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The Variable Costs of Providing Wheat Segregation in Central Queensland

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ABSTRACT

Of the 0.75 m tonnes of grain produced in central Queensland each year on average, 0.3 m tonnes are wheat. This can comprise as many as six different classes, from 'Prime Hard' through to 'Feed'. The paper addresses the question of how expensive it is to provide the handling services necessary to keep these classes separate.

Existing facilities were taken as given and a system wide approach adopted. The estimated reduction in variable costs if wheat were handled and stored as though there was only one class was calculated. Any savings identified would therefore be the variable costs in providing the segregation services. The component of annual variable costs attributable to providing the current level of segregation was estimated at $50,000. This was out of a total variable costs budget for central Queensland of $3.5 m.

It appeared that, without segregation, depot manning levels would largely be unaltered and also that the intake rate would not be greatly altered. The implications are that the extra costs of segregation in Central Queensland are low. This result has particular value in deciding the handling charges for wheat relative to the other grains such as sorghum.

INTRODUCTION

Background

By way of introduction to the topic of grain handling in general and its economics in central Queensland in particular, this section provides a thumb nail sketch of the facilities in central Queensland and how they are used.

The network of bulk grain depots in Central Queensland

The central Queensland grain growing districts extend southward from Mackay hinterland to the Arcadia, Dawson and Callide valleys west of Gladstone. The complement of 24 bulk grain depots operated by Bulk Grains Queensland to service this area constitutes the basic resources of the grain handling system under examination in this paper. Figure 1. provides an overview of the location of the depots and of the rail lines linking them to the export terminals of Gladstone and Mackay. The size of the grain terminals at the ports are commensurate with the region's production capacity and hence make central Queensland an essentially self-contained grain producing and exporting region.

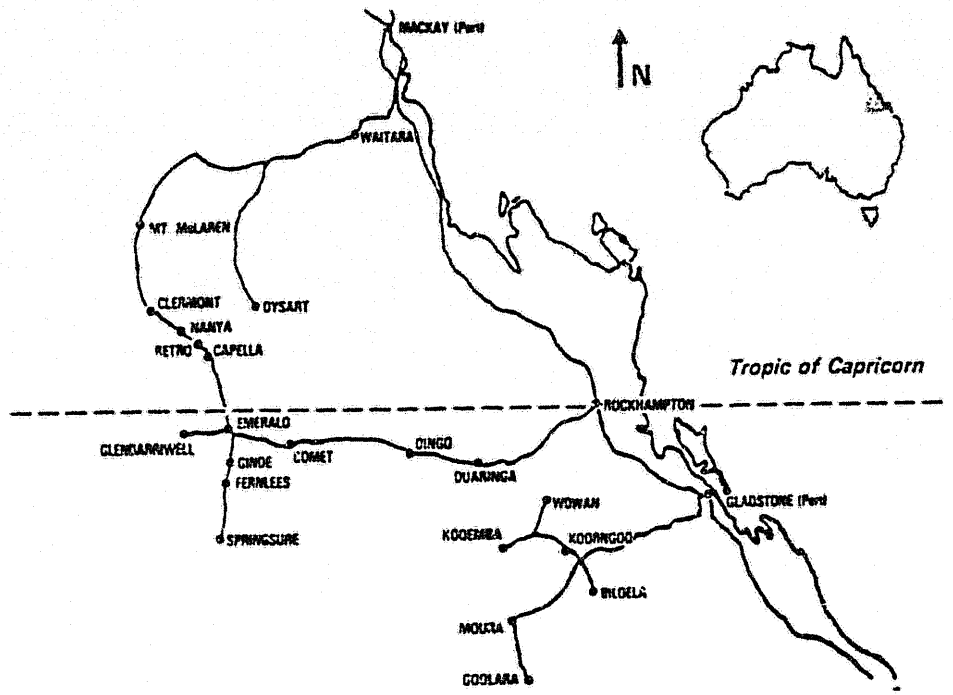

Figure 1. Map showing the number and location of the grain depots and port terminals in Central Queensland. (Not shown are the depots at Three Moon, Gosvenor and Gracemere.)

Depot Characteristics

While no two depots in central Queensland are the same, the features common to all of them are the presence of such facilities as a weighbridge, a testing stand for sampling grain from the delivering trucks, an office, and some mix of bulk storage facilities such as sheds, or silos equipped with the necessary hoppers, augers and elevators for transfering the grain into and out of storage. All deliveries are sampled, tested, classified, weighed and documented, and then treated against insect infestation on transfer into storage.

Coordinating Depot Activities

For convenience the depots are grouped into districts and permanent labour is deployed on a district rather than depot basis. The three 'districts' operated by BGQ in central Queensland are District 7, centred around Moura and Biloela; District 8, centred around Emerald and Springsure; and District 9, centred around Capella, Clermont, and Mt McLaren.

During peak times, such as at wheat intake, and at the height of the sorghum intake, additional labour is recruited. For example the (permanent) staff of 29, 25, and 24, in districts 7, 8, and 9, respectively were estimated to rise to 61, 50, and 30 for a 1985/86 sized wheat intake; almost doubling total staff numbers from 78 to 141.

Only at the larger depots such as Moura, Springsure, and Capella is there storage sufficient to take all the local crop. At the smaller depots such as Gindie, Emerald and Comet, grain is continuously out-turned during intake to the large 'overflow' storages at Gladstone and Mackay.

After intake, the timing of outloading to port from the different depots occurs at the discretion of BGQ management. The aim is to meet the shipping commitments made by the marketing authorities and to provide space for ensuing crops in the least-cost way to central Queensland as a whole.

The Scale of BGQ's Operations in central Queensland

The country depots range in capacity from the tiny 100 t and 300 t depots at Gracemere and Grovenor to the 110,000 t capacity depot at Moura. The typical central Queensland depots range in permanent storage capacity from 10,000 to 20,000 t.

BGQ's total permanent storage capacity in central Queensland including the ports of Gladstone and Mackay is around 450,000 tonnes. Additional temporary pad storage capacity of 450,000 t is also available. Throughput of the major grains in 1985/86 was 360,000 t of wheat, 450,000 t of sorghum, and 45,000 t of sunflower.

The Problem

Of the 750,000 tonnes of grain produced in central Queensland each year, on average 300,000 tonnes are wheat. This wheat can comprise as many as six different classes, from 'Prime Hard' through to 'Feed'. The question addressed in this paper is 'Given the existing investment in storage and handling facilities, and, for the life of this investment, how expensive is it to provide the storage and handling services necessary to keep these classes separate?'

The way this was done was to adopt a system wide approach, and pose the question in the following way 'what would happen to overall system variable costs if wheat were handled and stored as though there was just one class?' Any savings identified in answering the question would be the costs of providing the present level of segregation.

Limitations of the Study

By taking the existing facilities as given, the possibility that some of the features of the facilities presently in place are there due to the need to provide the extra space required by wheat segregation was not explored.

Another limitation of the analysis is that only the variable costs were analysed in detail. The non-structural fixed costs associated with segregation such as the provision of special testing equipment at the depots, and any additional administrative costs associated with collecting grain samples and storing them for possible future reference were not estimated.

METHOD

Conceptual Basis

The cost of segregation is clearly the difference between the costs 'without' segregation and the costs 'with' segregation. This 'with' and 'without' comparison then provided the framework for the analysis.

In implementing the analysis the existing facilities were taken as given, hence the important costs for both 'with' and 'without' segregation were assumed to relate only to labour and non-labour variable costs such as electricity, and repairs and maintenance.

Although only the difference in wheat handling costs under the two regimes was the primary concern, the full annual 'with' segregation cost for central Queensland was estimated. As well as providing a safeguard against overlooking possibly important out-of-wheat-season effects of wheat segregation, the annual costs provide a benchmark for assessing the relative importance of the cost difference due to segregation.

The interdependent nature of the operations at the depots, the availability of records on an individual depot basis, the simplicity of the calculations in the budgets, and the ready access to a computer meant that a system-wide approach was both appropriate and feasible.

From inspection of the records of grain handled in recent years, 1985/86 stood out as a 'good average' year. The actual volumes handled in that year were used as the basis for the budgets but the 10 week intake period in that year was considered unusually long. The budgets assume an average intake period of six weeks. Although the volumes handled are for 1985/86, the costs estimates are in 1988/89 $'s. In a similar segregation study contemplated by the ABARE 1985/86 was to be used as the average year (M. Lawrence, Senior Grains Economist, ABARE, pers. comm.).

Data Collection

Estimating the annual variable costs of the present, 'with' segregation system, warranted the collection of the following data:

- a comprehensive set of records of actual grain flows for each of the depots for 1985/86.
- an inventory of the facilities at each depot.
- an estimate of the permanent work force in each district.
- an estimate of the manning levels at peak times at each depot.
- wage rates for labour and unit operating costs for the various items of equipment.

Estimating the 'without' segregation costs warranted considerable reflection on the nature of the system under study and its likely behaviour under the 'without' segregation conditions. This yielded the following key assumptions: 'without' segregation there would be:

- no change in quantity of wheat handled, and
- no change in growers' delivery rate and hence no change in the intake rate provided by BGQ. (The major incentives to deliver promptly once the grain was ripe would still be there even without segregation. The increasing risk of crop loss from increasing likelihood of unfavourable weather, the absence of substantial on-farm storage, and the desire to promptly convert the crop to cash income remain.

On this basis, new data were then collected indicating how manning levels in particular, would change 'without' segregation given 1985/86 intake levels. The data were based on informed assessments of likely changes.

The savings if segregation was dropped could then be estimated.

RESULTS AND DISCUSSION

The total annual 'with' segregation variable cost for central Queensland given a 1985/86 type year was $3.5 million. This comprised $2.3 million of labour costs and $1.2 million of non-labour costs.

The cost savings from doing without wheat segregation were $37, 000 of labour costs saved, and $15, 000 of non-labour costs saved, giving an overall annual saving of $52, 000.

The insignificance of this amount relative to the $3.5 million per year of variable costs in grain handling in central Queensland is notable.

Labour Cost Savings 'without' Segregation

This cost saving is low because the reduction in manning levels is very low. Stemming from the two assumptions of no change in quantity and delivery pattern the duration of wheat intake would also be unaltered and the depot manning levels would have to be maintained at levels sufficient to keep the queuing times unchanged as well.

The consequent very low level of manpower saving at the respective depots is shown in the table below:

Depot level labour saving 'without' segregation for a 1985/86 sized wheat intake

depot	'with' segreg manning	'without' segreg saving	depot	'with' segreg manning	'without' segreg saving	depot	'with' segreg manning	'without' segreg saving
Goolara	9	2	Springsure	10	1	Capella	8	
Biloela	9	1	Fernlees	10		Retro	3	
Moura	16	4	Gindie	7	1	Nanya	0	
Kooemba	8	2	Emerald	9	1	Clermont	3	
Koorngoo	8	2	Glen/will	4		Dysart	3	
Wowan	6	1	Comet	4		Mt McLaren	7	
Three Moon/ Grosvenor	5	1	Dingo	2		Waitara	6	
			Duaringa	2				
			Gracemere	2				
District 7	61	13	District 8	50	3	District 9	30	0
CQ Total	141	16						

The size of the crop and the nature of the depot dictates what the savings will be. The labour cost difference is very small because labour costs are primarily a factor of the intake rate, and segregation is not a critical determinant of this.

The Non-Labour Cost Saving

To appreciate where these savings, if any, might lie it was necessary to study how segregation is presently being achieved.

Typically the maximum number of classes required is six. Accordingly, provision is required for at least six separate storage sites. The port terminals and the larger depots with their multiple bins, large sheds and large temporary storage pad sites can easily meet this requirement. At the smaller depots the problem is overcome in the following way:

Segregation involving separation of classes within a grain type means that minor contamination of one class with another is of no consequence. This fact, along with the constant angle of repose, a characteristic of bulk grain, allows:

1. mounds of grain of different classes can directly interface with one another in the one shed without any special additional measures to ensure ease of separation at a later date; and

2. in the event of a class of grain other than what is presently in the store being delivered, an empty cone of free space above an outloading auger to be all that is required for this grain to go directly to storage in rail wagons. Thus, a regular supply of empty rail wagons allows the smaller depots to provide the additional separate storage sites required for segregation. As indicated above, as a matter of course, these depots are routinely outloading to port during intake.

The overall segregation problem is simplified even further by the fact that although over a season, as many as six classes may be received very rarely are all six grades being delivered at once and in equal proportions. Typically, three main grades will account for most of the grain at any one time. Should climatic events cause the composition of intake to change, the grades no longer likely to occur are promptly outloaded to port and space provided for the now dominant grades.

In consequence, the requirements of segregation can be met while at the same time achieving a high level of utilisation of storage space particularly in the smaller depots. Hence, the potential for a quite different pattern of use of the facilities at each depot in the absence of segregation is low. In any case, for adjustment to occur there must also be the financial incentive to do so. The only places in which these conditions are met are at the depots where there is pad storage associated with substantial permanent storage, that is, at the larger depots. Here the marginal non-labour costs for grain going through the depots via temporary storage is at least $2.00 per tonne versus less than 20c per tonne for that same grain going through permanent storage. (With temporary storage the grain is first received into permanent storage and then shuttled across to the pad site by contract carriers. The procedure is reversed when emptying the pads. Transport costs make up $1.70 of the $2.00 per tonne handling costs for grain going via temporary storage.

The very high handling cost of temporary, relative to permanent, storage make it attractive to take advantage of the even small amount of space made available in permanent storage by dropping segregation.

The adjustments arising from doing 'without' segregation then will be for simply less grain to go to pad storage. For the reasons already outlined, the order of this adjustment will be small, say 10%. This is the basis of the estimate of the non-labour cost difference presented in the results. On balance, it is the already good use of the available space that causes little room for pathway adjustment. Hence, the non-labour costs of segregation are very low.

CONCLUSIONS

As usual the results are highly dependant on the underlying assumptions. Given that these reflect reality, the care taken in deriving the labour cost savings on the one hand, and the logic of the low non-labour cost when there is no change in the quantity handled, the savings estimated are realistic.

Quantitative analysis of the effect of variation in the composition or volume of the wheat crop was not explored. Despite this, insights from the work done suggest the following:

1. The high proportion of horizontal storages, and the speed with which classes no longer likely to be received because of weather conditions can be out-turned to port confers a high degree of low cost flexibility on the system. So variation in composition is not a serious problem.

2. With regard to variation in volume, it is the very big years, or those years in which there are substantial carryover stocks that the capacity to provide segregation will be stretched. In these instances it is the level of segregation that is compromised. But even here, because of the essential similarity of the grain in adjacent classes there is great flexibility to mix substantial amounts of lower class grain with higher class material without the integrity of that higher class material being jeopardised. So much so that actual occasions on which the level of segregation provided by BGQ in Central Queensland has been compromised with consequent loss of market flexibility to the AWB are quite rare. So the cost of segregation remains small over a very wide range of volumes.

An underlying factor in the provision of a high overall level of segregation at very low cost is the set of incentives that stimulate growers to promptly deliver grain in the order in which it comes off the paddock. This adds greatly to the predicability of the pattern of grades likely to be received at each depot at all stages of intake, and hence makes planning for and provision of segregation that much easier. A key element in this regime of incentives is the absence of delivery quotas. The introduction of quotas would greatly increase the randomness of the delivery patterns and the costs of providing segregation would increase.

On balance, the low cost of providing wheat segregation services in central Queensland implies the provision of this service is not the challenge it looks, and hence on variable cost grounds at least, there is no case for justifying a higher charge for handling wheat than for the non-wheat grains.