, except that a long-term contract in addition to other rights and obligations sets a deadline for ending the right of the state to cheaper warehousing. This model is also similar to the fifth model, except that the state has the right to cheaper warehousing until the end of a long-term contract. After the end of that agreement, the benefit expires. Example: Croatia, Madhya Pradesh in India.

The state of Madhya Pradesh in India has a PPP model with Viability Gap

Financing (VGF) support from the government to the private party with the amount of VGF required being the basis of bid. Section III examines the MP Silo Project in greater detail. The PEG scheme in India is also based on private financing of storage and renting back to government at pre-agreed rates. See Box 4 for details.

Box 4

PRIVATE FINANCING OF STORAGE INFRASTRUCTURE THROUGH THE PRIVATE ENTREPRENEURS GUARANTEE (PEG) SCHEME IN INDIA

Government procurement of wheat rose progressively from 9.23 million tons in 2006–07 to an estimated 40 million tons in 2013–14. In July 2008, the FCI launched the PEG Scheme, aimed at increasing the storage capacity for consuming states to four months of Targeted Public Distribution System (TPDS), and for procured food grain in producing states to meet the highest stock levels recorded in the previous three years. The PEG Scheme was started for states that do not participate in Decentralized Procurement (DCP), with facilities delivered under the program used by FCI to store Central Pool grain stocks. It was extended to the remaining states in 2009.

As the name implies, the program provides a guarantee of usage of godowns to private developers that deliver those facilities. The 2008 PEG Scheme was designed to increase the number of godowns through Central Warehousing Corporation (CWC), State Warehousing Corporation (SWC), and private entrepreneurs, based on providing guarantees for a period of five, seven, or 10 years. The minimum capacity of storage facilities to be procured under PEG is 5,000 MT for plain areas and 1,670 MT for hilly areas, requiring a minimum of two acres and 0.82 acres of land respectively. The construction period for the godowns is set at one year for non-railway siding facilities and two years for railway siding facilities, with the option for a one-year delay in construction resulting in a corresponding reduction in the guarantee period. The procurement process involved two-stage bidding.

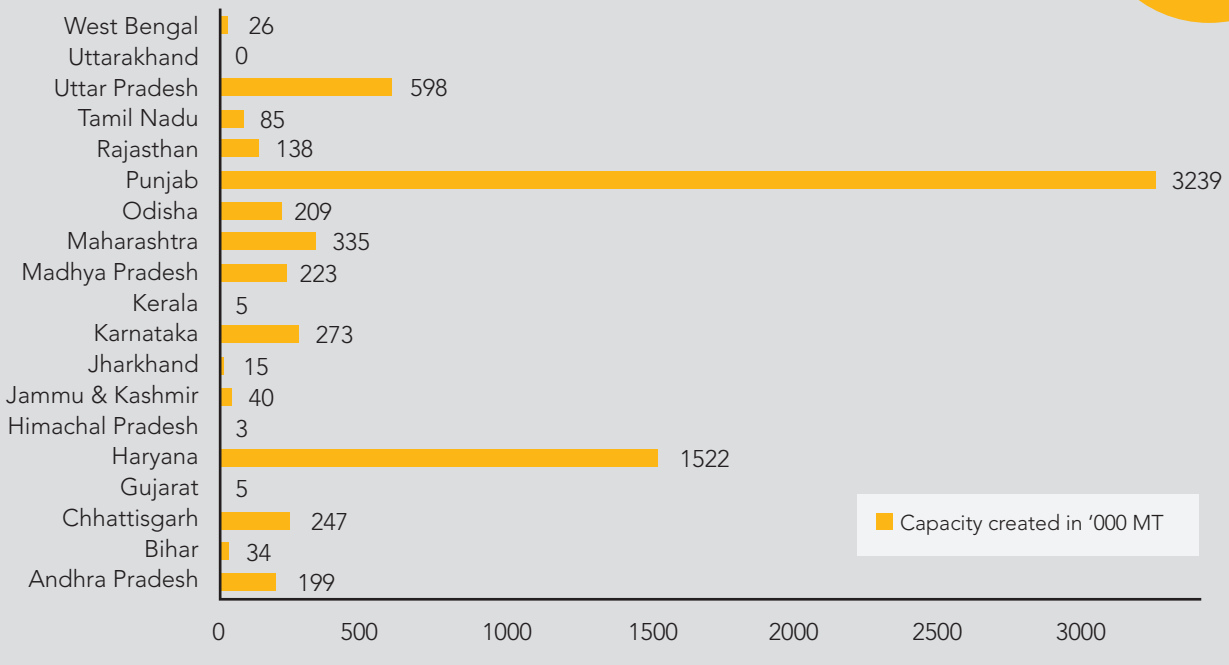
The program has the following features:

- The three parties involved in the PEG scheme are the FCI, the CWC/SWCs, and the private party. It involves two agreements for each project, one between the FCI and the CWC/ SWCs, and the other between the CWC/SWCs and the private party.
- The private party is selected based on a two-stage open bidding process.
- The monthly rate of rent to be paid to the private party is the sole selection criterion. Other factors considered as part of the technical bid prior to and separate from the financial bid are as follows: suitability of site based on distance from rail siding and other conditions; and the technical capacity of the bidder.
- The private party finances and constructs the storage based on technical specifications issued by FCI.
- The CWC/SWC hires the storage from the private party upon completion of construction.
- Five years upwards of guaranteed storage is provided to the private party.
- The private party can have contiguous storage for private/ commercial storage operations.
- The CWC/SWC is responsible for overall operations and bears the performance risk (i.e., the losses).

Box 4, continued

- The CWC/SWC can handle food grain preservation, security and other activities itself or outsource these to a private party.
- All payments are borne by the FCI under the PEG scheme guidelines.
- The payment mechanism for FCI payments to the CWC/SWCs has the following components:
  a. **Payments made by the CWC/SWCs to the private party;**
  b. **Expenses on food grain preservation and security; and.**
  c. **Supervision charges which are up to 15 percent of component A.**
- As of July 31, 2013, more than seven million MT of new capacity had been delivered under the PEG Scheme (Figure 11).

Figure 11: Storage capacity created state wise under PEG scheme, July 2013



Source: Food Corporation of India

PRIVATE OWNERSHIP AND OPERATION OF STORAGE

Storage facilities are owned and operated by the company, which acts as the landlord and manager. The food commodities are owned by the state. This is the model that is used in the 28 countries of the European Union (EU) whose rules do not permit use of government owned storage facilities for food commodities purchased under the EU Common Agricultural Policy's (CAP) system of Minimum Support Prices (MSP). In each EU country, there is a government payment agency that channels funds from the CAP budget to farmers, including for purchase of commodities at MSP. These national agencies also contract for storage services from the private sector following EU regulations, including open tenders.

This PPP model is also closest to the form we see in India (Design Build Finance Own and Operate, or DBFOO) in the FCI (Box 5) and Punjab Silo projects in India (Box 6), and in the Pakistan projects, where the storage services are provided for government owned grains at a price determined through bid.

Box 5

FCI SILO PROJECT IN INDIA

India's government mandated FCI to establish 2 million MT of food grain silo capacity on a PPP basis. The food grain silos are to be built across 36 different locations in both procuring and consuming areas, in a total of nine states: Bihar, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, and West Bengal. Thirty-four of the planned silo complexes will have a capacity of 50,000MTs, while the two silos planned for Kerala will have a 25,000MT capacity. FCI finalized three different project options based on project location, with variance in storage capacity (either 50,000MT or 25,000MT) and whether intake and offtake will be in bulk and bag, or solely in bags.

The PPP projects will operate on a Design, Build, Finance, Own and Operate (DBFOO) basis. FCI has chosen a two-stage online competitive bidding process for procuring the private party. FCI issued a Request for Qualification (RFQ) on November 21, 2013, which did not receive the expected response and has been cancelled. Fresh tenders with changes in some of the conditions are expected to be issued in next few months.

The basic project features are as follows:

- The private party is required to provide storage, preservation and handling services in the Silo Complex, on an exclusive basis to the Authority (FCI) for a period of 22 years.
- The project is fully financed by the private party.
- The private party is paid on the basis of making available the required capacity
- The payment mechanism consists of fixed charges, variable charges, and loading and unloading charges. The Fixed Storage Charge is indexed to 70 percent of the Wholesale Price Index. The Variable Storage Charge is 3 percent of the Fixed Storage Charge. The Handling charge is indexed to the Consumer Price index (CPI). The Authority also pays a Service Tax, as applicable under service tax rules.
- The bid variable is the lowest level of fixed charges.
- The Selected Bidder for each of the proposed Silo Complexes procures the land for the Complex and the rail siding. The land required for the 50,000 MT capacity silo complex is a minimum of 11 acres, with a requirement of 9 acres for the 25,000 MT silos.

Box 5, continued

- The proposed location of the rail siding should be feasible for connectivity with the Indian Railway network.
- The Concessionaire is permitted to use the rail siding for other commercial activities at a revenue share of 5 percent with FCI.

It is expected that the capital costs of the project might be higher than other silo projects, such as the Punjab and MP projects. This is due to the requirements related to the rail siding including the large area of land and the prior feasibility study on suitability of the land for the purpose.

Box 6

PUNJAB SILO PROJECT IN INDIA

The Punjab silo was the pioneering PPP project in grain storage in India after the initial project by Adani Agro Logistics Limited (AALL), which was commissioned in 2007 (Box 12). It is a BOO project with a concession period of thirty years with a set of four silos with a capacity 12,500 MT each, for a total capacity of 50,000 MT. The Punjab project set the tone for other projects that followed in the state of Madhya Pradesh, as well as FCI sponsored projects to be constructed all over the country. It is also one of the relatively few BOO PPP projects in India. The Punjab project, as is the case with other recent projects in India, is solely for the purpose of storing wheat. It has been fully operational for three years.

The project was procured by the Punjab State Grain Procurement Corporation (PUNGRAIN) with the help of IFC, which was engaged as the transaction advisor. A two stage bidding process was used, whereby 12 bidders participated in the RFQ process and final proposals were submitted by five shortlisted participants. The bid criterion used was the lowest fixed charge payable by government per MT. LT Foods Limited, a 40-year-old company engaged in the processing, storage, and marketing of basmati rice – and which has 15 years of experience in silo storage—won the final bid on the basis of a price of INR 1,185 per MT. The award was made in May 2010 and work was completed in early 2011.

The key features of the PPP are as follows:

- The private party is responsible for the financing, design, construction, operation and maintenance of the silo.
- The private party is responsible for procuring land within a period of three months from the date of contract execution.
- The site is required to be within eight kilometers of a rail head with loading facilities, siding, and a commercial facility for booking.
- The sites require a minimum of 3 hectares of land.
- The authority is responsible for making payments based on availability.

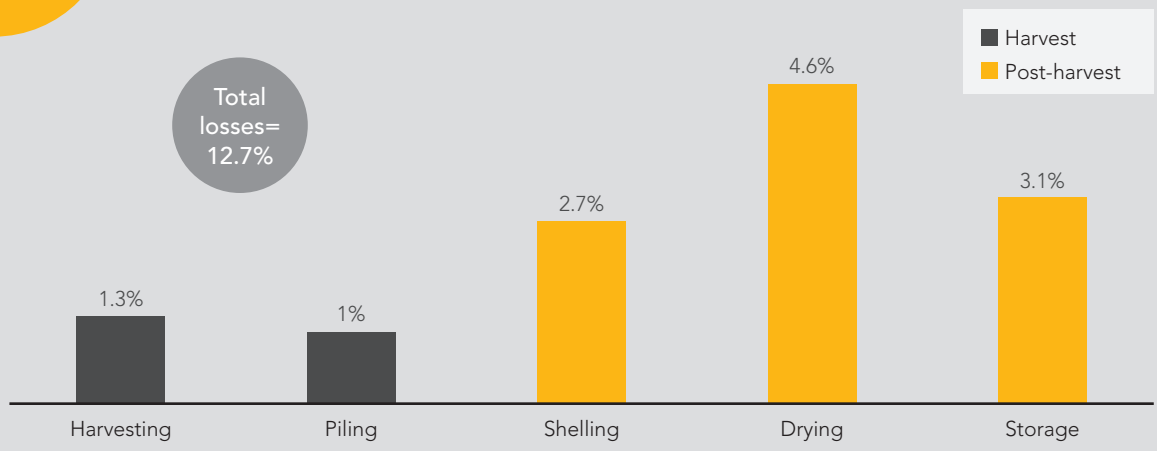
Box 6, continued

- The Authority (PUNGRAIN) is required to procure and deliver the wheat grain in bags to the Concessionaire for storage in the silos.
- The private party is responsible for unloading, de-bagging, weighing, testing, drying (if required), storing, and maintaining the quality of wheat grain, and bagging and dispatching the wheat grain.
- The payment mechanism consists of fixed and variable charges. The Fixed Service Charge is at INR 1,185/MT and the Variable Acceptance and Dispatch Service Charges are at 7.5 percent of the Fixed Service Charge each.
- The Fixed Service Charge is paid on a monthly basis by the Authority whether or not the storage is fully utilized.
- The project assets remain with the concessionaire after contract expiry.

CONCESSION WITH PRIVATE OPERATION AND OWNERSHIP OF STORAGE AND AGRICULTURAL STOCK

Under this model, operational in Switzerland, storage is owned and operated by the company and the agricultural commodities are also owned by the company. The state merely supervises the implementation of contractual obligations of storage. This is the only model of ensuring commodity reserves that is financed by the companies. In all other models, goods/ grains are financed by the state. An example of a totally private model in ensuring the development of a commercial grain market but for a purpose other than maintaining core strategic food reserves is that of the PHPTCs (Box 7) in the Philippines. These were initially envisaged by the government as a PPP but were later converted to an outright sale of assets to the private sector.

Figure 12: Post-harvest losses in white corn in the Philippines



Source: Estimates by Department of Agriculture, Philippines, 2011

Box 7

THE CASE OF THE POST-HARVEST PROCESSING AND TRADING CENTERS (PHPTC) IN THE PHILIPPINES

The Philippines Department of Agriculture's National Agribusiness Corporation (NABCOR) owned and operated about 19 PHPTCs for yellow corn. These PHPTCs were owned by the NABCOR jointly with Local Government Units (LGUs) before the official closing of NABCOR recently. The PHPTCs bought yellow corn from the farmers and processed and marketed it. However, these facilities have been operating inefficiently and at high loss levels. The Philippines Department of Agriculture (DA), given the high levels of post-harvest losses (Figure 12), planned to convert the jointly owned PHPTCs into PPPs as part of a plan to deliver a bulk handling system for grain, with processing centers and transshipment stations in major production areas and selected seaports.

Based on feasibility studies, it was found that PPP projects were feasible for 11 of the PHPTCs.

However, with a change in policy and government's emphasis on running the grain and agricultural business as a commercial venture, rather than as a government supported activity, the government decided to go in for outright sale of assets of the 11 centers and has called for requests for qualifications from interested private parties. Firms can place bids for multiple PHPTCs and once the successful bidders are selected the government will sign asset purchase agreements with them. The PHPTCs are expected to operate as fully privatized entities with the government (under the DA and the Bureau of Agriculture and Fisheries Products Standards [BAFPS] quality accreditations system) playing a regulatory role.

[31] Public-Private Partnership Program "The Philippine Public-Private Partnership Program," May 2012, http://ppp.gov.ph/wp-content/uploads/2012/05/PPP-Brochure_May2012.pdf, 23.

PROJECT CASE STUDY

MP SILO PROJECT, INDIA[32]

This case examines the objectives, structuring and procurement of the silo project in the state of Madhya Pradesh in India.

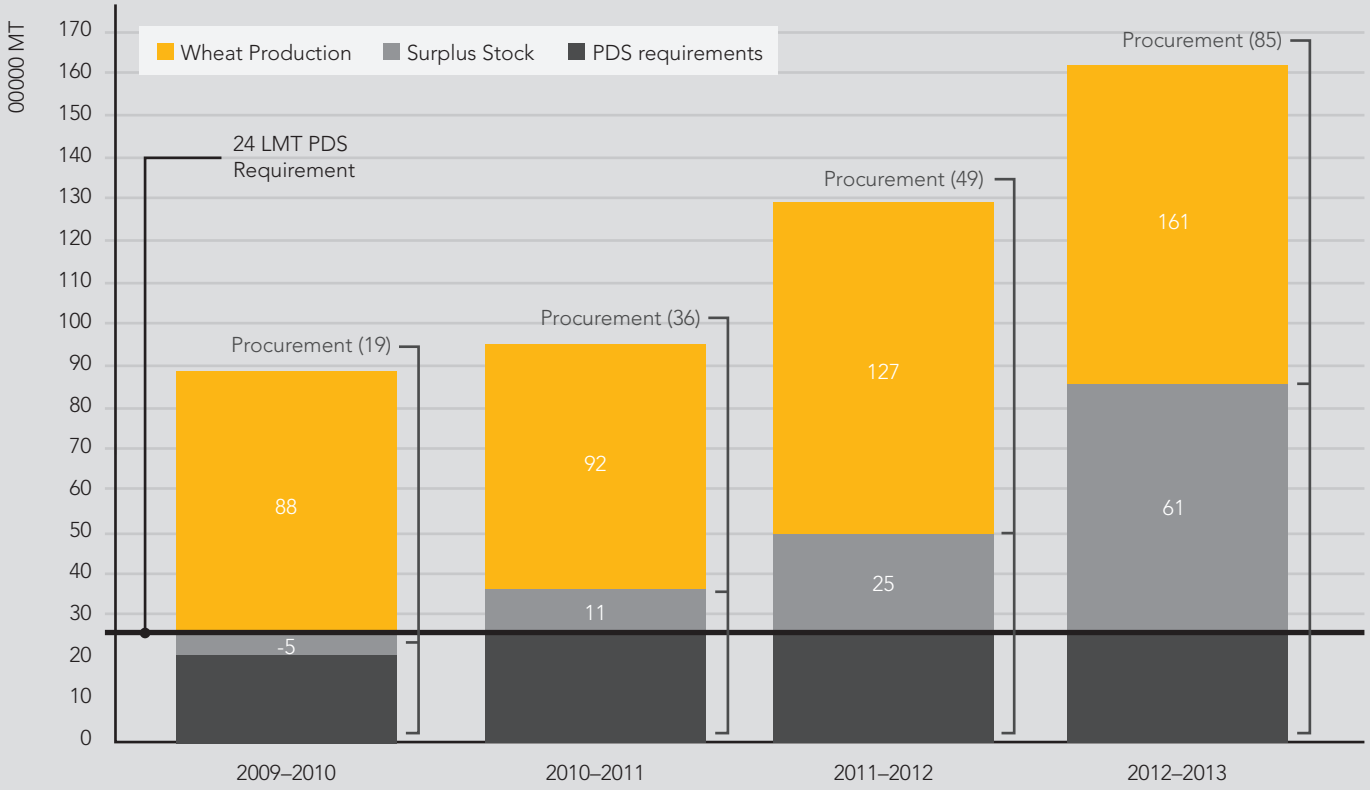
Wheat production in the state of Madhya Pradesh in India has increased significantly during the last few years. Simultaneously, frequent upward revision of the Minimum Support Price (MSP) and the consequent increase in the quantum of wheat procured by the state has resulted in surplus stocks over and above the amount required for the Public Distribution System (Figure 13). However, Madhya Pradesh lacks the required level of storage and handling facilities for such large stocks, resulting in losses estimated by the MPWLC at 10 percent of the total stock.

The Government of Madhya Pradesh decided to add about 6 million MT of storage over and above the 9.1 million MT of storage available in the state in 2012. The storage was to be added over two years: 2.5 million MT in 2013 and 3.5 million MT in 2014. There is a mix of public and private investment as well as a mix of storage types, including conventional warehouses, steel silos, and silo bags (Table 2). The choice was based on an analysis of available public fiscal space, volumes of storage needed, and location of storage, as well as the potential attractiveness of a specific storage project to the private sector.

The government issued the Warehousing & Logistics Policy in 2012 to promote the silo project and adopted a Design, Build, Finance, Operate, and Transfer (DBFOT) model. The firm Mott MacDonald was retained to prepare a

[32] The case study is based on presentation and discussion of the MP Silo project by Sheo Shekhar Shukla, Ex-MD, MPWLC at the Brown Bag Lunch on "Public-Private Partnerships in Grain Storage", held on June 5 at the World Bank, Washington DC. In addition, some details have been accessed from the procurement and contract documents relating to these projects available in the public domain.

Figure 13: Surplus wheat stocks in Madhya Pradesh, India



Source: Madhya Pradesh Warehousing and Logistics Corporation Limited

techno-commercial feasibility study of the proposal. The contract document was drafted in close coordination with the Planning Commission as well as the Department of Economic Affairs in the Government of India. Table 3 describes the salient features of the project.

The individual silo projects are very small PPP projects with small capital and operational costs. It may be noted that land costs are not included in the total costs. The capital cost of each project has been estimated at approximately INR 31 crore (approximately $5 million[33]). It was estimated based on a financial analysis that VGF may be required to make the project financially feasible. Box 8 describes basic costs, sources of revenue, and key projected financial ratios for the project.

[33] at current rate of exchange of $1 = INR 60

Table 2: Projected investment in storage in MP, India

PRIVATE INVESTMENT	
Investment incentives	1.50 million MT
Business Guarantee	1.30 million MT
Rural Godowns	0.35 million MT
Steel Silos with VGF	0.50 million MT
Steel Silos with Business Guarantee	0.35 million MT
TOTAL	4.00 million MT
Public Investment	2.00 million MT
GRAND TOTAL	6.00 million MT

Source: Government of Madhya Pradesh, India

Table 3: Salient features of the MP silo project, India

PPP MODEL	LOCATIONS	CAPACITY	GOVERNMENT SUPPORT	BID CRITERION	TARIFF
DBFOT	Dewas, Harda, Hoshangabad, Raisen, Satna, Sehore, Ujjain, Vidisha, Bhopal, and Indore.	50000 MT in each location and a total of 0.5 million MT.	20% VGF each by MP state/ Government of India in upfront and operational payments. 8 acres of land for each project by state. 10 year business guarantee for the entire capacity built. 20 years concession term.	Lowest Viability Gap Financing required.	The same tariff as for conventional godowns. The tariff is set from time to time by the Government of Madhya Pradesh for all MPWLC-owned storage.

Box 8

PROJECTED FINANCIALS OF MP SILO PROJECT, INDIA

Tables 4, 5, 6a, and 6b detail the cost structure, revenues, and the sensitivity analysis of key ratios projected for each silo project by the MPWLC. The government appears to have used a lower than actual level of WACC, but the financial analysis shows that the projects are feasible with good debt service coverage (30:70 equity: debt ratio and with some level of VGF).

Table 4: Silo complex—costs

DESCRIPTION	INR MILLION
Land & Site Development	0.070
Building and Civil Works	144.563
Plant & Machineries	96.695
Electrical, Automation, & other Utilities	28.750
Preliminary & Pre-Operative Expenses	21.877
Contingency	13.504
Total Block Cost	305.458
Margin Money	0.8943
Total Capital Cost	306.352

Table 5: Silo complex—revenues

REVENUES	INR/MT/YEAR	DESCRIPTION
Receipt & Dispatch Charges	91.20	Reimbursement at actual values handled
Commission Charges	1%	On value of actual quantity handled under central pool system

STORAGE CHARGES	INR/MT/YEAR	
Variable Charge	67.30	As on April 1, 2012
Fixed Charge	723.46	As on April 1, 2012

Table 6a: Sensitivity of key ratios to VGF

VGF %	0%	10%	20%	25%	30%	35%	40%
Project Cost	3063.52	2757.17	2450.81	2297.64	2144.46	1991.29	1838.11
VGF Amount	0.00	306.35	612.70	765.88	919.06	1072.23	1225.41
Project IRR	12.14%	13.23%	14.55%	15.34%	16.21%	17.19%	18.32%
Equity IRR	14.05%	15.85%	18.23%	19.75%	21.57%	23.83%	26.68%
DSCR	1.00	1.11	1.24	1.31	1.40	1.50	1.61

WACC=9.97

Table 6b: Sensitivity of equity IRR to VGF & utilization year 11–30

UTILIZATION & VGF		AVAILABILITY OF VGF					
EQUITY IRR	14.05%	10%	20%	25%	30%	35%	40%
UTILIZATION AFTER 10 YEARS	100%	15.85%	18.23%	19.75%	21.57%	23.83%	26.68%
	90%	14.87%	17.27%	18.80%	20.64%	22.93%	25.82%
	80%	13.77%	16.16%	17.69%	19.55%	21.87%	24.83%
	70%	13.12%	15.52%	17.07%	18.95%	21.29%	24.29%
	60%	10.75%	13.19%	14.77%	16.70%	19.13%	22.28%

WACC=9.97 | Equity IRR > 12% desirable

The MPWLC adopted a two-stage open bidding process with a Request for Qualifications in March 2013 for pre-qualifying eligible bidders. See Box 9 for details of the evaluation process adopted.

Box 9

EVALUATION PROCESS OF MP SILO PROJECT, INDIA

The evaluation process consisted of a scoring and weighting system based on project experience of firms/ consortia. For the purpose of technical pre-qualification of firms, the issue the MPWLC had to deal with was to reach a balance between the PPP and sector/ domain expertise requirements. While it was decided to not require mandatory silo experience for the firm, since there is less of that kind of expertise inside the country and larger international firms may not be interested in bidding for smaller projects even if bid out in packages, it was felt that firms should at least get a premium in terms of scores to the extent of their silo / storage sector experience. The MPWLC therefore categorized the firm's project experience in terms of four categories of projects and assigned weights/factors for evaluating the experience in each specific category (Table 7).

Firms pre-qualified based on the above criteria were invited to submit financial bids. At this stage the sole criterion used was the amount of VGF required/ amount of premium offered.

Table 7: Categorization of projects & assignment of weights

	CATEGORY I	CATEGORY II	CATEGORY III	CATEGORY IV
Sector	PPP projects in warehousing/ storage sector	PPP projects in core sector	EPC projects in warehousing/ storage sector	EPC projects in core sector
Factor assigned	1.5	0.8	0.9	0.4

There was a high level of interest in the project and 168 bids were submitted by 31 firms/ consortia for the ten silo complexes. Forty-four financial bids were submitted by nine firms/ consortia for the 10 silo complexes. The sole bid criterion following pre-qualification on technical and financial criteria was the lowest level of VGF required (or the premium offered). (See Box 10 for details of the VGF based bids received.)

Box 10

VIABILITY GAP FINANCING FOR SILOS IN MP, INDIA

The Scheme for Support to Public-Private Partnerships in Infrastructure was initiated in 2005. The scheme provides for 20 percent grant support from the Government of India to projects at national and sub-national levels, where a project is found to be economically feasible but not financially so, and fulfills other general eligibility criteria.

The Government of India accorded in-principle approval for up to 20 percent VGF to be provided to the 10 silo complexes. Final VGF paid is determined on the basis of the bid, with the amount of VGF required being the sole bid criterion in the second stage of bidding involving pre-qualified firms.

The private sector perspective on the projects appears to be mixed, with a range of amounts quoted as VGF for each project by different bidders. Overall, the perspective is more optimistic than the government view, as very low VGF or some amount of premium has been bid by the winning firms/ consortia (Table 8). One reason could be that firms were allowed to bid for multiple projects, and getting more than one project leads to synergies that reduce costs. Another reason could be early wins that companies might be trying to get in order to prepare for the larger FCI storage program and other state programs likely in the short to medium term. However, it does raise questions—as in any other PPP project—about the information on costs. It also brings up issues of aggressive bidding in order to capture the market for a specific type of project/ service, as well as questions on possible future problems in closing or even future operational performance issues.

Table 8: VGF bids by firms in the MP silo projects

Location*	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
Firm	Financial Quote (VGF required) in INR millions									
Pristine Logistics	1.025	0.911	0.971	1.000	1.075	0.874	0.999	1.051	-	-
Adani Enterprise	0.211	0.291	0.241	0.231	0.311	0.221	0.241	0.221	0.351	0.311
LT Foods Limited	0.626	1.220	1.130	1.146	0.626	0.577	0.611	1.170	0.005 Premium	0.005
Techno Electric & Engineering	-	-	0.842	-	-	0.582	0.985	-	-	-
Veerprabhu Marketing	1.070	1.138	1.070	0.941	-	0.795	-	0.941	-	-
Sri Avantika Contractors (T)	-	-	-	0.900	-	-	-	0.900	-	-
Total Shipping & Logistics	-	-	-	0.525	-	0.001 Premium	-	-	-	-
Oakridge Energy	-	0.899	-	-	-	-	-	-	-	-
Vishandas Asnani	-	-	-	-	-	-	-	-	0.165	0.145
Lowest Bidders	Adani	Adani	Adani	Adani	Adani	TSL**	Adani	Adani	LT Foods	LT Foods

* Locations: (i) Dewas; (ii) Harda; (iii) Hoshangabad; (iv) Raisen; (v) Satna; (vi) Sehore; (vii) Ujjain; (viii) Vidisha; (ix) Bhopal; (x) Indore.

**Total Shipping & Logistics Limited

The deals are expected to achieve financial closure very soon and it is expected that the new silos would be ready for use before the 2015 Rabi[34] harvest.

[34] Rabi crops are sown in October-November and are harvested in spring, i.e., around April.

CONCLUSION

KEY LESSONS

Lessons are now emerging in countries that are at various stages of implementing PPP silo projects. India, where we studied the evolution of the various PPP types in greater detail for the purposes of this paper, has a number of early lessons to offer. Many of these early stage concerns relate to procurement stages from bid requirements and clauses in draft contracts. Other issues focus on the understanding and acceptability of project structures by investors. Key positive lessons from India underline the importance of following a transparent procurement process—where bidders are not only kept aware of the progress of the process but key elements of information are shared with bidders, and bidder feedback is taken at each stage of the process.

Some areas where governments need to be cautious and some issues that have emerged from ongoing experience are also highlighted below. These do not exhaust all possibilities and it is likely that we will see more lessons emerging as we gain more implementation experience from a larger set of countries.

STRUCTURING OF PROJECTS

As discussed earlier in the paper, silo projects have risk profiles which are related to government policy as well as to the way the sponsor structures the project that is brought to bid.

Similar to PPP projects in other sectors, it is important that the project is structured in a way that the risk allocation is fair and efficient, with the risks

allocated to parties that are best able to handle them. For example, risks that are in the government's control (for example, changes in law) should be allocated to the public sector, while other risks that are in the private party's control (such as construction and operation) should be allocated to the operator.

However, it is important to remember that PPP projects in grain storage are typically first of their kinds in countries and therefore carry higher risks than projects in other sectors (such as power, where private sector activity is more common). Specifically, in a grain storage project, the private sector operator's primary concern revolves around the government's ability to pay during the concession term. This payment risk has to be addressed in some way during project structuring in order to encourage the private sector to be willing to take this risk for the long term. For example, in case of the ongoing Sindh grain storage PPP project, the provincial government has set up a VGF, which will be tapped into to provide a letter of credit to the private sector investor to cover part of the payment risk. This not only addresses some of the payment risk for the project, but also shows government commitment to the project and encourages the private sector to invest in the project.

Another important risk that is typical in grain storage projects is the large number of stakeholders in this sector. These can include farmers, middlemen, provincial and federal governments, millers, and consumers. With introduction of private sector activity in this sector, there is a possibility that some or all of these stakeholders are not excited about this change. The public sector has to undertake consultation sessions with each of these stakeholders in order to ensure that there are no grievances at a later stage. If this is a risk that is not handled properly at the onset of the project, it has potential to create significant social issues. Since this risk is not in the private sector's hands, it needs to be handled entirely by the government.

Apart from risk allocation related issues, we have seen in the case of the Madhya Pradesh project that there could be challenges in the costing of projects. While silo projects do seem to be rather simple in terms of capital investments, it is not clear what level of tariff should be considered the right level. For example, there is substantial difference between the tariff in the case of the Punjab project and the MP project. While the costs could be explained by the initial investments in land, upfront grants by the MP government, and the differences in commercial structure such as provision of actual handling charges in MP, it is not entirely clear with the low level of VGF requirements being presented by the bidders in MP if these differences alone can explain the large difference in tariff, one set by the government and one determined through market competition. In general, there is a risk when the government sets an artificially low or high tariff instead of relying on market forces.

PRE-QUALIFICATION OF FIRMS

Incorrect or vaguely written pre-qualification criteria could have the following repercussions:

- Companies with little experience enter the bid process;

- Eligibility criteria create an entry barrier for companies, resulting in low level of competition; and
- Quality of bids suffers with bid prices and storage solutions that are not feasible.

Many developing countries have little experience within the public or private sector of establishing, or operating and maintaining, larger scale silo storage. Given this, it has been difficult for governments to set the eligibility criteria for bidding for these projects appropriately. Stringent requirements relating to running of silo projects have the potential to become a major entry barrier. At the same time, more flexibility with emphasis on allowing companies to source technical experts from outside to provide the required experience and expertise could result in participant companies with no experience getting pre-qualified as well. There is also the likelihood of low but less well analyzed or infeasible bids; even infeasible bids may have to be accepted by the public authority given procurement rules relating to lowest bid.

It is not unlikely under such a scenario that public authorities will sign agreements with companies or consortia with no prior experience in the area. The performance risk increases substantially in each case. Table 9 shows the technical pre-qualification criteria used in three different silo PPP projects in India. In the Indian projects, the lack of prior experience in food silo or storage projects was not used as a basis for rejection. However, the evaluation scores were weighted such that experience in food silo or storage projects would count for more. However, since the scoring was done as a factor of the total value/cost of payments received by the firm, firms with a high value of total payments in core infrastructure projects could potentially score higher than firms with a fair or medium level of focused silo or food storage infrastructure experience.

In the case of the bids for the 10 silo projects, of the nine firms appearing in the final proposals, at least five had substantial experience in food silo or storage projects. However, while this is the case in technical selection, the financial bid is the sole determining factor for selection from within technically qualified firms. Because there is no weight allocated in the final reckoning for the technical scores, there is an increased probability that a firm with no food silo or storage experience will be selected.

In the case of Punjab as well as the Madhya Pradesh projects in India, however, firms with some prior experience in storage emerged as preferred bidders. In Madhya Pradesh, in seven out of 10 projects, Adani Enterprise—which has run storage and transportation projects for government through its affiliated companies—was selected.

It is also worthwhile considering other procurement methodologies that might give different weights to technical and cost factors or evaluate these differently—for example, use both financial and technical factors to arrive at the final score.

Table 9: Technical Prequalification criteria in silo PPP projects, India

PROJECT	TECHNICAL PREQUALIFICATION CRITERIA
FCI	Option A: Shareholder with min. of 51 percent equity stake in development, operation & maintenance of at least 1 infrastructure project with min. capital cost per project not less than INR 32 crores for 50,000 MT capacity silo complex and INR 21 crores for 25,000 MT. Option B: Shareholder with min. of 51 percent equity stake in development, operation & maintenance of projects related to (i) bulk storage and material handling systems of; and (ii) projects related to handling and storage of food grains or similar commodities, including project management, operation and maintenance of handling systems and equipment; min. experience with 1 project with capital cost of not less than INR 32 crores for 50,000 MT projects/INR 21 crores for 25,000MT OR min. experience of 2 projects with cost not less than Rs 16 crores for 50,000 MT project/Rs 11 crores each for 25,000 MT project. Option C: Execution of at least 1 project with at least 51 percent equity stake of turnkey Engineering Procurement and Construction (EPC) contracts in infrastructure of bulk storage and material handling systems or projects relating to handling and storage of food grains or similar commodities; minimum capital cost shall be Rs 32 crores for 50,000 MT projects, Rs 21 crores for 25,000 MT projects.
Madhya Pradesh	Project experience including: paid for, or received payments for construction of, and/or paid for development of, and/or collected and appropriated revenues such that the sum total is INR 45 crore for the following eligible projects in the warehousing/storage sector and core sector: A PPP project undertaken on a BOT, BOLT, BOO, BOOT or similar basis for providing output or services to a public sector entity or providing non-discriminatory access to users in pursuance of its charter, concession or contract; the entity claiming experience must have held a min. of 26 percent equity; the capital cost must have been more than INR 6 crore; the entity claiming experience shall, during the last 5 financial years preceding the application due date have (i) paid for development of the project, and/or (ii) collected and appropriated the revenues from users availing of non-discriminatory access to or use of fixed project assets, but shall not include revenues from sale/provision of goods or services; OR Construction experience in warehousing/storage sector or core sector in which the applicant has paid for the execution of it construction works or received payments for its clients, fully or partially, during the 5 financial years immediately preceding the application due date, and only the payments actually made or received during such 5 financial years shall qualify in computing the Experience Score; payments less than INR 6 crore shall not be reckoned as payments/receipts for eligible projects.

Table 9, continued :

Punjab	Project experience including: paid for development of, and/or experience in the operations and maintenance of, and collected and appropriated revenues from, and/or paid for, or received payments for, construction of the following eligible projects: A PPP project undertaken on a BOT, BOLT, BOO, BOOT or similar basis for providing output or services to a public sector entity or providing non-discriminatory access to users in pursuance of concession or contract, and construction experience in agricultural sector (including agri. projects undertaken on a private basis and/or captive basis)and/or a PPP project and construction in the core sector; the entity claiming experience must have held a min. of 26 percent of issued and paid-up equity throughout project; capital cost of project must have been more than INR 50 million; and during the last 5 years or 2 years have (i) paid for development of the project; and/or (ii) collected and appropriated the revenues from users of fixed project assets; OR Paid for the execution of its construction works or received payments from its client(s) for construction executed, fully or partially, during the 5 or 2 financial years immediately preceding the bid due date, and only the payments actually made or received shall qualify; payments/receipts less than INR 5 crores shall not be reckoned as payments/receipts for eligible projects; and construction works shall not include the supply of goods/equipment except when they form part of a turnkey construction contract/EPC contract for the project; the cost of land shall not be included; AND Such that the sum total of the above is more than INR 600 million with the bidder demonstrating experience over 5 financial years preceding the bid due date or more than INR 250 million while demonstrating technical capacity and experience over 2 financial years preceding the bid due date.

BID REQUIREMENTS RELATING TO SITE

In projects where the private sector provides the land, a few key problems may also arise:

- Availability of land at the desired location may be an issue;
- Cost of land at desired location might be substantial, leading to a higher bid price; and
- Land ownership/ access related provisions as a condition for eligibility to bid could reduce private sector interest.

The government needs to preserve a balance between its legitimate concern of ensuring that the bids do not fail due to lack of bidder access to land, and the problem of rigidity in bid conditions, which might deter bidders from participating in the bid.

In order to ensure the availability of land at an early stage in the bid, the FCI Silo project in India has the following requirement relating to land at RFQ stage: "The Applicant shall have adequate and contiguous parcel of land, free from encumbrances, as per the specifications laid down herein for the construction of the Project along with rail siding connected to the rail network for each of the locations being applied for. The Applicant shall provide details of the land parcel(s) as part of the Application. If the Applicant and in case of consortium, any member or their Associate owns the requisite extent of the land, such owner shall give an undertaking for transfer of the land either by sale or on a long lease, of not less than 25 (twenty five) years, to the Concessionaire SPV duly supported by the certified copy of ownership documents."

In cases where such ownership cannot be demonstrated at the time of RFQ, the applicant has to submit an additional bank guarantee of INR 7.5 million with the application. This amount is not unduly high, but companies have pointed this out as adding to bid costs which are already substantial as compared to the value of individual silo projects which are typically small in size. In addition, the applicant is also required to submit a feasibility study from an authorized consultant for connecting the site of the rail siding to the network of the Indian Railways. This adds to the cost substantially, as feasibility studies do not come cheap. If there are various applicants for the same location, it is likely that a number of companies might be looking at the same parcel of land, especially where there may be limited options leading to substantial premium being added to the price leading up to its purchase by the winning bidder.

These costs, which may be substantial, are required to be borne by the applicant. Given that an applicant has no guarantee of winning the bid, these requirements at RFQ stage could be premature and may have the potential to reduce private sector interest in the project.

In contrast, in the Punjab silo project, land was provided by the private party. However, the private party was allowed three months after the execution of the contract to produce land ownership or lease documents with no requirements relating to this at RFQ stage. While this increases the risk of non-serious bidding or site risk for the public authority, it reduces the costs of bidding for the private party.

It is not fully clear to what extent the requirements relating to land could affect participation in bidding. This would need to be tracked as the procurement process in the FCI project progresses. However, it is clear that this could be one of the issues where authorities may have to look for a balanced approach.

REQUIREMENTS RELATING TO CONNECTING INFRASTRUCTURE/ LOGISTICS

Silo projects cannot be designed in isolation, and like several other infrastructure projects (such as power generation, ports, and airports) there are issues of evacuation and loading. This brings up the need for a good road or rail connection, preferably the latter. The quantities and movements could be substantial, especially where producing and consuming areas are different, and, cost issues are likely. Handling equipment in the silos requires electricity, but it is possible to install back-up diesel-generation sets for the purpose.

All projects come with location requirements based on adequate availability of land, connectivity to rail and road, and proximity to producing and consuming locations. In the case of the state of Madhya Pradesh, government land has been used, so sites are specific. In the case of the other projects where the private party is expected to secure land, given that the services are to be bought by the government for a guaranteed period of time, location requirements are stated in the contract.

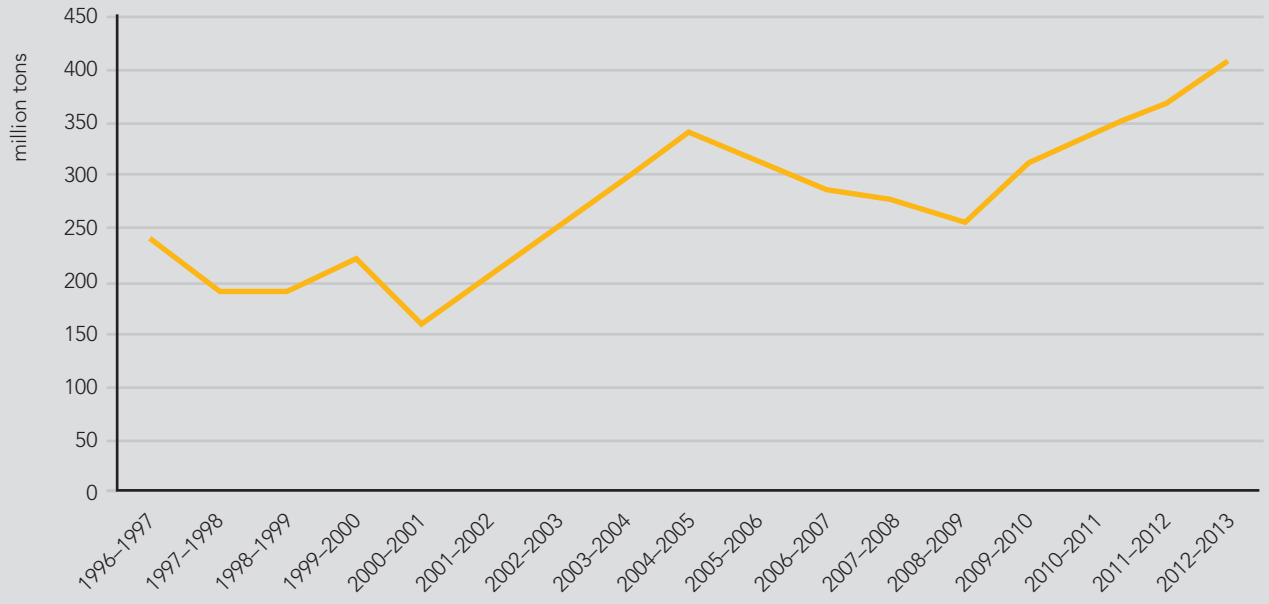
Of the project examples reviewed, the FCI project has a mandatory requirement of rail siding, while there is no such requirement in the case of other projects. Discussed below are some of the ramifications of this requirement:

- Less flexibility in location: The location choice becomes less flexible where the rail siding has to be a part of the infrastructure provided by the private provider, especially since the connection needs to be to an existing rail network in order to minimize the costs involved. This could lead to major delays in site identification and could also lead to lower levels of investor interest.
- High capital costs: The cost of construction of a rail siding is expected to add considerably to the cost of each project. As compared to the costs of the projects in Madhya Pradesh or Punjab, it is expected that the FCI project will be much costlier.
- Movement volumes to justify cost: It is doubtful if there would be movement volumes sufficient to justify the initial capital costs for a rail siding at each silo project. While the annual transportation volumes by FCI are quite high (Figure 14) and increasing, movement from each site would normally be on the lower side as silos are being used by the Government of India for longer term storage rather than for frequent receipt and dispatch.
- Separate contracts for storage and transportation: It is expected that there will be separate contracts for storage and transportation (network and rail siding infrastructure is expected to be part of the silo project, but the actual ownership and operation of rolling stock is expected to be by a separate provider) in the case of the FCI projects. This has its advantages, especially given the recent discussion in India of creating three separate entities for procurement, storage, and transportation, given the expected volume of operations. However, it requires a high level of coordination among the procurement processes for these separate projects, and also some level of coordination between the

concessionaires of the two projects if these turn out to be separate. While in the case of firms like Adani, which have a wide range of businesses which includes storage as well as logistics, it is likely that they bid for both and also manage to secure both, it may not always be the case. Before embarking on storage and logistics projects which are combined partially or fully, governments should look carefully at different options and their implications. See Box 12 for the salient features of a joint storage and transportation BOO contract that was implemented in India in 2007.

- Use for other purposes: The FCI draft contract does provide for use of rail siding for other purposes—for example,for transport of other commodities by the private provider (transport operator). This essentially means that for the private provider to make use of this clause, he needs to be able to create volumes which in turn will depend upon the location Creating other business may not be possible in some of the locations.
- Use after completion of contract term: Since some of these will be BOO projects, the private provider (the transport operator) needs to be able to create options for replacing the rail siding business of the FCI after completion of contract term.

Figure 14: Transportation of food grains by FCI, India, 1996–2013



Source: FCI, http://fciweb.nic.in/movements/view/5

Box 12

PPP IN HANDLING, STORAGE AND TRANSPORTATION OF FOOD, INDIA

The National Policy on Handling, Storage and Transportation of Food Grains 2000 aimed to introduce bulk handling of food grain through private participation, with the FCI as the project sponsoring authority. Key objectives are:

- Introduction of scientific methods of storage of food grain over longer periods of time;
- Introduction of bulk handling of food grain as opposed to use of bags;
- Reduction in volume and quality losses through better storage;
- Transfer of financing and performance risk to the private party;
- Introduction of a longer term perspective on storage; and
- Provide seamless handling, storage and transportation of food grain from procurement to distribution centers.

A project was structured under a Build-Own-Operate (BOO) delivery mechanism involving the creation of a complete and seamless supply chain from grain procurement to distribution. A service agreement was signed on June 28, 2005 with Adani Agri-Logistics Limited (AALL), which was selected through an open competitive tender. The project was commissioned in May 2007.

The salient features of the project are as follows:

- The project is financed, designed, constructed, operated and maintained by the private party.
- The service is provided as agreed to FCI over a period of 20 years from commissioning.
- The private party is responsible for the storage of food grain received at the two designated base depots (Moga in Punjab and Kaithal in Haryana) from FCI and for transportation and delivery to the five designated field depots (at Navi Mumbai, Hoogly, Chennai, Coimbatore, and Bangalore).
- Storage is in galvanized silos with facilities for aeration, fumigation and tumbling.
- The base depots require parking space for 150 vehicles at any one time, with unloading capacity of 75 vehicles per hour, a service time of one hour from sampling to exit and a testing lab capacity of 75 samples per hour.
- Quality of grain is defined in the contract. All risk of quality and volume losses are borne by the private party.
- Transportation is in bulk using high speed high capacity top loading bottom discharge wagons owned by the private party using Indian Railways track, with 50 wagons in a rake with a rake capacity of 3200 MT. This was the first project to feature specialized top-loading and bottom-unloading grain transport railway cars, and these are the only such railway cars in operation in India to the present day.
- The payment mechanism is based on payment by FCI of fixed storage and handling charges indexed to WPI for an annual guaranteed tonnage of 800,000 MT.

The project has been functioning reasonably well with reported losses of approximately 0.2 percent as against the average losses in conventional storage of over 10 percent.

MIGRATING CONTRACTS TO FUTURE LIBERALIZATION

A problem that all governments might face, especially where there is scope for fluctuations in policy, is the migration of contracts to a different policy regime. We have discussed the issues relating to demand and policy affecting contracts specific to PPPs in grain storage in an earlier section. Currently, most contracts have clauses relating to change in law; whether these adequately cover unforeseen changes in terms of sector liberalization is unclear, and these could be specifically addressed. While this is a risk that is generic to most PPPs, and has been covered very well in a wide variety of PPP literature on risks, it merits brief mention here as grain silo PPP contracts are especially vulnerable to changes in government policy.

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APPENDIX

SIMPLIFIED GUIDE TO MODERN SILOS

Bulk storage of grains with mechanized handling can be done either in flat warehouses or in vertical silos of concrete or steel. Since the technology was first introduced in North America about 60 years ago, steel silos have become the most common choice for new grain and oilseed storage projects in all climates globally. Concrete silos and grain elevators, though more costly on a per ton of storage basis, are still used for port facilities and food and feed processing plants where taller structures are desirable because of limited space—particularly if high grain throughput justifies the larger investment costs. Silos may have either hopper (cone) bottoms or flat bottoms. Hopper bottoms are limited to about a 12 meter diameter and have higher construction costs on a per ton basis. Individual flat bottom steel silos now may be as much as 30 meters in diameter and hold up to 30,000 MT of grain.

The key advantages of vertical silo storage systems include:

- Automated, mechanical handling to reduce operating costs;
- Computerized controls for monitoring of intake, discharge, aeration, and other operations;
- Temperature monitoring, ventilation and fumigation systems;
- Storage volume per unit of land area is multiple times that of flat warehouse storages; and

- Reduction in bag inventory and dunnage (pallets) costs.

CONSTRUCTION

Bolted steel silos offer the advantage of relatively easy and rapid erection by the general contractor using a kit supplied by the manufacturer. After silo foundation (often concrete based) is complete based on the drawing provided by the silo manufacturer, the silo walls are constructed from the components at ground level, starting with the uppermost ring, followed by assembly of the steel roof on top of it. Hydraulic jacks, as many as two dozen for a 20 meter diameter silo, are then used to lift the wall structure off the ground to accommodate the next ring of wall panels. The silo is raised in this manner until all rings have been bolted together and the silo can be anchored to the foundation. Working in this manner, a team of 10 semi-skilled workers can erect a steel grain bin with 5,000 MT capacity in just two months.

EQUIPMENT

The equipment components of a grain silo facility can vary greatly depending on the needs of the end user. The basic sections consist of the receiving, storage, and discharging systems. Nearly all silo components are made of galvanized steel. This includes wall panels, bolts, and washers, conveying equipment, bucket elevators, catwalks, and towers. The zinc coating enables the facility to stand for decades without major rust problems, even in tropical ports.

For short distances, conveyers are of the "drag chain" type that push the grain along by use of enclosed flighting. Belt conveyers are used for longer distances.

Optional but commonly used equipment includes cleaning, bulk weighing, dust aspiration, temperature monitoring, fumigation, aeration, and bagging systems. Drying systems and grain chilling are also both commonly used.

OPERATIONS

Modern grain silo facilities allow for highly efficient, mechanized receiving and discharging of grain and for operational procedures to ensure minimal loss of quality during storage.

Receiving: On arrival at the site, the truck or railcar stops at a weighbridge that electronically records the weight. Samples are taken for analysis of moisture content, foreign material, and other quality parameters at a laboratory on the site. The bulk grain is dumped through a grill into a concrete or steel receiving pit as much as 3 or 4 meters deep. If arriving in bags, they are slit open manually and emptied into the pit.

From there the grain is lifted by a bucket elevator, which is made up of plastic or metal containers attached to a belt conveyer. These continuously scoop the grain at the bottom (boot) and lift it up. At its top, or "bonnet," the bucket elevator feeds a horizontal conveyer normally positioned on a catwalk that spans an entire row of silos along the centerline. This chain conveyer has slide gates (outlets) at the peak of each roof that allow for center filling of each bin, critical for maintaining even loads on the silo walls.

Discharge: Gravity flow makes possible the discharge of 85 percent of the grain from flat bottom silos of average dimensions. An outlet in the center of the silo

is opened via a slide gate for initial emptying onto a bottom conveyer that runs along the centerline of a whole row of silos. Subsequently, additional outlets on each side of the center are opened to feed the conveyer until gravity flow has ended and the grain inside has reached its angle of repose. A sweep augur mounted on a pivot removes the residual grain in two revolutions. The augur is a screw conveyer that pulls the grain from the outside inward to the center discharge outlet while moving through the mass in a circle. The bottom conveyers move the grain back to a bucket elevator that lifts the grain so that it can be sent to bagging stations or to trucks/rail cars for transport to mills/users.

MAINTAINING QUALITY

During storage, several operations may take place to maintain grain quality. Aeration serves to cool the grain and ensure uniform moisture levels. Large fans mounted outside the silo walls blow air into channels with perforated covers in the concrete floor of the silo and then upwards through the grain mass, exiting through vents in the roof. Cables suspended in the grain mass from the roof enable operators in the control room to monitor temperature changes. Sensors every meter or so can detect the location where grain heats up due to pockets of moisture or due to insect infestation.

Recirculation of the grain from one bin to another using the conveying systems for filling and discharge is another way to reduce insect activity and maintain even moisture content throughout.

Fumigation can be achieved during silo filling with automatic dispensing of fumigant tablets into the conveying system.

STAFFING

A grain silo facility requires a mix of professional staff, semi-skilled personnel, and unskilled labor. Because of mechanization and automated handling, total personnel is only a fraction of a flat warehouse facility holding similar quantities of grain in bagged form. Management of grain silo operations has been simplified by touch screen panels for control of filling, discharging, and recirculation. This allows constant monitoring of grain levels, moisture, and temperature.

Typical grain storage projects with 50,000 tons of storage capacity may have the following job positions with responsibilities and skills as indicated:

- Facility manager: overall responsibility for operations; knowledgeable with the software used for inventory management; sufficient electro-mechanical training to troubleshoot problems in grain receiving and discharge; ability to manage all staff.
- Operations managers: day to day operations on shifts when the facility manager is not present; knowledge of electrical and mechanical engineering and grain science.
- Weighbridge operator: operation of the electronic truck scales and issuing receipts to drivers on arrival and departure.
- Laboratory technicians: collection of grain samples at reception and dispatch and analysis on quality parameters.
- Bookkeeper / accountant: managing the financial accounts.

- Electrician / mechanic: equipment repair and troubleshooting.
- Security guards: security of premises and operations.
- Labor: loading bagged grain into trucks, silo clean out operations.

GEAPS (Grain Elevator and Processors Society) is a professional organization that in partnership with Kansas State University (USA) offers over 20 online courses covering all aspects of grain storage operations. Credentialing is also part of the joint program. Course titles range from the general to the specific: Introduction to Grain Handling Operations; Grain Quality Management; Grain Elevator Equipment Maintenance; and Grain Entrapment: Causes, Prevention and Rescue, among others.

INVESTMENT COSTS

The main investment costs in a steel silo grain storage facility are broken down into three parts: land, civil works, and equipment. New large silo storage facilities are most often built outside urban areas in grain production zones. This is done to minimize land costs and optimize logistics, provided transport access infrastructure is suitable and access to power is adequate.

Civil works: Concrete silo foundations are the most important component in civil works associated with a silo project. An internationally accepted rule of thumb in steel silo projects is that foundations make up one-third of the project cost, assuming stable soil with only minimal need for pilings. If extensive pilings are needed, the cost can exceed the total cost of the bins and the electro-mechanical handling equipment.

Equipment costs: Manufactured components of a steel grain silo facility vconsist of the stationary steel bins and the electro-mechanical machinery made up primarily of conveyers and bucket elevators. Per ton of storage construction costs depend on several factors, including type, number, average size, height, and diameter of bins; filling and discharge capacity; aeration equipment; and bagging and weighing systems.

Hopper bottom bins are desirable for easy clean out but cost roughly twice that of flat bottom bins because of the structural supports at the base. Use of larger bins reduces cost. A 100,000 ton capacity facility consisting of 10 bins of 10,000 tons could cost about one- third less than a one with 20 bins of 5000 tons.

Bin height and diameter are also important. A taller, narrower silo requires more steel than a wider, shorter one. The thickness of the steel in the rings is less for the top rings and greater for the bottom rings. A taller silo requires higher gauge steel for the bottom rings or double wall panels. However, if the silo is too wide then the conveying systems must be longer and cost more.

Handling systems can be designed to fill and discharge the facility at any rate, from as little as 50 tons per hour to 1000 tons per hour or more. Higher capacities require bigger, more expensive motors and larger conveyers and elevators. Higher capacity is required at port grain terminals, where ships must be loaded or discharged quickly to avoid demurrage, and also other places where large volumes of grain need be received in a short period of time.

High capacity grain cleaning, bulk weighing and bagging systems can signifi-

cantly add to the per ton cost. Grain dryers and grain chillers, sometimes essential for ensuring grain quality in storage, can increase cost by 10 percent to 20 percent.

In a typical steel silo facility, the high tensile strength galvanized steel makes up roughly 60 percent of manufacturer's cost. Silo design is based on minimizing the amount of steel to obtain maximum storage capacity. Therefore, the sticker price will vary according to steel prices.

EQUIPMENT SUPPLY

Equipment supply for grain silo facilities is highly competitive. Since the steel grain bins are the biggest cost component in a silo facility, most grain bin manufacturers sell complete facilities, using manufacturers of the handling equipment as sub-suppliers if they do not manufacture it themselves.

There are about 25 manufacturers of grain bins that do business internationally. Three-quarters of these are located in North America, Europe, or Turkey. A handful of manufacturers are located in Brazil and China as well. Many of the larger manufacturers have their silos installed in over 50 countries.

The competitiveness of supply has to do with the low transport costs in relation to ex-works costs. The one-meter by two-meter corrugated steel panels stack neatly, making shipment in ocean containers economical. This rarely amounts to more than 10 percent of the CIF price, even to the most distant countries.

Grain bin manufacturers are rarely willing to undertake turnkey projects. They leave this to the local construction companies that have the ability to do the civil works and hire labor for erection of the bins. The manufacturers do provide erection supervisors at an extra cost, but without liability for errors by the contractor. Because silo erection is relatively simple, consisting mostly of bolted assembly at ground level, many silo operators act as their own general contractor—purchasing the equipment directly and engaging a construction company only to do the civil works and provide labor for erection.

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