Ministry of Consumer Affairs, Food and Public Distribution

Food Corporation of India

DEVELOPMENT OF STEEL SILOS FOR STORAGE OF WHEAT AT WHITEFIELD, KARNATAKA ON DBFOT BASIS UNDER PPP MODE

Draft Feasibility Report
March 2015

Submitted by

Srei Infrastructure Finance Limited
# CONTENTS

1. **INTRODUCTION**
   1.1. **PROJECT BACKGROUND**  
   1.2. **OBJECTIVES OF THE STUDY**
   1.3. **SCOPE OF CONSULTANCY**
      1.3.1. General TOR
      1.3.2. Details of Scope of Services
   1.4. **CURRENT PROJECT STATUS**

2. **CURRENT POLICIES DIRECTIVES & AGREEMENTS**
   2.1. **ORGANISATIONAL SETUP**
   2.2. **STRUCTURE OF FOOD GRAIN MANAGEMENT**
      2.2.1. National Food Security System
      2.2.2. Procurement of Food Grains for Central Pool
      2.2.3. Storage Management
      2.2.4. Capacity Augmentation Programmes
   2.3. **GRAIN SUPPLY CHAIN & ROLE OF FCI**
      2.3.1. Existing role of FCI and Storage Capacity
   2.4. **REGULATORY FRAMEWORK**
      2.4.1. National Food Security Bill, 2013
      2.4.2. Decentralized Procurement Scheme
      2.4.3. High Level Committee Report, 2000
      2.4.4. Private Entrepreneurs Guarantee (PEG) Scheme

3. **EXISTING SUPPLY CHAIN OF STORAGE FACILITIES**
   3.1. **CONVENTIONAL COVERED WAREHOUSE**
      3.1.1. Covered Area Plinth (CAP)
   3.2. **SILOS**
   3.3. **CONVENTIONAL STORAGE vs. MODERN SILO STORAGE**
      3.3.1. Indian Scenario
      3.3.2. Flat Warehouse Vs Modern Vertical Silos
      3.3.3. Experience of Creating Silos in India
      3.3.4. Road Map for future – Impetus on Bulk Handling and Transport

4. **TECHNICAL FEASIBILITY**
   4.1. **Location Appreciation**
   4.1.2. Connectivity Status
   4.1.3. Existing Infrastructure
   4.1.4. Existing Utilities
   4.1.5. Observations/Constraint
   4.2. **FACTORS INFLUENCING CAPACITY PLANNING**
      4.2.1. Factors
      4.2.2. State Wise Production
      4.2.3. Allotment and Off-take of Food Grain

March 2015
4.2.4. State Wise Storage Capacity 4-7
4.2.5. Gap Analysis: Allotment vs Storage Facility 4-8

4.3. SUPPLY CHAIN OF MODERN SILOS 4-8

4.4. CAPACITY PLANNING AND PROJECT FACILITY 4-10

4.5. PROJECT SCOPING 4-10
4.5.1. Associated Infrastructure: 4-12
4.5.2. Fire Detection and Fighting System: 4-13
4.5.3. Buildings and Sheds: 4-13

4.6. RAILWAY SIDING 4-14
4.6.1. Site Appreciation 4-14
4.6.2. Analysis of FCI Siding Complex 4-15
4.6.3. Train Working Arrangement / Operational Planning 4-15

4.7. TECHNICAL FEASIBILITY 4-16
Chapter 1
INTRODUCTION

1. INTRODUCTION

1.1. PROJECT BACKGROUND

The Food Corporation of India (FCI) was established on 14th January, 1965 under the Food Corporations Act, 1964. FCI is a Public Sector Undertaking under the Department of Food & Public Distribution, Ministry of Consumer Affairs, Food & Public Distribution, and Government of India (GOI).

The Corporation is the main agency responsible for execution of food policies of the Government of India. The functions of FCI primarily relate to the Purchase, Storage, Movement, Distribution and Sale of food grains on behalf of the Government of India. It is also engaged in the Handling, Storage and Distribution of Sugar in North Eastern States and Jammu & Kashmir and two Union Territories Andaman & Nicobar Islands and Lakshadweep Island.

The main objectives of FCI are;

(a) Procurement of foodgrains from farmers at remunerative prices;

(b) Distribution of foodgrains to consumers through PDS, particularly the vulnerable sections of society at affordable prices; and

(c) Maintenance of buffer stock of foodgrains for food security and price stability.

Food Corporation of India (FCI) is a Public Sector Undertaking under Department of Food & Public Distribution, Ministry of Consumer Affairs, Food & Public Distribution. The general superintendence, direction and management of the affairs and business of the Corporation vest in the Board of Directors.

India's grain production has steadily increased due to advances in technology, but post-harvest loss is constant at 10%. Losses during storage, accounts for around 6% of the total losses as proper storage facilities are not available. In India, food grains are stored using traditional structures by small farmers. The surplus grains are stored with government agencies like: Food Corporation of India (FCI), Central and State warehousing Corporations. The commonly used storage method is Cover and Plinth (CAP) storage, which is economical but loss of grains is inevitable. Very few scientific storage structures like silos are available with these agencies. The government is taking initiatives now in building silos for long-term safe storage of grains since we do not have enough storage capacity as of now. Drying of harvested grains to safe moisture levels will reduce losses to a greater extent. However, very less literature is available on behaviour of grains after harvest for Indian climatic conditions. Therefore, there is a need for research to develop management guidelines for safe storage and drying to ensure quality management of stored grains.

The High Level Committee (HLC) was constituted by GoI on 20th August 2014 to evaluate the possibility of restructuring of Food Corporation of India by identifying the hiccups in the existing supply chain. The HLC submitted the final report on 19th Jan 2015 and recommended key steps to achieve the desired results. One of the recommendations of
HLC is that the FCI should invite bids to convert its conventional go-downs to modern silos under PPP mode, which will not only substantially reduces the overall wastage of the food grains, but also the private sector brings in investments in the system and mechanization / automation of operations will induce efficiency in the whole supply chain of procurement, storage and distribution.

Therefore, based on the above recommendations, Food Corporation of India (FCI) is envisaging the Development of Steel Silos for Storage of wheat in consuming and distributing areas, initially at eleven (11) pilot locations in six states (Punjab, Delhi, Bihar, Assam, Maharashtra and Karnataka) of India on Design, Build, Finance, Operate and Transfer (the "DBFOT") basis under Public Private Partnership (PPP) mode. The modern silos are envisaged to be developed within the premises of selected FCI depots by utilizing the vacant land and land covered under Cover and Plinth (CAP). The current strategies of FCI have been to phase out and dispense with the methods CAP storage by next financial year to enhance quality of storage.

Against this background, FCI has rightly steeped forward and strategized to increase / develop safe wheat storage in view of large demand existing in the various parts of the country. In this connection FCI engaged ‘Srei Infrastructure Finance Limited as Consultants’ through a competitive bidding process for preparation of the ‘Feasibility report for 11 locations Pan India and manage the bid process management to attract the private investment in the project through a transparent bidding process.

This is a pilot assignment and there will more locations needing development of modern storage facility for wheat and rice storage in near future. FCI is already envisaging - comprehensively phasing out the CAP storage and replacing it with modern silos with bulk loading and unloading facilities.

1.2. OBJECTIVES OF THE STUDY

In order to persuade and reassure the objectives & provisions for National Food Policy of GOI a number of initiatives have been fast paced to enhance the quality of effective food storage management with the discharge of following responsibilities:

i. Effective price support operations for safeguarding the interests of the Farmers;

ii. Distribution of food grains throughout the country for PDS and other Schemes of Government of India; and

iii. Maintaining satisfactory level of buffer stocks of food grains to ensure National Food Security.

The above objectives of the National Food Policy are being achieved by the Corporation through its main operations of procurement, transportation, storage and distribution of food grains. FCI has played a significant role in India's success in transforming the crisis management oriented food security into a stable food security system, providing farmers with remunerative prices through procurement of food grains, distribution of food grains throughout the country for the Public Distribution System (PDS), particularly to vulnerable sections of the society and also maintaining buffer stocks of food grains in order to ensure national food security.

The Food Corporation of India (FCI) has been appointed as nodal agency for creation of modern storage capacity through construction of Silos for food grains and as part of this
endeavor, FCI, decided to undertake construction of silos for storage of wheat at 11 locations pan India as pilot projects through Public Private Partnership on Design, Build, Finance, Operate and Transfer (DBFOT) basis.

i. The basic objective is to prepare a feasibility study for determining the technical feasibility and financial viability of the Project through a transparent bid process management procedure.

ii. The consultants’ shall undertake feasibility study and prepare a Feasibility Report of the Project for the purpose of firming up the FCI’s requirements in respect of development and construction of the Project and enabling the prospective bidders to assess the FCI's requirements in a clear and predictable manner to ensure enhanced safety and level of service for the silo and a superior operation and maintenance of the system with operational efficiencies.

1.3. SCOPE OF CONSULTANCY

1.3.1. General TOR

i. The Consultant shall be guided in its assignment by the Model Concession Agreement and RFP/RFQ.

ii. The Consultant shall be responsible for preparing the Schedules of the Concession Agreement and for bringing out any special feature or requirement of the Project referred to in the Concession Agreement.

iii. The Consultant shall assist FCI by furnishing clarifications as required for the Technical & Financial appraisal and legal scrutiny of the Project and bid documents in the bid process for selection of Concessionaire.

iv. The Consultant shall also participate in the pre-bid conference with the bidders of the Project and assist the FCI in clarifying the technical aspects arising from the bid documents including the Feasibility Report in the bid process for selection of Concessionaire.

v. The Consultant shall be responsible for modification and fine tuning of existing RFQ & RFP documents for selection of Concessionaire, if required and responsible for the entire bid process Management for selection of Concessionaire, including bid evaluation, issue of LOA, signing of Concession agreement.

vi. The Consultant shall also engage the services of a Railway approved Consultant for preparing the feasibility report for construction / extension of railway siding amenable for bulk / bagged loading / unloading from/to special bulk wagon / conventional rail wagon as per specifications of Indian Railway for each identified project.

1.3.2. Details of Scope of Services

i. Collection, compilation and analysis of available information provided by FCI.

ii. Consultant while preparing PFR will arrange for Feasibility Report from Railway Approved Consultant for provision of railway siding connected to Indian Railway Network and amenable for bulk and bagged loading/unloading from/to special bulk wagon/conventional rail wagons for newly acquired land parcel and FCI’s owned godowns where railway siding is available or otherwise.

iii. Assess financial viability of the Project;
iv. Development of revenue model;

v. Preparation of indicative BOQ and Rough Cost Estimates; and

vi. Preparation of Schedules A, B, C, D and H of the Concession Agreement.

Details of services:

COMPILATION AND ANALYSIS OF DATA

vii. The Consultant shall, based on available information, compile and analyse the data including technical, physical, economic, commercial and financial features of each of the Project sites.

FINANCIAL VIABILITY

viii. The Feasibility Report shall include an assessment of the financial viability of the Project with a view to estimating the likely IRR over a concession period of 15, 20 and 25 years respectively. The Consultant shall calculate the NPV and EIRR for the Project, including sensitivity analysis by identifying the most critical factors and determine their impact on the EIRR, including varying project;

ix. Compute Costs and benefits, implementation period and combinations of these factors. The Consultant shall also determine the likely requirement of Viability Gap Funding (VGF) in accordance with the VGF Guidelines of the Government of India. While undertaking the financial analysis and projecting the IRR, following assumptions shall be adopted:

a. Capital cost shall be adopted as per estimates of construction cost to which 25% (twenty five per cent) shall be added for physical and price contingencies, interest during construction, other financing costs etc.;

b. DE ratio may be assumed as 70:30; and

c. O&M costs may be assumed as per norms of the Authority;

x. The Consultant shall:

a. Calculate the NPV and EIRR for the Project. It will undertake sensitivity analysis by identifying the most critical factors and determine their impact on the EIRR, including varying project costs and benefits, implementation period and combinations of these factors; and

b. Conduct a risk analysis (using the Monte Carlo method) by considering the possible values for key variables based on records, and their occurrence probability.

c. If the IRR of the Project, based on the aforesaid calculations is less than 12% (twelve per cent), an effort should be made to reduce the capital costs in consultation with the Authority. This may be done either by omitting/ modifying some of the proposed structures or by phasing them after a period of seven years or more, such that the IRR reaches a minimum of 12% (twelve per cent).

REVENUE MODEL

xi. The Consultant shall identify and quantify all costs, expenses and revenues of the Project and shall prepare cash-flow statements for a period of 10 years. With a view to examining the feasibility of attracting private sector participation, the Consultant shall
prepare the Revenue Model which will indicate the possible capital structure, likely sources of financing taking into account the viability gap funding or grant provided by the Central Government and the Project Authority, the costs of financing, the cash flow, debt service, return on investment etc. (the “Revenue Model”).

COST ESTIMATES

xii. The Consultant shall work out indicative BOQ of various components and prepare rough cost estimates of the location specific Project with a break up of cost for each component separately. To the construction cost so arrived at, the Consultant may add 25% (twenty five per cent) thereof as a lumpsum provision for physical and price contingencies, interest during construction and other financing costs, pre-construction expenses etc.

xiii. Assistance in preparation of Schedules of the Concession Agreement

xiv. The Consultant shall assist FCI in the finalisation of the technical Schedules A, B, C, D and H of the Concession Agreement and for bringing out any special feature or requirement of the Project referred to in the Concession Agreement.

1.4. CURRENT PROJECT STATUS

The consultants' have completed the site visits of all 11 locations along with the Railway Empanelled Consultants (Ms/ Vogue, New Delhi covering Punjab and Delhi and E to E Consultants, Bangalore covering Bihar, Assam, Maharashtra and Karnataka State locations.

The draft feasibility report has been prepared to assess the technical viability of selected project site to accommodate the modern wheat steel silos of minimum targeted capacity of 25000 MT upwards with bulk loading/unloading facility through railway siding arrangement.

The step driven approach has been followed for finalization of draft feasibility report and structured into following chapters

i. Brief Background of the Project

ii. Regulatory Framework

iii. Existing Supply Chain of Storage Facilities

iv. Comparison between Conventional Storage and Modern Silo Storage

v. Site Appreciation

vi. Importance of Railway siding in Modern Silos

vii. Gap Analysis

viii. Supply chain of Modern Silos

ix. Capacity Planning and Project Facility

x. Project Scoping

xi. Technical Feasibility
The steel silos main project components are long term storage Silos, Pre Storage Silos, Shipping Silo, Loading & Unloading facilities, fumigation and Aeration, Bagging and De-bagging facilities, Cleaning facilities, Weighing facilities, Lab for testing, Miscellaneous Storages, Admin Block and Utility Infrastructure.

The Central Government will provide up to a maximum of 20% Viability Gap Funding (VGF) support, if required, in addition to 20% VGF by State Government. However, such projects will not be eligible for Capital Investment Subsidy and the Interest Subsidy.

The project shall be awarded to private developer by following two stage transparent bidding process. The indicative project implementation structure under PPP mode is as follows:

**Proposed Project Implementation Structure**

- **Food Corporation of India**
  - Equity
  - Develop and maintain the project till the end of concession period and collect user charges fixed by FCI

- **Private Investor / SPV**
  - Debt
  - Concession rights on land for creation of the project facility

- **Concessionaire**
  - Bid Parameter: VGF/Upfront Concession Premium

- **Bank**

**THE PROJECT**

Development of Wheat Silos at 11 Locations
Chapter 2
CURRENT SETUP, DIRECTIVES AND AGREEMENTS

2. CURRENT POLICIES DIRECTIVES & AGREEMENTS

2.1. ORGANISATIONAL SETUP

The affairs of FCI are managed by a Board of Directors headed by Chairman & Managing Director along with two Directors representing Ministry of Consumer Affairs, Food and Public Distribution, one Director from Ministry of Agriculture & Co-operation, one ex-officio (Managing Director of Central Warehousing Corporation) and two non-official Directors.

All the Directors are appointed by the Central Government. As against the provisions of the Act of having 12 Directors in the Board, the present FCI Board consists of only seven Directors. Its functions are managed through country-wide network of offices with headquarters at New Delhi with five Zonal offices, 24 Regional offices, 168 District offices and one Port office at Adipur (Kutch), Gujarat.

2.2. STRUCTURE OF FOOD GRAIN MANAGEMENT

2.2.1. National Food Security System

Food security as a concept originated only in the mid-1970s, in the discussions of International food problems at a time of global food crisis. The initial focus of attention was primarily on food supply problems - in assuring availability and to some degree the price stability of basic foodstuffs at the international and national level. That supply side, international and institutional set of concerns reflected the changing organization of the global food economy that had precipitated the crisis. A process of international negotiation followed, leading to the World Food Conference of 1974, and a new set of institutional arrangements covering information, resources for promoting food security and forums for dialogue on policy issues.

The issues of famine, hunger and food crisis were also being extensively examined, following the events of the mid-1970s. The outcome was a redefinition of food security, which recognized that the behaviour of potentially vulnerable and affected people was a critical aspect.

A third, perhaps crucially important, factor in modifying views of food security was the evidence that the technical successes of the Green Revolution did not automatically and rapidly lead to dramatic reductions in poverty and levels of malnutrition.

The initial focus, reflecting the global concerns of 1974, was on the volume and stability of food supplies. Food security was defined in the 1974 World Food Summit as:

“Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”.

In 1983, FAO expanded its concept to include securing access by vulnerable people to available supplies, implying that attention should be balanced between the demand and supply side of the food security equation:

“Ensuring that all people at all times have both physical and economic access to the basic food that they need”.

March 2015
Page 2-1
In 1986, the World Bank report, Poverty and Hunger, focused on the temporal dynamics of food insecurity. It introduced the widely accepted distinction between chronic food insecurity, associated with problems of continuing or structural poverty and low incomes, and transitory food insecurity, which involved periods of intensified pressure caused by natural disasters, economic collapse or conflict. This concept of food security is further elaborated in terms of:

“Access of all people at all times to enough food for an active, healthy life”.

By the mid-1990s food security was recognized as a significant concern, spanning a spectrum from the individual to the global level. However, access now involved sufficient food, indicating continuing concern with protein-energy malnutrition. But the definition was broadened to incorporate food safety and also nutritional balance, reflecting concerns about food composition and minor nutrient requirements for an active and healthy life. Food preferences, socially or culturally determined, now became a consideration.

The 1996 World Food Summit adopted a still more complex definition:

“Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”.

This definition is again refined in The State of Food Insecurity in the World 2001:

“Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life”.

Essentially, food security can be described as a phenomenon relating to individuals. It is the nutritional status of the individual household member that is the ultimate focus. So, Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern, and Food insecurity exists when people do not have adequate physical, social or economic access to food as defined above.

The amount and quality of food available globally, nationally and locally can be affected temporarily or long-term by many factors including climate, disasters, war, civil unrest, population size and growth, agricultural practices, environment, social status and trade. Affordable age, status, gender, income, geographic location and ethnicity all affect a person's ability to access and afford sufficient food. When there is a shortage of food the rich are unlikely to go hungry but their demand for food increases the price and makes it harder for poor people to obtain food.

A ‘National Food Security System of the Government of India’ is operated under an operational framework involving procurement of food grains through price support operations by fixing Minimum Support Price (MSP), maintenance of buffer stocks, food subsidy regime, allocations and distribution of food grains to weaker and vulnerable sections of society through TPDS. Timely and efficient procurement and building up of adequate buffer stocks in the Central Pool, through efficient storage and movement of food grains are central to the food security strategy of the GOI. Storage Management and movement of food grains, therefore, are important links in the whole system from procurement to distribution of food grains to the consumers.
Procurement of food grains for the Central Pool is carried out by FCI, State Government Agencies (SGAs) and Private Rice Millers. In addition, 10 states/UT’s which are presently under De-centralised Procurement (DCP) scheme also procure food grains for the Central Pool but directly store and distribute under TPDS and Other Welfare Schemes (OWS) based on the allocation made by the GOI. Any surplus stock over their requirement is taken over by FCI and in case of any shortfall in procurement against allocation made by the GOI, FCI meets the deficit out of the Central Pool.

The procured food grains are taken over into the Central Pool by FCI, only Government agency entrusted with movement activities, from SGAs and private rice millers and are moved from the procuring States to the consuming States for distribution to the consumers and for creation of buffer stock in various States. Food grains of the Central Pool are stored by FCI in both its owned capacity and hired godowns in different parts of the country. The function of distribution of food grains to the consumers is carried out by the State Governments through TPDS and OWS. The food grains are also disposed of by FCI and State Governments based on allocation of the GOI through sale under Open Market Sales Scheme (OMSS).

### 2.2.2. **Procurement of Food Grains for Central Pool**

Under the existing procurement policy of the GOI, food grains for the Central Pool are procured by various agencies such as FCI, State Government Agencies (SGAs) and private rice millers. Procurement of wheat and paddy for the Central Pool is carried out on open ended basis at MSP fixed by the GOI. In addition, rice is also procured by FCI from private rice millers under statutory levy scheme through price support mechanism.

Procurement of rice for the Central Pool is undertaken through two routes, namely, Custom Milled Rice (CMR) and levy rice. Rice obtained out of paddy procured for the Central Pool by SGAs under price support system is known as CMR. Rice purchased by FCI from private rice millers against paddy procured by them at MSP under levy orders issued by respective State Governments at state-wise levy prices fixed by the GOI is known as levy rice.

Paddy and wheat procured by the State Governments falling under DCP scheme are also part of the Central Pool. Under this scheme, the DCP states procure, store and directly distribute food grains including levy rice towards TPDS and OWS. Any surplus stock over their requirements is taken over by FCI for the Central Pool and in case, of any shortfall in procurement against allocation made by the GOI for distribution to TPDS, FCI meets the deficit out of the Central Pool.

The production, mandi arrival and procurement of food grains (wheat and rice) between the period 2006-07 & 2011-12 are presented in Table 2.1.
2.2.3. Storage Management

The primary policy objective of the GOI, obviously, is to ensure food security in the country through timely and efficient procurement and distribution of food grains. This involves procurement of food grains, building up and maintenance of food stocks, storage, movement and delivery of food grains to distributing agencies. Storage management is an important link in the whole system from procurement to distribution of food grains to the consumers.

Under the existing operational framework for ensuring food security in the country, FCI is the main Government agency entrusted with management of food grains in the Central Pool held by SGAs and DCP states. FCI is also responsible for storage of the Central Pool stock by taking over the food grains procured by SGAs; whereas the food grains procured by DCP States are stored and directly distributed by them under TPDS and OWS.

FCI, however, has to resort to hire space from various agencies such as CWC, SWCs, SGAs and private parties as its own storage capacity is sometimes insufficient to accommodate the Central Pool stock of food grains. The stock of food grains is normally stored in covered godowns, silos and uncovered godowns called Covered and Plinth (CAP) as presented in Table 2.2.

### Table 2.2 AVAILABILITY OF STORAGE CAPACITIES

<table>
<thead>
<tr>
<th>As on 31 March</th>
<th>FCI (Owned covered and CAP)</th>
<th>CWC</th>
<th>SWCs</th>
<th>Total Storage Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>152.33</td>
<td>102.20</td>
<td>191.86</td>
<td>446.39</td>
</tr>
<tr>
<td>2008</td>
<td>151.54</td>
<td>98.78</td>
<td>187.32</td>
<td>437.64</td>
</tr>
<tr>
<td>2009</td>
<td>151.40</td>
<td>105.25</td>
<td>196.82</td>
<td>453.47</td>
</tr>
<tr>
<td>2010</td>
<td>154.77</td>
<td>105.98</td>
<td>209.26</td>
<td>470.01</td>
</tr>
<tr>
<td>2011</td>
<td>156.07</td>
<td>102.47</td>
<td>211.27</td>
<td>469.81</td>
</tr>
<tr>
<td>2012</td>
<td>156.40</td>
<td>100.85</td>
<td>234.61</td>
<td>491.86</td>
</tr>
<tr>
<td>2013</td>
<td>156.40</td>
<td>108.02</td>
<td>250.93</td>
<td>515.35</td>
</tr>
<tr>
<td>2014</td>
<td>156.40</td>
<td>104.94</td>
<td>266.96</td>
<td>528.30</td>
</tr>
</tbody>
</table>

Source: FCI, CWC, State WC’s

The total storage capacity for the central pool available with FCI inclusive of the capacity hired from various sources (State Government, SWC, SWC and Private Sector) ranged (Table 2.3) between 252 LMT in 2007 and 369 LMT in year 2014.
2.2.4. Capacity Augmentation Programmes

The most critical infrastructure in context of capacity augmentation is storage. There have been several initiatives by FCI to resolve the storage constraints. FCI recognises the facts that construction of safe storage facilities will ultimately become valuable assets. Therefore, FCI has made long term strategic planning with a flexible approach to plan infrastructure and manage them with changing scenarios and secure the benefits of value appreciation with the passage of time. In this regard role of private sector will be important in synergising the development process for building the storage infrastructure and capacity for the nation.

Various augmentation programmes of FCI are:

i. Construction of owned storage in XI Five year Plan including schemes for North East.

ii. Implementation of National Policy on Handling, Storage and Transportation of Food grains.

iii. Private Entrepreneurs Guarantee (PEG) Scheme, 2008

FCI is a step closer in building state-of-the-art grain storage and movement facilities through its public-private participation projects to add about 2 million tonne capacity Silos by 2014-15. This is one of the most significant projects in the food sector and a step towards modernization of food grain storage logistics aimed at bringing together the expertise with private and public sector on key design, structure and financing of the project and be regarded as a major endeavour by the FCI and Ministry of Consumer Affairs, Food and Public Distribution towards modernizing the country’s food grain storage and movement.

It is challenge and responsibility to ensure the annual availability of an estimated 62 million tonne food grains for distribution under the Public Distribution System (PDS), therefore, new paradigm of food security would necessitate extensive and sizeable augmentation of the country’s grain storage capacity. The current initiative will be a PPP initiative on DBFOT basis for 11 pilot locations in the States of Maharashtra, Punjab, Assam & Bihar. This will create a vast opportunity for private investors representing Silo equipment suppliers and manufacturers and financial institutions, Silo operators, warehousing and logistics companies.

All these efforts will be beneficial for creating integrated modern warehousing capacities in the country. For meeting the capital expenditure on construction of silos, the private entrepreneurs would be eligible for Viability Gap Funding (VGF) under the existing VGF scheme which allows grants of up to 20% of capital cost on the basis of competitive bidding. The FCI would provide an additional VGF to enhance the viability. For storage of wheat in these silos, the developer will be entitled to receive a recurring service charge provided he meets the required performance and maintenance standards.
2.3. **GRAIN SUPPLY CHAIN & ROLE OF FCI**

Grain supply chain efficiency depends primarily on two things: (a) what is the overall volume (scale) of grain to be procured, stored and moved; and (b) at each segment of the supply chain, what technology is adopted to handle grain so that per unit cost is reduced. Normally, if the scale of operations is large, it would be desirable to introduce bulk handling facilities with better mechanized system at every level so that one can save on not only the time to turn around, but also give some relief to labour from carrying lakhs of bags on their backs.

If India implements the NFSA, 2013 in its current envisaged form, it would require procurement and distribution of about 61 MMT of grains annually as flow variables. Strategic reserves are fungible and they are accounted for in the buffer stocking norm for each quarter. Currently, the highest buffer stocking norm (including strategic reserves) is 31.9 MMT. Keeping in mind the needs of NFSA, GoI has recently approved new buffer norm of 41.12 MMT, but revised downwards the buffer norm of January 1st from the current level of 25 MMT to 21.41 MMT. Efficiency of the entire logistics of grain-chain depends upon how fast one can move around grains from surplus to consuming areas. And this necessitates bulk handling systems in grain supply chain.

The procurement of grains has hovered around 63 MMT and off-take from TPDS has remained around 60 MMT, and the long distance movement of grains has been around 40 MMT. Almost 70 percent of this long distance movement originates in the north-west, indicating that surplus is concentrated in the north-west.

2.3.1. **Existing role of FCI and Storage Capacity**

Existing storage capacity with FCI and State agencies for Central Pool stocks as on 01.01.2015 was 72.49 MMT, of which 15.71 MMT was in Cover and Plinth (CAP).

Break-up of FCI’s cost as per Budgetary Estimates 2014-15 are summarised below:

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Wheat</th>
<th>%age</th>
<th>Fixed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pooled Cost of gran</td>
<td>1353.25</td>
<td>68%</td>
<td>GoI</td>
</tr>
<tr>
<td>Proc. Incidentals</td>
<td>348.50</td>
<td>17%</td>
<td>GoI State Govt.</td>
</tr>
<tr>
<td>Acquisition Cost</td>
<td>1701.75</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>Freight</td>
<td>113.85</td>
<td>6%</td>
<td>Railways/ Open tender</td>
</tr>
<tr>
<td>Handling</td>
<td>57.25</td>
<td>3%</td>
<td>Wage settlement/min wage act</td>
</tr>
<tr>
<td>Storage</td>
<td>36.57</td>
<td>2%</td>
<td>GoI open tender</td>
</tr>
<tr>
<td>Interest</td>
<td>58.32</td>
<td>3%</td>
<td>Consortium of banks</td>
</tr>
<tr>
<td>Losses</td>
<td>2.66</td>
<td>0%</td>
<td>Operational losses</td>
</tr>
<tr>
<td>Admin Overheads</td>
<td>23.30</td>
<td>1%</td>
<td>GoI as per DPE guidelines</td>
</tr>
<tr>
<td>Distribution costs</td>
<td>291.95</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>Economic costs</td>
<td>1993.70</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Average sales realization</td>
<td>539.57</td>
<td>27%</td>
<td>GoI/tender</td>
</tr>
<tr>
<td>Subsidy</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Table 2.4 STORAGE CAPACITY SCENE IN INDIA (COVERED VS. CAP) - LAKH TONNES

<table>
<thead>
<tr>
<th></th>
<th>Covered</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Owned</td>
<td>Hired</td>
<td>Owned</td>
<td>Hired</td>
</tr>
<tr>
<td><strong>Storage Capacity with FCI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CAP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Owned (41%)</td>
<td>130.09</td>
<td>225.38</td>
<td>26.38</td>
<td>4.42</td>
</tr>
<tr>
<td>Total Hired (59%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (FCI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Storage Capacity with State Agencies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(excludes capacity allotted to FCI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covered</td>
<td></td>
<td></td>
<td>219.86</td>
<td></td>
</tr>
<tr>
<td>CAP</td>
<td></td>
<td></td>
<td>150.41</td>
<td></td>
</tr>
<tr>
<td>Total (State)</td>
<td></td>
<td></td>
<td>370.27</td>
<td></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td></td>
<td>756.54</td>
<td></td>
</tr>
</tbody>
</table>

The total hired capacity with FCI (Table 2.4) is about 60% i.e. 260 lakh tonnes. CWC, SWC & Private hired capacity are about 9%, 24% & 27% respectively.

The shortages in food grains can be classified under three heads, namely, storage loss, transit loss and non-issuable / damaged food grains. As per FCI’s data, the third category is negligible.

The factors contributing to the storage loss are:

(i) Loss in moisture  
(ii) Prolonged storage  
(iii) Poor texture of gunnies, accentuated by use of iron hooks  
(iv) Improper storage practices

The factors contributing to the transit loss are:

(i) Multiple handling  
(ii) Poor texture of gunnies, accentuated by use of iron hooks  
(iii) Poor quality wagons  
(iv) En route pilferages  
(v) Inadequate security at rail points, especially during night working and BG/MG transhipment

![Fig 2.1 TRANSIT & STORAGE LOSS](image-url)
2.4. REGULATORY FRAMEWORK

2.4.1. National Food Security Bill, 2013

The National Food Security Bill, 2013 passed by the parliament on late Monday gives right to subsidised food grain to 67 percent of India’s 1.2 billion people and provides for penalty for non-compliance by public servants. The bill’s salient features include:

i. Seventy five percent of rural and 50 percent of the urban population entitled to five kg foodgrains per month at Rs 3, Rs 2, Re 1 per kg for rice, wheat and coarse grains, respectively.

ii. The work of identification of eligible households has been left to the states.

iii. Pregnant women and lactating mothers entitled to nutritious meals and maternity benefit of at least Rs 6,000 for six months.

iv. The central government will provide funds to states in case of short supply of foodgrain.

v. The current foodgrains allocation of the states will be protected by the central government.

vi. The state governments will provide food security allowance to the beneficiaries in case of non-supply of foodgrains.

vii. Public distribution system to be reformed.

viii. The eldest woman in the household, 18 years or above, will be the head of the household for the issue of the ration card.

ix. There will be state and district level redress mechanisms.

2.4.2. Decentralized Procurement Scheme

The scheme of Decentralized Procurement of foodgrains was introduced by the Government in 1997-98 with a view to enhancing the efficiency of procurement and PDS and encouraging local procurement to the maximum extent thereby extending the benefits of MSP to local farmers as well as to save on transit costs. This also enables procurement of foodgrains more suited to the local taste.

Under this scheme, the State Government itself undertakes direct purchase of paddy and wheat and procurement of levy rice on behalf of Government of India, and also stores and distributes these foodgrains under TPDS and other welfare schemes. The Central Government undertakes to meet the entire expenditure incurred by the State Governments on the procurement operations as per the approved costing. The Central Government also monitors the quality of foodgrains procured under the scheme and reviews the arrangements made to ensure that the procurement operations are carried on smoothly.

At present following States are under DCP system:

<table>
<thead>
<tr>
<th>S.N.</th>
<th>State/UT</th>
<th>DCP adopted for</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A&amp;N Islands</td>
<td>Rice</td>
</tr>
<tr>
<td>2.</td>
<td>Bihar</td>
<td>Rice/Wheat</td>
</tr>
<tr>
<td>3.</td>
<td>Chhattisgarh</td>
<td>Rice/Wheat</td>
</tr>
<tr>
<td>4.</td>
<td>Gujarat</td>
<td>Wheat</td>
</tr>
<tr>
<td>5.</td>
<td>Karnataka</td>
<td>Rice</td>
</tr>
<tr>
<td>6.</td>
<td>Kerala</td>
<td>Rice</td>
</tr>
<tr>
<td>7.</td>
<td>Madhya Pradesh</td>
<td>Rice/Wheat</td>
</tr>
<tr>
<td>8.</td>
<td>Odisha</td>
<td>Rice</td>
</tr>
</tbody>
</table>
2.4.3. **High Level Committee Report, 2000**

The Union Ministry of Consumer Affairs, Food & Public Distribution constituted this High Level Committee for formulating a Long-term Grain Policy for the country on the 17th of November 2000. The Terms of Reference (see Annexure 1) assigned to it required examination of the following areas:

i. Minimum Support Prices (MSP) and Price Support Operations

ii. The Role of the Food Corporation of India (FCI)

iii. Functioning of the Public Distribution System (PDS)

iv. Policies regarding buffer stocks, open market sales and foreign trade

v. Allocation of grain for Rural Development and other Welfare programme

These cover almost all aspects of the present system of national food security, under which:

- The Union Government announces MSPs at which it guarantees open-ended purchase of whatever grain is offered by farmers.

- The Centre also has responsibility for maintaining buffer stocks and for the allocation and pricing of grain supplied to States for sale through the PDS.

- The actual implementation of the procurement, storage and distribution functions that follow from these decisions of the Central Government rests on the FCI, a Central public sector undertaking, which is also required to maintain the food security buffer stocks and to carry out price stabilisation operations through open market sales.

- It is the responsibility of State governments to maintain and provision the network of retail fair price shops required to reach the PDS to consumers and to implement any other welfare programmes, such as mid-day meal schemes in schools and food-for-work schemes for rural development, through which food grains may be distributed to those in need.

2.4.4. **Private Entrepreneurs Guarantee (PEG) Scheme**

Higher MSP coupled with better outreach led to higher procurement in the past few years. As a result of higher procurement of foodgrains, the Central Pool stock had increased from 196.38 lakh MT as on 1.4.2008 to a peak level 823.17 lakh MT as on 1.6.2012. Hence, necessity was felt to augment the storage capacity for foodgrains. The Department is implementing a scheme, namely Private Entrepreneurs Guarantee (PEG) Scheme, for augmenting the storage capacity in the form of covered godowns and to reduce the dependence on CAP storage.

### Table: S.N. State/UT, DCP adopted for

<table>
<thead>
<tr>
<th>S.N.</th>
<th>State/UT</th>
<th>DCP adopted for</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>Tamil Nadu</td>
<td>Rice</td>
</tr>
<tr>
<td>10.</td>
<td>Uttarakhand</td>
<td>Rice/Wheat</td>
</tr>
<tr>
<td>11.</td>
<td>West Bengal</td>
<td>Rice/Wheat</td>
</tr>
<tr>
<td>12.</td>
<td>Punjab (for NFSA obligations)</td>
<td>Wheat</td>
</tr>
<tr>
<td>13.</td>
<td>Rajasthan (in Alwar District)</td>
<td>Wheat</td>
</tr>
<tr>
<td>14.</td>
<td>Andhra Pradesh (6 Districts)</td>
<td>Rice</td>
</tr>
<tr>
<td>15.</td>
<td>Telengana (9 Districts)</td>
<td>Rice</td>
</tr>
</tbody>
</table>
i. Under the PEG Scheme, which was launched in 2008, godowns are constructed in PPP mode through private parties, as well as various agencies in Public Sector for guaranteed hiring by FCI.

ii. Guarantee period for private parties is 10 years whereas for Public Sector agencies it is 9 years. In case of private parties, state wise tenders are invited by designated nodal agency under a 2 bid system. At the technical bid stage, sites are inspected and bids in respect of only those sites which are found suitable, are processed further. Tenders are allotted to the lowest bidders. Non railway siding based godowns are to be constructed in one year whereas godowns with railway siding are allowed two years construction period. This period can be extended by one year at the request of the investor. After completion of the godown, final inspection is carried by a joint committee of FCI and the Nodal agency and godowns completed in all respects and as per specifications are taken over on guarantee basis.

iii. Locations for construction of godowns was identified by the FCI on the basis of recommendations of State Level Committees (SLCs) to meet the storage gaps. For consuming areas, the storage gap is assessed on the basis of 4 months requirement of PDS and OWS while for procuring states the storage gap has been assessed based on the highest stock levels in the last three years, and keeping in view the potential of procurement.

iv. Accordingly, approximately 200 lakh MT capacity creation was planned with construction of godowns at various locations in 19 states. As on 30.06.2014, capacity of 153.16 lakh MT has been sanctioned for construction and 120.30 lakh MT has been completed.

v. The Government has also approved construction of modern storage facilities in the form of silos of 20 lakh MT capacity within the overall approved capacity for PEG Scheme. Each silo will have capacity of 25,000 or 50,000 MT. FCI has identified the locations of silos in 10 States. Construction is being planned in the PPP in both Viability Gap Funding (VGF) and non-VGF modes.
Chapter 3
EXISTING SUPPLY CHAIN OF STORAGE FACILITIES

3. EXISTING SUPPLY CHAIN OF STORAGE FACILITIES

3.1. CONVENTIONAL COVERED WAREHOUSE

The conventional covered warehouses are the traditional godowns developed with RCC type columns and roof structures. Godowns are constructed with super structure of brick masonry in cement mortar. It has generally brick or stone masonry for foundation. Godown units are generally constructed in modules of capacity 5000 MT. The Food Corporation of India (FCI) has developed guidelines for construction of godowns suitable for the storage of food grains. Covered godowns can store wheat in bagged as well as bulk form. However, FCI stores wheat mainly in godowns in bagged form only, in the absence of mechanical handling required for bulk storage.

Shelf Life: The shelf life of grains in godowns depends on grain management and preservation and therefore there is no fixed period. In general the grain can be kept safely in godowns until 16-18 months.

Land Requirements: Warehouses are horizontal structures which require significant land area. It is learnt that a 50,000 MT warehouse would require an area of approximately 18-20 acres.

Ease of Construction & Maintenance: FCI has standardised the construction and maintenance guidelines for godowns and it is understood that godowns can be easily built in a short timeframe of 3-4 months as materials are available locally and the technical know-how is also available.

Multiple Commodity Storage: As the warehouses have bagged storage therefore it can accommodate multi commodities. Primarily FCI and other procurement agencies store wheat and rice in the existing godowns together.

3.1.1. Covered Area Plinth (CAP)

CAP is a scientific yet temporary storage technique with guided specifications of concrete plinth, dun-age and tarpaulin. As CAP storage is an open storage the grains need to be essentially bagged.

Shelf Life: Similar to godowns the shelf life of grains in CAP storage is dependent on grain management and preservation and therefore there is no fixed period. In general, the standard time for which the grain can be kept completely safe in CAP storage is about 6 months.

Storage Techniques

Land Requirements: CAP storages are horizontal structures which require sizeable land area. Since there is no peripheral structure, the land requirement is lesser than that of a warehouse.

Ease of Construction & Maintenance: The FCI has standardised the construction and maintenance guidelines for CAP and it is understood that a CAP is easily built in short timeframe of a few days as materials are available locally and the technical knowhow is
also available.

**Multiple Commodity Storage:** As the CAP storages are bagged storage therefore they can accommodate multi commodities.

### 3.2. SILOS

Silos are primarily the large tank type structures either made of steel or concrete for storage of food grains or other materials in monitored atmosphere. As silos are tank type high vertical structures, wheat or other materials are stored in bulk form only. Silo requires mechanized handling for loading and unloading of material. At port locations which are more prone to corrosion, concrete silos are constructed while for inland locations, steel silos are better as they are quite cost effective as compared to concrete silos.

**Shelf Life:** In silos, there are many aspects of grain management, the management is mechanical rather than manual. In general, the grain may be kept safely in silos for a period of 2 years.

**Land Requirements:** Silo is basically a vertical storage option as compared to godowns or CAP which are horizontal type storages. Hence, silos save a lot of land compared to warehouses. For a 50,000 MT silo, 7 acres land is required.

**Ease of Construction & Maintenance:** The construction of steel silos can be done within 10 months including the lead time of importing the steel structures. The erection time is about 2-3 months. Steel silos are quite easy to maintain.

**Multiple Commodity Storage:** As silos are meant for bulk storage, two commodities cannot be kept within the same silo bin or even in different bins as they have the same mechanical handling equipment.

### 3.3. CONVENTIONAL STORAGE vs. MODERN SILO STORAGE

Food Security cannot be complete without addressing the rudiments on scientific storage of Grains. According to a report published by UN, world loses ARE ABOUT one third of the food produced. This amounts to a staggering 1.3 billion tons annually. India loses about 10% of its grain and oilseeds annually. ‘Harvest to Household’ losses may actually be more than what a country like Australia Exports.

The current covered ware house capacity available with FCI is 33.63 Million Tons. With procurement exceeding 63.68 Million Tons, adequate storage actually falls short. A large quantity of Wheat is still lying in open under CAP Storage waiting to be evacuated, through it has been phased out by FCI.

Private sector investment in Agriculture in our country declined from around 12% in 1999-2000 to less than 6% currently. It is in this back drop we would examine the opportunities and challenges of improving Post-Harvest infrastructure in our country.

#### 3.3.1. Indian Scenario

India produces about 250 Million Tons of Food Grain and Wheat production has skyrocketed to 95 million tons on the strength of Govt. buying. Corn production has gone up to 21 million tons. States like Karnataka, Bihar have done exceedingly well in this regard.

Warehousing capacity in India has not kept pace with Production/Procurement increase. Storage Gap of 35 Million Tons is estimated for 12th Plan period.
3.3.2. **Flat Warehouse Vs Modern Vertical Silos**

In India we have been debating for decades whether Flat warehouses are good for our country or we need to modernise by having vertical Silos. The most important aspect would be to understand and study the International Best Practices as existing globally.

**USA**: USA has more than 310 Million Ton Silo storage capacity. On farm / Silo capacity is almost equal to off farm capacity, adopting the ideal ‘Hub and Spoke System’. On farm storage helps farmer to store Grain at the site at harvest time and move to off farm. As compared to this in Punjab/Haryana, scene is chaotic at harvest time.

**Canada**: Canadian Wheat Board is the nodal agency for Wheat. Major food grains holdings of CWB are at farm level and grain terminals same as ‘Hub and Spoke System’.

**China**: China procures, handles, stores & transports its food grains viz., Wheat, Paddy, Rice & Corn in Bulk only. Bags are used at the final stage i.e. while selling to consumer. State intervention in China is quite strong. Just, like India, they have planned remunerative prices for farmers and low prices to consumers. The CAP storage in China is nil. Transition from CAP to Flat Warehouse happened in 1998 when China realized the quantum of wastage in CAP. Punjab/Haryana stores a lot of Grains in CAP. China stores grains in Bulk in their warehouses also. Transition from Warehouse to Silo came when China realized construction of Warehouse was more expensive than Silos.

3.3.3. **Experience of Creating Silos in India**

The pilot projects were built on BOO basis and FCI was the Nodal Agency. This was the first experience for FCI. The quality of Wheat stocks even after 5 years has been excellent. Transit loss is below 0.25%. Fumigation and insect control is excellent with zero residues in the Grain. Farmers are benefitted as they get accurate weighments and are free in 1 hour. Rake loading is completed within 3/4 hours as against 8/9 hours in conventional bag loading. Similarly unloading is done within 3/4 hours as opposed to 8/9 hours in Bags unloading.

3.3.4. **Road Map for future – Impetus on Bulk Handling and Transport**

Labour costs in our country are going through the roof. Apart from costs arranging labour is becoming a nightmare. Cost of Jute bags has become prohibitive. With Indian Railways stretched for funds and new rolling stock difficult to procure.

The need of the hour is to improve capacity utilization. Freight Income for Railways is around 6700 Crore. Grain accounts for 8.3% of freight revenue, if we reduce 50% turnaround time in loading/ unloading of wagons the savings for the Nation would be humongous. Preservation of Grain is much better in Silos apart from lower land requirement (1/3rd of Flat Godowns).

Our farmers use Sun-Drying method for corn which has disastrous results. Invariably our corn suffers Aflatoxin issues due to improper drying and gets rejected. Huge value destruction takes place. Proper Driers attached to Silos are the crying need to address this issue. If we, analyse end to end solution Silos score over flat warehouses even in terms of cost. The Myth of Silos being expensive needs to be broken. In conclusion, Flat Warehouses are no match for silos in terms of Quality/ Quantity/ Handling losses/ Logistics cost and Storage Space in Grain. Similarly, procurement and storage of wheat will be greatly affected by the development of silos pan India.
Important suggestions:

i. Promote and develop an efficient, integrated and Mechanized Bulk Handling, Storage and Transportation System in the country.

ii. Give full-fledged infrastructure status to warehousing with all financial benefits like cheap loans, IT and Service Tax benefits.

iii. Hub and Spoke System needs to be implemented in India. Smaller Silos at Mandi level connected to Mother Silos. Mother Silos should have Bulk handling and Rail connectivity.

iv. Upcountry Silos also should have rail connectivity.

v. Changeover from Box Wagons to Top Loading/Bottom discharge.

vi. Wagon would go a long way in improving capacity utilization for Railways.

vii. Suitable Top loading/Bottom discharge wagon to be made available for handling Grain. If Railways is stressed for funds Private Sector should be suitably incentivised to create required wagon capacity.

viii. Silo sites should be notified as Mandis under relevant APMC Act by State Governments.

ix. Post-Harvest Agriculture Infrastructure could be created under PPP model to encourage Private Sector Investment.

x. Our Port Infrastructure should be suitably tweaked to receive and store Grain in Bulk. This will facilitate both Import & Exports.

Unless these vital issues are not addressed, destruction of Grain may be much faster than its creation. High productivity/yields may prove futile in real terms. Construction of silos is going to be the first step to achieve the above objectives. The techno-commercial comparison of silos and traditional flat warehouse is epitomised below in Table 3.1.

Table 3.1 COMPARATIVES ON SILOS AND FLAT WAREHOUSES

<table>
<thead>
<tr>
<th>SILOS</th>
<th>TRADITIONAL WAREHOUSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>erection cost of Rs 6000 to 6800 per MT</td>
<td>erection cost of Rs 3500 to 7800 per MT</td>
</tr>
<tr>
<td>commissioning within 8-12 months</td>
<td>completion time of 1-2 years &amp; more.</td>
</tr>
<tr>
<td>mechanical process for bulk handling</td>
<td>huge manpower cost</td>
</tr>
<tr>
<td>smaller land parcel required</td>
<td>land requirement 2-3 times that of silos</td>
</tr>
<tr>
<td>lower maintenance cost</td>
<td>regular repair required</td>
</tr>
<tr>
<td>high degree of automation</td>
<td>no automation</td>
</tr>
<tr>
<td>no requirement for multiple bagging</td>
<td>huge cost incurred in multiple bagging</td>
</tr>
<tr>
<td>quality monitoring at all the stages with minimum human interference</td>
<td>no such provisions</td>
</tr>
</tbody>
</table>
Comparison of Costs (construction and operational) of Silos and Conventional Godowns of 50,000 tonnes capacity as studied in HPC Report is presented in Table 3.2.

<table>
<thead>
<tr>
<th>S.N</th>
<th>COMPONENTS OF COSTS</th>
<th>SILO</th>
<th>GODOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land (in acre)</td>
<td>7.00 *</td>
<td>17.50</td>
</tr>
<tr>
<td>2</td>
<td>Land Cost (Rs. crore per acre)</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>3</td>
<td>Total land cost (Rs. Crore)</td>
<td>3.50</td>
<td>8.75</td>
</tr>
<tr>
<td>4</td>
<td>Construction cost (including civil work, roads, ancillary units, weigh bridge, electrical, plant &amp; machinery for silos (Rs. in crore))</td>
<td>26.00</td>
<td>25.00</td>
</tr>
<tr>
<td>5</td>
<td>Total construction cost (Rs. in crore)</td>
<td>29.50</td>
<td>33.75</td>
</tr>
<tr>
<td>6</td>
<td>Construction cost per tonne (in Rs)</td>
<td>5900</td>
<td>6750</td>
</tr>
<tr>
<td>7</td>
<td>Operational Cost per tonne (in Rs)</td>
<td>4442</td>
<td>4530</td>
</tr>
</tbody>
</table>

(*) May vary subject to operation plan and track arrangement, Source: HLC Report

The international best practices handle food grains storages in modern silos with bulk loading/unloading through railway sidings, which reduces the storages and transit losses substantially. Hence, it is also important to minimize the number of stages of handling. Based on the above the outsourcing storage and movement through Public Private Partnerships (PPPs) on a competitive bidding basis would provide the required investments and managerial competence for effectively managing the supply chain.

Grain supply chain efficiency depends primarily on two things: (a) what is the overall volume (scale) of grain to be procured, stored and moved; and (b) at each segment of the supply chain, what technology is adopted to handle grain so that per unit cost is reduced. Normally, if the scale of operations is large, it would be desirable to introduce bulk handling facilities with better mechanized system at every level so that one can save on not only the time to turn around, but also give some relief to labour from carrying lakhs of bags on their backs.

Therefore the vision of the Government and FCI, is to develop modern silos initially at pilot 11 locations with bulk handling facility and thereafter take on a larger scale to about 85 locations in next five years.
Chapter 4
TECHNICAL FEASIBILITY

4. TECHNICAL FEASIBILITY

The Site visit and appreciation has been undertaken for the proposed brownfield site at Whitefield, Karnataka for development of Steel silos for storage of wheat. The main objective is to study the existing infrastructure of the FCI facility and to assess the feasibility for the proposed silo development in the premises of FCI depot.

4.1.1. Location Appreciation

FCI Godown Whitefield is located on the Eastern side of Bangalore City at a distance of approximately 20 km. This facility is consuming complex for FCI operations. This FCI Facility is enveloped with Residential Landuse from North, West and South side while eastern area is green vacant land.

4.1.2. Connectivity Status

The facility is well connected with arterial roads from the west along the boundary side of the facility and at south side (Channasadra main road) which is adjacent to the facility and also providing access to the facility. Towards the north side the facility is well connected with Whitefield Railway Station which being 1 km away.
4.1.3. **Existing Infrastructure**

Total area of the FCI facility is 71 acres, 34 acres has been utilized with 17 Godowns of 5000 MT each and 16 CAP’s (not utilized – the area may be considered as vacant land) of 5000 MT. The proposed site is already developed land with flat terrain. The internal roads of the facility are 6 m wide with ROW of 10 m. Total existing storage capacity of the facility is 85,000 MT. Total 17 nos of warehouses with 5000 MT capacity are present in the facility with intermediate gap of 15 m. The covered warehouses are in good condition with 5000 MT capacity with area of 3465 sq.m (27.5 x 126 m). Railway track passes through the site splitting into three and runs for about a kilometre within the premises with each part consisting of 2 tracks for utilization and one track as loop line. In total there are 6 tracks with 3 loop lines inside the premises utilized for the current operations. The ROW of railway track is 18 m. A total of 2 weighbridges are present in the facility with a capacity of 40 MT each. Other buildings includes Administrative block (527.89 Sq m), Canteen (203.83 Sq m), Toilet Blocks (119.36 Sq m), Labour shed (171.58 Sq m), Security post (11.20 Sq m), other structures (185.62 Sq m), etc.

![Diagram of the facility with labels for existing infrastructure and utilities](image)

4.1.4. **Existing Utilities**

There is a power supply consumption of 74 KW for site operations. There are 2 bore wells present in the facility from which tanks are filled with the help of submersible pumps. 1 overhead and 6 underground tank are available within the premises with a total capacity of 100000 litre. For sewerage, there are pits provided for each toilet blocks separately. There are no underground utilities.
4.1.5. **Observations/Constraint**

Adani group is planning to develop silo and marked 6 acres of land for developing the same in the facility. At present an Adani silo of 25000 MT is established 25 kms away from the existing facility at Malur and is completely utilized by FCI with monthly payment to Adani.

Some site pictures are enclosed below.

![Pathway to Administrative block](image1)
![Track between the Warehouses](image2)
![Electrified track line](image3)
![Open Plinths](image4)
![Vacant Land – 13 Acres](image5)
![Vacant Land – 6 Acres](image6)

Existing Layout Plan of FCI Depot Complex at Whitefield, Karnataka India is presented in Figure 4.1.

4.2. **FACTORS INFLUENCING CAPACITY PLANNING**

4.2.1. **Factors**

The capacity planning part of infrastructural development is one of the most integral parts of planning and dependent on number of parameters, which need to be critically analysed in detail. The development of new project need capital investment, hence possibilities and limitations need to be factored judiciously and properly. The development of the modern silos means creation of better storage capacity keeping in view;

- Regulatory framework / recommendations by various applicable committees
- Availability of the land for construction of modern silos
- Conversion of old storage facilities into the modern silos, which means phasing out & dismantling of CAP for development of modern silos
- Railway Siding feasibility factoring the bulk loading/unloading facility
Gap analysis is to identify the storage shortfall by assessing demand supply of storage facilities. Further, for the wheat procurement region, gap will be difference between procurement of wheat and storage facilities available, whereas; for the consuming regions, the gap will be the difference between the yearly wheat allocation for the State and the storage facilities available.

In the present scenario the modern silos are not only required to add the storage facility for meeting the storage requirement but to modernise the existing storage system to reap the benefits of the scientific methods of storage based on the recommendations of the various committees, which will reduce the intermediaries of supply chain and increase the overall efficiency of supply chain. Therefore on this basis, first we will follow the regulatory framework.

a) Schemes and Recommendations

High Level Committee (HLC) set-up by the Government is of the view that;

“Outsourcing storage and movement through Public Private Partnerships (PPPs) on a competitive bidding basis would provide the required investments and managerial competence for effectively managing the supply chain. Where required, existing land/facilities can be provided to the PPPs. FCI should invite bids to convert its own conventional warehouses to modern silos under PPP mode”.

The whole system of grain management is lagging behind with technology of 1960s and 1970s, with thousands of workers carrying sacks on their backs, which need to be upgraded to conveyor belts, forklifts, containers and silos. A major modernization drive of this grain supply chains will need lot of investments which should be leveraged by inviting private sector and FCI offering its existing lands with conventional storages, wherever possible. A shift from ‘human back’ to ‘machine back’ will promote dignity of labour, will
save on time and resources, and be in line with best international practices in storage and movement.

b) Availability of Land for Construction of Silos

In the VGF based PPP model, the government will provide land to the private developer on concession and the private developer shall be responsible for development of the project, hence the land is the critical part for the success of the project, which means the land ownership either lies with the FCI or state agencies or FCI will acquire land at such a place where the railway siding facility can be accommodated to enable the bulk loading facility.

The land acquisition is somewhat a time consuming process factoring the availability of land at such strategic locations, hence FCI is of the view that they will first utilize the vacant land available within the FCI depots which are having existing railway siding facilities to expedite the whole process and modernize the existing storage system which will provide enumerable benefits. Out of proposed 11 locations, 8 locations are within the FCI depots and the remaining 3 are Greenfield sites including the land belonging to State Governments.

c) Dismantling of CAPs / Creation of Land / Conversion of CAPs into Modern Silos

The FCI is envisaging the development of the modern silos in the premises of FCI depots by using vacant land and also the creation of the land by dismantling of the existing CAPs (Cover and Plinth). The CAPs are one of the conventional ways of storage of wheat grains, which need to be upgraded considering the wastage of grains due to CAP storage. Therefore the project facilities are planned by including the creation of the land area from dismantling of the CAPs. It also justifies the demand side, because there is transformation from old silo facility to the modern silo facility.

d) Railway Siding Facility

All the modern silos needs to be developed along with bulk loading/unloading facilities through railway siding, hence it is imperative to plan the capacity in conjunction with the railway siding. For accommodation of railway rake inside the premises, the minimum length is required as per the guidelines of railways; therefore this factor will impact the final capacity of each site in big way.

e) Gap Analysis

This is the last factor taken into consideration, which further revalidates the final capacity of the modern silos for each site. The overall wheat scenario from macro and micro point of view detailed out to understand the concept. The details of total wheat production and area over the years are given below the figure;

4.2.2. State Wise Production

The data showing State wise production for FY 12-13 is presented in Table 4.1.
Table 4.1 STATE-WISE ANNUAL WHEAT PRODUCTION

<table>
<thead>
<tr>
<th>State</th>
<th>Thousand Tonne (FY 2012-13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>10</td>
</tr>
<tr>
<td>Arunachal Pradesh</td>
<td>4</td>
</tr>
<tr>
<td>Assam</td>
<td>44</td>
</tr>
<tr>
<td>Bihar</td>
<td>5357</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>141</td>
</tr>
<tr>
<td>Goa</td>
<td>-</td>
</tr>
<tr>
<td>Gujarat</td>
<td>2944</td>
</tr>
<tr>
<td>Haryana</td>
<td>11117</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>609</td>
</tr>
<tr>
<td>Jammu &amp; Kashmir</td>
<td>462</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>319</td>
</tr>
<tr>
<td>Karnataka</td>
<td>179</td>
</tr>
<tr>
<td>Kerala</td>
<td>-</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>13133</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>1181</td>
</tr>
<tr>
<td>Manipur</td>
<td>6</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>1</td>
</tr>
<tr>
<td>Mizoram</td>
<td>-</td>
</tr>
<tr>
<td>Nagaland</td>
<td>6</td>
</tr>
<tr>
<td>Orissa</td>
<td>2</td>
</tr>
<tr>
<td>Punjab</td>
<td>16591</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>9275</td>
</tr>
<tr>
<td>Sikkim</td>
<td>1</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>-</td>
</tr>
<tr>
<td>Tripura</td>
<td>1</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>30302</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>856</td>
</tr>
<tr>
<td>West Bengal</td>
<td>896</td>
</tr>
<tr>
<td>Union Territory:</td>
<td>-</td>
</tr>
<tr>
<td>A. &amp; N. Islands</td>
<td>-</td>
</tr>
<tr>
<td>Chandigarh</td>
<td>-</td>
</tr>
<tr>
<td>D. &amp; N. Haveli</td>
<td>-</td>
</tr>
<tr>
<td>Daman &amp; Diu</td>
<td>-</td>
</tr>
<tr>
<td>Delhi</td>
<td>65</td>
</tr>
<tr>
<td>Lakshadweep</td>
<td>-</td>
</tr>
<tr>
<td>Puducherry</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>-</td>
</tr>
</tbody>
</table>

Top Ten Wheat Producing States (Figure 4.2) reveal that UP, Punjab, MP, Haryana and Rajasthan are the top 5 wheat producing States. Bihar produces about 5.25 MMT of wheat annually. Gujarat, Maharashtra, WB and Uttarakhand produce between 1 to 3 MMT annually.
4.2.3. Allotment and Off-take of Food Grain

The details of Allotment and Off-take of food grains under NFSA during 2014-15 (up to Jan 2015) from Central Pool is given below in the Table 4.2.

<table>
<thead>
<tr>
<th>State</th>
<th>Wheat Allotment</th>
<th>Rice Allotment</th>
<th>Total Allotment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punjab</td>
<td>8.7</td>
<td>1.91</td>
<td>8.7</td>
</tr>
<tr>
<td>Bihar</td>
<td>19.65</td>
<td>17.41</td>
<td>49.13</td>
</tr>
<tr>
<td>Delhi</td>
<td>2.7</td>
<td>2.7</td>
<td>3.51</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>25.4</td>
<td>20.78</td>
<td>45.3</td>
</tr>
<tr>
<td>Assam</td>
<td>3.78</td>
<td>3.45</td>
<td>20.32</td>
</tr>
<tr>
<td>Karnataka</td>
<td>1.2</td>
<td>1.28</td>
<td>25.28</td>
</tr>
</tbody>
</table>

4.2.4. State Wise Storage Capacity

The State Wise Monthly Average Storage Capacity with FCI for the Month of July 2014 is given below in Table 4.3.

<table>
<thead>
<tr>
<th>Region</th>
<th>FCI</th>
<th>State</th>
<th>CWC</th>
<th>SWC</th>
<th>PEG</th>
<th>PWS</th>
<th>Private</th>
<th>Total Hired</th>
<th>Total Covered</th>
<th>Owned</th>
<th>Hired</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punjab</td>
<td>21.17</td>
<td>0.74</td>
<td>4.99</td>
<td>40.22</td>
<td>36.55</td>
<td>0</td>
<td>3.81</td>
<td>86.31</td>
<td>107.48</td>
<td>7.14</td>
<td>2.6</td>
<td>9.74</td>
</tr>
<tr>
<td>Bihar</td>
<td>3.66</td>
<td>0.03</td>
<td>0.87</td>
<td>0.84</td>
<td>0.2</td>
<td>0</td>
<td>0.49</td>
<td>2.43</td>
<td>6.09</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Delhi</td>
<td>3.36</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3.36</td>
<td>0.31</td>
<td>0</td>
<td>0.31</td>
<td>3.67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>11.9</td>
<td>0</td>
<td>1.9</td>
<td>2.94</td>
<td>5.15</td>
<td>0.32</td>
<td>0.95</td>
<td>11.26</td>
<td>23.16</td>
<td>1.02</td>
<td>0</td>
<td>1.02</td>
</tr>
<tr>
<td>Assam</td>
<td>2.12</td>
<td>0.01</td>
<td>0.22</td>
<td>0.24</td>
<td>0</td>
<td>0</td>
<td>0.51</td>
<td>0.98</td>
<td>3.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Karnataka</td>
<td>3.81</td>
<td>0</td>
<td>0.66</td>
<td>1.3</td>
<td>0.75</td>
<td>0</td>
<td>0.9</td>
<td>3.61</td>
<td>7.42</td>
<td>1.36</td>
<td>0</td>
<td>1.36</td>
</tr>
</tbody>
</table>
4.2.5. **Gap Analysis: Allotment vs Storage Facility**

The details of the gap analysis between state wise allotment (Wheat & Rice) and state wise total storage capacity are indicated in Table 4.4.

<table>
<thead>
<tr>
<th>State</th>
<th>Total Allocation (lakh MT)</th>
<th>Total Storage Facility (Lakh MT)</th>
<th>Storage Gap (Lakh MT)</th>
<th>Proposed Capacity of Steel Silos</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bihar</td>
<td>49.13</td>
<td>7.09</td>
<td>-42.04 (Kathiar: 50000 MT and Buxar 19000 MT)</td>
<td>Total: 69000 MT</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>45.3</td>
<td>24.18</td>
<td>-21.12</td>
<td>50000 MT</td>
</tr>
<tr>
<td>Assam</td>
<td>20.32</td>
<td>3.1</td>
<td>-17.22</td>
<td>50000 MT</td>
</tr>
<tr>
<td>Karnataka</td>
<td>25.28</td>
<td>8.78</td>
<td>-16.5</td>
<td>Bellary 50000 MT and Whitefield 50000 MT Total 100000MT</td>
</tr>
</tbody>
</table>

From the above table, it could be inferred that there is substantial gap between state allocation and state storage facilities, hence the new facilities needs to be added to full fill the storage facility gap. Therefore, the idea of development of the modern steel silos for wheat is well justified from demand supply point of view. The development of modern silos are not only required from storage gap point of view, but for better quality of food grain storage and downsizes the redundancies of existing supply chain, which will reduce the cost of operations substantially.

4.3. **SUPPLY CHAIN OF MODERN SILOS**

The supply chain of a Silo Complex of FCI depends on the geographic location of the Complex i.e. it may be located in a “Producing Area” or a “Consuming Area”.

The supply chain of a Silo complex is as described below:
General Arrangement Drawing (GAD) of both “Producing Area” and “Consuming Area” Silo Complex is presented as Annexure A and Annexure B.
4.4. CAPACITY PLANNING AND PROJECT FACILITY

The Project is being planned in wheat “Consuming Area” and hence the silo complex shall have facilities of receiving food grain in bulk form by rail. The primary off-take/issue shall be in bagged form and shall be transported by road. However provision of bulk dispatch by road shall also be made.

Whitefield Depot of FCI at present has a storage capacity of 85,000 MT. The entire capacity is shared for storage of both wheat and paddy. The average stock of wheat maintained at Whitefield Depot is about 40,000 MT per month. If a buffer stock for 3 months is maintained then the storage requirement is approximately 1,20,000 MT. Further, various policies adopted by FCI aims towards phasing out of bag storage of wheat and move towards Steel Silo storage.

FCI has about 19 Acres of land, 8 Acres at entry point of Railway Siding and 11 Acres at end point of railway siding respectively at Whitefield Depot earmarked for development of a Silo Complex.

The 8 Acres available at entry point is sufficient to accommodate a Silo Complex of capacity 1,00,000 MT. The existing Railway Siding shall be sufficient to service the Silo complex planned. Further, connecting roads are wide and well maintained and are sufficient for dispatch of grain by trucks.

In view of the above facts, a Silo Complex of 50,000 MT in the 1st Phase and another 50,000 MT in the 2nd Phase has been planned.

The following Project facilities are envisaged.

4.5. PROJECT SCOPING

Whitefield Depot of FCI is planned to have a 1,00,000 MT silo complex in 2 phases of 50,000 MT each. The land area utilised to accommodate this Silo complex is approximately 7.5 acres. The Complex shall have the following facilities.
**Grain Receipt**
- a. Railway siding (Existing Middle Tracks)
- b. In-motion weigh bridge for wagon of capacity 120 MT
- c. Receiving Silo for bulk wagon unloading 4000 MT
- d. Wagon Unloading Pits at least 2 nos of capacity 50 MT each
- e. Chain Conveyor 2 Nos, 350 TPH to Bucket Elevator
- g. Debagging Station for Debagging of Bagged Grain Received.

**Process Tower**
- a. Chain Conveyor 125 TPH to process tower
- b. Bucket Elevator 125 TPH to main silo
- c. Bucket Elevator 125 TPH, to shipping/bagging silos
- d. Pre-cleaner + Aspiration System 125 TPH
- e. Vacuum De-stoner 125 TPH
- f. Magnetic Separator 125 TPH
- g. On line weighing system 125 TPH
- g. Chain Conveyors to Main silos, shipping and bagging silos, 125 TPH

**Storage**
- a. 8 x 12500 MT main storage silos with -
  1. H- Type / F - Type floor aeration system
  2. Aeration Fans atleast 4 Nos. of capacity 6 to 6.5 m³
  3. Close Loop Fumigation system
  3. Roof Vents and Mechanical ventilation system
  4. Sweep Auger capacity 50 TPH
  5. Over Silo Catwalk of width 1.60 m and Support Package
  6. Silo Access Package (Ladders and Platforms)
  7. Sensor Package (High Level Sensor, Low Level Sensor, Sweep Auger Parking Switch, Side wall door limit switch etc.)
Grain Dispatch -

a. Bagging Silo (Hopper Bottom) of 250 MT, 2 Nos and Bagging Shed
b. Bagging System of capacity 60 TPH (2 Station of 30 TPH with surge bins of 50 MT)
c. Pipe Chutes / Chain Conveyors to Bagging Silo / Truck Loading Silos, 125 TPH capacity
d. Bucket Elevators to Load Bagging Silos / Truck Loading Silos, 125 TPH Capacity
c. Bulk Truck Loading Silo (Hopper Bottom) of 100 MT
d. Weigh Bridge 80 MT capacity for trucks

4.5.1. Associated Infrastructure:

Internal Roads and Parking: Internal roads of width 7.5 m are planned for the Silo Complex. Concrete pavements are envisaged in view of the fact that mostly heavily loaded vehicles shall be plying on them. The pavement design shall be as illustrated below.

- **Base Layer**
  - Compacted Soil of CBR 20
  - 250 mm thick GSB
  - 150 mm thick WMM
  - 50 mm thick sand
  - 125 micron polythene sheet

- **Main pavement**
  - 200 mm thick M30 concrete broom finish
  - Contraction joints at every 5 m interval
  - Expansion Joints at every 30 m interval

- **Protection**
  - 25 mm bituminous concrete
  - 6 mm thick bituminous seal coat

The parking bay shall have space for parking at least 45 Trucks the bay size envisaged is 4 x 12 m. The parking shall concrete pavement of 150 mm thickness.
**Power Supply:** The power sub-station of capacity at least 800 KW shall be installed. The substation shall have the following components –

- HT PANELS
- TRANSFORMERS 3 Nos
- LT PANELS
- LT & HT CABLES
- BUS DUCTS
- EARTHING SYSTEM
- LIGHTING ARRESTORS

It is envisaged that all cables shall be laid underground through RCC hume pipes and inspection chambers shall be provided at every 30 mts interval.

4.5.2. **Fire Detection and Fighting System:**

The entire complex shall be provided with fire detection devices which would include smoke detectors, alarms and public announcement system. The fire fighting system shall consist of the following major components –

i. Underground Water Storage Reservoir (UGR) of at least 2,00,000 Liters capacity

ii. Underground pump house which shall have space for:
   - Fire Pumps: 1 Working + 1 Stand by
   - Diesel Pumps: 1 Working + 1 Stand by
   - Jockey Pumps: 1 Working + 1 Stand by

iii. Supply main of 150 mm dia. to UGR

iv. Distribution main of 100 mm with Hydrants fitted at every 30 m intervals

v. All electrical equipment rooms and the process tower shall also be equipped with suitable numbers of CO₂ or Dry Powder based extinguishers.

4.5.3. **Buildings and Sheds:**

Other than the bagging shed already mentioned the following buildings and sheds shall be part of the complex.
Administrative Buildings: The administrative building shall be a RCC structure with floor space of 1500 sq ft minimum.

Laboratory: The laboratory may be a separate structure or clubbed with the Administrative building. The minimum floor space of Laboratory shall be 500 sq ft.

Canteen & Rest Room: The canteen and rest room may be a separate structure or clubbed with the Administrative building. The minimum floor space for the same shall be 1000 sq ft.

Bag Storage Shed: The same shall be a MS Steel structure with sheet roofing. The minimum area required shall be 1500 sq mts. The capacity of the warehouse shall be 2500 Mts.

Railway Siding: The existing central tracks of the railway siding on approximately 5.2 Acre of land shall be used to service the Silo complex.

4.6. RAILWAY SIDING

4.6.1. Site Appreciation

This FCI Railway siding is connected to Whitefield [code WFD] Railway station situated at CH 332.660 KM in Bangalore city Jn – Jolarpettai. Jn between stations SGWF on Bangalore end and Devanakunti [code - DKN] at Jolarpettai Jn end. This section is also electrified [provided with electric traction] and the siding is also extended with electric traction to all siding lines inside FCI godown.

Whitefield station is a B class station provided with multiple aspect colour light signals with Panel Interlocking and it has six running lines. The train movement to and from FCI siding has direct access to all the running lines of Whitefield Railway station.

The Railway siding track between the siding and the Whitefield stn. is approximately 400 m.

Inside the siding, the track branches out into three lines and again with spurs of three lines out of each line totalling nine lines and details of CSL given below.

a. All the three siding lines laid between Godowns No.6,7 and 5, 8, 17 are with CSL of about 540 mts (Existing Provision-1 as shown in plan).

b. All the three siding lines laid between Godowns No. 4, 9, 16 and 3, 10, 15 are with CSL of about 740 mts (Existing Provision-2 as shown in plan).

c. All the three lines between Godowns No. 2, 11, 14 and 1, 12, 13 are with CSL of about 740 mts (Existing Provision-3 as shown in plan).

The FCI siding has 17 Godowns with storage capacity of 5000 MT each - totalling 85000 MT covered storage. On an average of 5 Goods Trains/Rakes [train loads] per month are being received at this siding. At present the placement of train /rake into the siding is carried out by engine pushing.

The proposed project of establishing modern storage capacity for the storage of Food Grains through construction of SILOS at Whitefield FCI siding with capacity of 25000 MT will generate additional freight traffic in train/rake loads to and fro Whitefield Siding.

The projection of traffic through Railways depends upon procurement of Food grains immediately during Harvest seasons that will be higher in volume, as it also eliminates wastage of time in packing food grains in gunny bags, in manual loading/unloading and in handling bagged food grains at both loading as well as at unloading points facilitating
quicker transit of train / rake loads with added advantage of increased efficiency in wagon turn around.

4.6.2. **Analysis of FCI Siding Complex**

Based on Reconnaissance survey conducted it is found out that there is no scope for construction/extension of track in side FCI Railway siding at WFD for want of space.

The CSL of three lines [spur] with 540 mts lying between Godowns No.6,7 and 5,8,17 cannot be extended any more for the reasons mentioned in the above Para 5.1 [shown as Existing Provision No.1 in the Draft lay out plan of FCI siding WFD]. The land/space available between this spur lines indicated as Existing Provision No.1 and the built up area consisting of FCI office building is also suitable for construction of Silos. As the CSL of this siding is restricted to 540 meters it prevents placement of Train/rake load. Therefore, placement of train/rake on this siding track needs to be split into two. This may be considered as option No.2.

However the vacant land/space indicated as future godown No 22 and lying between Existing Provision No1 and 2 may be used for the proposed construction of Silos as this spur lines are with CSL of 740 mts. This may be considered as option No.1.

As indicated in Para 3.3 (above) the length of siding track leading to station being 430 meters it again becomes inevitable to split the rake during unloading operation of wagons with EOL (engine on load) system of operation being applied to Existing Provision No 2 referred in Para 5.3 above.

As all the tracks inside siding had been Electrified, the proposed construction of Silos in this suggested vacant space/land available must be considered taking into account that construction activities and unloading of wagons followed by filling up of Silos through mechanised system of conveyor belt arrangement shall not infringe the OHE/Traction power lines. In this connection necessary clearance/In Principle Approval [IPA] from railway authorities must be obtained.

Prior sanction and approval of plan for Construction of Grain dump pit at suitable location for the purpose of unloading grains beneath the track [underground] and installing of In motion Electronic weigh bridge where ever necessary [applicable for loading/unloading of wagons] under the supervision of Railway authorities shall be obtained from Railways.

The staff cost involving supervision of Construction of Silos related to track portion shall be paid by the FCI siding to Railways to ensure safety.

4.6.3. **Train Working Arrangement / Operational Planning**

i. The empty rake received at the serving station will be placed at FCI siding by pushing from serving station by reversing the engine if needed

ii. After entering FCI depot gate, the empty rakes takes route A&B and moves under the silo while filling the wagons till last wagon reaches buffer end OF L1.

iii. Care is to be taken to detach the brake van and place it on brake van siding if any reversal is needed.

iv. As OHE will be terminated 30m ahead of silo, it will be necessary to attach 2 empty wagons/2 brake vans to the engine and at the rear of the last portion of the rake to be loaded so that the engine remains within the electrified length of the track till remaining part of the rake is fully loaded. For this one additional brake van or a dummy wagon has to be kept at FCI depot.

v. The empty part of the rake is detached and pulled back till point ‘E’. At this stage engine picks up 2 nos. of brake vans/empty wagons parked at Brake van sidings and attach
the same to the rear of unloaded part of the rake and then start pushing the remaining empty rake via route EF for loading under silo on line no. 2 till whole of the rake is loaded.

vi. Train Engine thereafter detaches the empty dummy wagons/brake vans and places them on the brake van siding keeping the brake van towards FCI gate end. Thereafter engine pulls back loaded part of the rake from line no. 2 and attaches the same to the loaded part on line no. 1 to make the full rake ready for dispatch. At this stage the rake is pulled out of FCI gate on the approach siding till the rear portion reaches brake van siding to enable the attaching of the brake van in the rear before final dispatch to the serving station.

Refer: Annexure – C: Site Layout Plan for details.

4.7. TECHNICAL FEASIBILITY

The Whitefield Silo complex is planned within the existing Depot at Whitefield. The land area earmarked by FCI for the same is approximately 19 Acres. The existing central tracks of the railway siding shall also cater to the Silo complex planned.

The Silos, Process Tower, Grain receipt and dispatch infrastructure planned are positioned to facilitate unloading of grain in wagons close to the entry point of the railway siding. As described in the earlier section a Split placement of rack is envisaged for the new Silo Complex in view of the fact that length of the land available is not enough to accommodate Full Rack placement.

Annexure – C: Site Layout Plan, illustrates the various components of the Silo Complex along with the unloading arrangement planned on the existing railway siding. Annexure – D: Site Arrangement Plan illustrates the possible placement of various Silos, Process tower and Receipt and Dispatch infrastructure.

7.5 Acres of land has been utilised for accommodating the Silo Complex. The existing railway siding in addition utilises 5.2 Acres of land.

It is evident from the average yearly/monthly storage done at Whitefield Depot that 50,000 MT facilities planned for the 1st Phase is sufficient to replace Bag storage of wheat to Bulk Storage in line with policies adopted by FCI for wheat storage in better interest of the Nation and food security of the population. Further, provision has been made for additional 50,000 MT for future demand.

The land available in Whitefield Depot is suitable and sufficient to accommodate all infrastructure required for a 1, 00,000 MT Silo Complex. The existing Railway Siding is sufficient to service the Silo complex planned, as illustrated in Annexure C and D. The road connectivity for dispatch of grain is adequate. Further, power supply in the region is sufficient. Water and drainage infrastructure is present at site.

Hence, considering the above facts it is concluded that a Silo Complex in Whitefield Depot is technically feasible. The key parameters of the site are as presented in Table 4.5 and 4.6.
Table 4.5 KEY PLANNING PARAMETERS AT PROPOSED WHITFIELD SILO COMPLEX – CIVIL AND STORAGE EQUIPMENT

<table>
<thead>
<tr>
<th>Project Site</th>
<th>Nature of Site</th>
<th>Type of Facility Planned</th>
<th>Existing Capacity</th>
<th>Capacity Planned</th>
<th>Future Capacity Planned</th>
<th>Area of Silo Complex (Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitefield</td>
<td>Brown Field</td>
<td>Consuming Area Silo Complex</td>
<td>85,000 MT</td>
<td>50000 MT</td>
<td>50000 MT</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Table 4.6 KEY PLANNING PARAMETERS AT WHITFIELD SILO COMPLEX – RAILWAY SIDING

<table>
<thead>
<tr>
<th>Project Site</th>
<th>Nature of Site</th>
<th>Type of Facility Planned</th>
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