

STORAGE OF GRAIN IN EARTH-COVERED BUNKERS

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Abstract

Storage of grain in plastic-lined earth-covered bunkers has been demonstrated to provide a low-cost method for maintaining quality in grain held for long periods. Various designs of bunker have been evaluated in Australia and the most satisfactory has been based on an above-ground structure with permanent earth side walls and end built on a slight slope to facilitate drainage. The walls and base are covered with a thin layer of sand and lined with polyethylene sheeting. After filling and trimming, the grain is covered with a woven polyethylene fabric, a layer of sand spread over the cover sheets to protect them, and then soil placed over the structure to a total depth of 1 metre. The method has been used commercially in Australia with bulks of wheat up to 25 000 tonnes at total storage costs averaging A\$6.72 per tonne. The concept of storage in earth-covered bunkers is discussed and its use throughout the world reviewed.

INTRODUCTION

Grain has been stored underground in many parts of the world almost since time immemorial, particularly in the Mediterranean, Middle East and North and West Africa. As well as having a role in subsistence economies, such storage of grain underground has potential in commercial operations for low-cost emergency applications and in buffer stock control systems. In recent years, a range of systems has been developed, for example in Argentina, the large underground storage complexes in China, and small-scale farm storages elsewhere. There are also reports of use of caves such as in limestone caves near Kansas City.

The need for this type of storage comes from a variety of situations. Any long-term storage system ideally requires a low capital investment in the storage structure but a high degree of security from losses during storage. This applies particularly to planned maintenance of buffer stocks or other strategic stockpiling of grain. However, there are the situations that do not arise from deliberate planning. Thus, the situation frequently arises when production in particular areas is more than the available permanent storage capacity. This may result from storages being full at times of over-supply of grain on world markets, difficulties in moving grain to alternative storage sites, shortage of adequate storage capacity particularly in expanding areas of production, or from abnormally high yields in areas where such occurrences are not at frequencies that would justify provision of additional permanent storage capacity. If the grain cannot be moved from the district to other stores, some emergency storage must be provided to protect the grain from deterioration through weather and pests. Ideally, the method should provide the option for long-term safe protection of the grain so that the time in storage can be open-ended.