

**DESIGN OF A FOODGRAIN STORAGE SYSTEM  
FOR RURAL AREAS**

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by  
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DEDICATED TO MY WIFE REENA  
DAUGHTER PREETI AND SON ANKUR  
THE TIME I HAVE USED FOR THIS  
WORK ACTUALLY BELONGED TO THEM

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## CERTIFICATE

This is to certify that the thesis entitled DESIGN OF A FOODGRAIN STORAGE SYSTEM FOR RURAL AREAS submitted by MR. BALBIR KUMAR ARORA to the Indian Institute of Technology, Delhi for the award of degree of DOCTOR OF PHILOSOPHY in Rural Development and Appropriate Technology is a record of bonafide research work carried out by him. Mr Balbir Kumar Arora has worked under my supervision and guidance and has fulfilled the requirements for submission of this thesis. In my opinion, the thesis is worthy of consideration for the award of degree of Doctor of Philosophy in accordance with the regulations of the institute.

The results embodied in this thesis have not been submitted, in part or in full, to any other university or institute for the award of any other degree or diploma.

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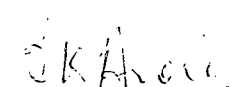
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## ABSTRACT

Storage is an important component of foodgrains production-consumption cycle. Storage is practiced at various levels such as Central Government, State Governments, Public Agencies, wholesale traders, processors, retailers and households. The structures, methods followed and extent of losses vary from one level to another. The most critical level for foodgrain storage in our country, is storage at the farm or rural household level. Not only the quantities held at the rural household level are very large, but also the losses per tonne of foodgrain stored are the highest.

A further analysis of the problem and solutions sought in the past leads one to the conclusion that the problem of storage at the farm level is very closely linked to the credit and marketing needs of the farmers. So, the solution to the problem has to be sought considering storage as a system, linked appropriately to its related aspects such as credit and marketing. In the present thesis, approaches to solve the problem in an integrated manner have been discussed. Suitable illustrative models have been developed based on data obtained from fixed geographical areas to demonstrate the methodology for solving the problem.

Historical and hypothetical approaches such as farmers' owned storage, community storage, cooperative storage, commercial storage and rural warehousing have been discussed. An integrated facility named as 'Credit linked Storage-cum-Procurement Centre' (CSP Centre) has been proposed as an optimum solution to the credit, storage and marketing problems of the farmers in rural areas. Various details of the proposed system such as type of storage facility, location of centre, capacity of storage godown, function/<sup>al</sup> and structural requirements of storage godown, credit delivery system, procurement system and finances for the centre, have been described.

In order to quantify storage and related needs of farmers in rural areas, understand their level of awareness, elicit opinion about the proposed facility and develop suitable illustrative models to demonstrate the methodology of setting up CSP centres, a field survey was carried out. The survey covered 720 households in 24 villages selected from two development blocks. Data collected included production and marketed surplus, disposal of marketable surplus, storage methods used and performance, awareness of the existing storage facilities, opinion about available storage, credit and marketing facilities and reactions towards the proposed integrated facility. It was found that the existing credit and storage facilities were inadequate. Also these have not been properly integrated with the available marketing facilities. Farmers were willing to use the proposed facility provided this was located within about 5 Km, storage charges were reasonable, identity of stocks was not disturbed and interest charges on loans were not very high. Storage charges of 50 paise per quintal and interest rate of 12 percent were found acceptable to most farmers. Design of the illustrative models has been attempted for two blocks namely Pehowa in District Kurukshetra and Gurgaon in District Gurgaon. While former is agriculturally well developed, the latter is not-so-well-developed. The development of model includes working out viable size of the centre, identifying locations of the centres, structural design of godown and facilities and details of step pricing system.

Size of the centre has been worked out considering various costs and revenue for different sizes of CSP Centres. The cost heads include cost of capital, depreciation of building and equipments, cost of staff and establishment, cost of preservatives, cost of repairs and maintenance and cost of insurance. The items of revenue include storage charges, service charges on loans and service charges on procurement. The break even size of the centre has been found as 2300 MT.

Locations of the centres have been identified considering storage requirements of each village, economic size of the centre and road network of the area. The methodology of locating the centres has been duly demonstrated.

Design of structural components such as roof, walls, floors, columns, foundations, doors and ventilators have been given for a godown size of 2500 MT. Besides, a model design for Office-cum-residence complex has been prepared. A tentative layout of facilities such as godown, office-cum-residence, roads, shops, parking area and drying yard has also been provided.

Step-pricing system which is considered as an integral part of the system has been described. It envisages a variable price system for procurement of foodgrains at CSP centres. A formula for calculation of step-price of foodgrains covering basic price, storage charges, interest on value of foodgrains and incentive for holding grains, has been outlined.

In the last chapter, some details for efficient operation of CSP centres have been given. These include management of stocks, maintaining viability of centre, record-keeping and information system, manpower development and training, extension efforts, structural linkages between centres and apex organisation. The details have been provided to compensate the lack of experimentation by actually setting up and running these centres on a significant scale. The discussion on these aspects is meant to provide details which can ensure efficient and smooth functioning of these centres in a co-ordinated manner.

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