

**RPCs / Cartons /
Packaging
Standardisation -
Market Interaction &
Change Opportunity**

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Horticulture Australia Ltd

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1 EXECUTIVE SUMMARY

The project highlighted the following key issues:

1. RPC's have approximately 7% and 6% share respectively of the US and Western European markets for short shelf life produce packaging
2. In two interviews, with Armour's and Schruer's, RPC's were seen to be significantly cheaper than the carton equivalent.

Laver's avocado property is in North Queensland. RPC cost is approximately 25% higher than the carton equivalent in this case.

Three interviews is not sufficient to draw a conclusion and HAL needs to undertake further analysis, of a broader representative sample, to better understand this outcome prior to any meeting with Coles

3. The RPC model was initially designed to enable producers and packers to obtain an indicative cost comparison between cartons and RPC equivalents. It was not designed to develop detailed and specific information for negotiation with Coles
4. The model is not simple and intuitive to use and, particularly the level of transparency, can be improved substantially by:
 1. Redrafting the Help Manual to include the various items in this report, and others as appropriate
 2. Improving the quality and quantity of information in the Input Help Screens
 3. Providing a detailed Guide to Interpreting Results

It is very important that a detailed Help Manual be available and included with the RPC model package, on the CD Rom. Also the Help Manual should be heavily "sign-posted" on the Third Party Logistics web site (www.3pl.com.au).

5. The RPC model has weaknesses in terms of Model design logic that must be addressed in the Help Manual
6. The RPC model requires increased flexibility in order to better compare relevant carton and RPC scenarios, including:
 - Capability to input RPC payload that compares with a specific carton payload
 - Different buffer stock assumptions for cartons and RPC's
 - Multiple pallet configurations and vehicle load configurations for any specific scenario
 - Different vehicle load configurations for cartons and RPC's

Whether these changes are to be made is dependent upon their cost. Further work would be required to undertake an analysis of cost and benefit before any changes as outlined in this point "5" can be made.

7. There are specific modelling issues that require addressing and rectification, including:
 - No recognition, in the calculation of pallet and RPC hire charges, of weekends and public holidays

- There are no allowances for, and calculations of, inventory (excluding safety stock):
 - Pallets to hold carton inventory
 - RPC's

These issues are significant and should be addressed, either in the Model directly or by reference in the Help Manual, before HAL promotes the RPC model to its constituents

8. There are specific costs that should be included as input fields in the RPC model, including

- Cost to shrink wrap cartons to pallets (identified at both site visits)
- Cost to add a label to cartons

These issues are significant in as far as their absence may bring the overall credibility of the model into question with an informed User. Therefore they should be addressed, either in the Model directly or by reference in the Help Manual, before HAL promotes the RPC model to its constituents.

2 INTRODUCTION

Horticulture Australia Limited (“HAL”) has sponsored the development of a financial model to aid fresh produce growers and packers with the determination of the financial implications of replacing disposable cartons with Returnable Plastic Crates (“RPC’s”). The RPC model was completed in late 2002. At that time HAL was pre-empting the introduction of RPC’s and the role of the RPC model was to assist growers and packer/wholesalers to understand the potential impact of a move to RPC’s.

The RPC model is available on the web (see www.3pl.com.au). It is unclear as to the take up and use of the model in its current form.

The fresh produce division of Coles is now driving out the implementation of RPC’s throughout its business nationally. The plan is to implement RPC’s in a structured manner, by industry. In addition Coles will negotiate specific pricing with individual suppliers, on a case by case basis. Two meetings with Coles staff have been conducted. The outcomes from those meetings and a discussion of relevant issues are presented in the report.

In broad terms, Coles fresh produce suppliers are very concerned about the impact, on their businesses, of the implementation of this project and have lobbied HAL to develop a better understanding of all of the cost elements involved. To this end the financial model referred to above is seen as a tool to assist in developing that understanding. It is likely that the RPC model, if appropriate, could provide a basis to undertake the RPC rental negotiation with Coles.

The scope of this project is in 2 parts:

1. As context for the introduction of RPC’s into the Australian fresh produce industries, briefly describe some of the relevant issues on RPC introduction and penetration in selected markets and regions
 - The United States
 - Western Europe
2. Review the model; the following steps are included:
 - Meet model development staff to obtain an overview of the RPC model
 - Review the RPC model logic
 - Structure of the RPC model
 - Logic in the RPC model
 - Identify and confirm modelling assumptions
 - Meet with selected growers and wholesalers, across various industries to identify the issues in using the RPC model :
 - Armour’s Apple Growers at Bona Vista
 - Peter Schruer and Sons, Vegetable growers Devon Meadows
 - Lavers Avocados, Mareeba, Queensland

- Run the RPC model over sufficient scenarios to test the breadth of horticulture industry coverage and applicability, including with the industry participants referred to in (4) above
- Identify any gaps in assumptions or areas that the RPC model should, but does not, adequately cover
- Discuss any risks that may arise from the application of the RPC model, particularly in the context of a grower negotiating the RPC rental cost with Coles
- Identify any documentation or training needs that may be required in order to assist growers in applying the RPC model to their specific situation.

It should be clearly stated that there was no aspect of this part of the scope that requires testing of the validity of the model against any original work that may have included a “*like – for – like*” comparison of a carton versus a RPC equivalent. The scope is to comment on the applicability of the RPC model in current circumstances.

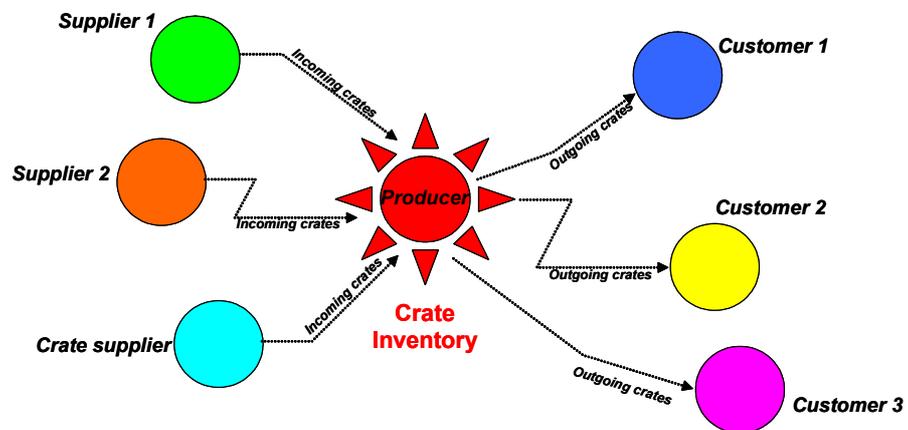
3 RPC'S IN THE UNITED STATES AND EUROPE

RPC's are available, and are used, in many markets. This report will present a short review of status and penetration in the United States and Western Europe. These markets should be viewed as "Open Loop" systems (defined below). RPC's are being introduced in Australia by Coles and Woolworths, essentially 2 "Closed Loop" systems.

3.1 Open Loop Systems

In an open loop system there are likely several sources for crates. The producer is likely to have a crate inventory and will be using crates from that inventory, augmented with crates from the crate supplier. There will be several customer destinations for those crates.

This is shown pictorially as follows:



The following issues are likely to exist in this system:

- Rental cost from crate inventory
- Administration
- Losses

This open loop model for crates is likely to mirror that for pallets and the issues and problems that exist for pallets should be observed in this system.

3.2 Closed Loop Systems

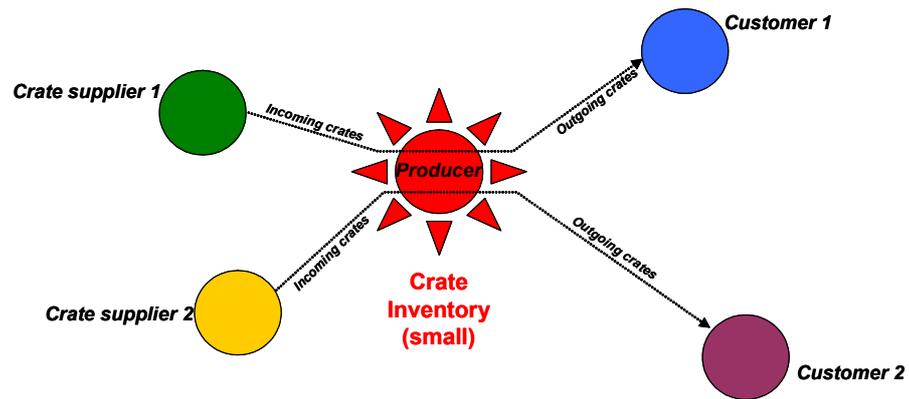
In a closed loop system there will be a single source for a specific range of crates for a customer (e.g. Coles). Woolworths will have a separate source. The crates are not likely to be the same, and therefore will not be interchangeable.

This is shown pictorially below.

In this system there will be:

- Lower inventory
- Little administration

- Few (if any) losses



3.3 The United States RPC Market

A recent survey¹, commissioned by the Corrugated Packaging Alliance, in Indianapolis USA, questioned 500 packaging purchasers from a cross section of industries. Approximately 10% of survey participants were either grower – shipper or retailer who purchased produce. No specific information was presented on the number of respondents, nor total volume of packaging material consumed, from the short shelf life foods segment. It was stated, however, that “*half the people they talked to were in the food segment*”¹. The survey results included:

1. 99% of respondents said they are satisfied with the packaging options available to them
2. About 64% said corrugated was their top packaging choice
3. 7% preferred reusable plastic containers
4. 64% of respondents indicate a preference for existing corrugated systems
5. 36% of respondents are “interested” in alternative packaging systems

In addition, the survey asked respondents to produce a list of attributes they consider when choosing a packaging material. The respondents were then asked how corrugated ranked in those attributes. Those chosen attributes were

- Meeting specifications
- Product protection
- Cost reduction
- Providing value

Of the four packaging options – corrugated, flexible packaging, folding cartons and RPC's – corrugated received the highest ranking in those four areas.

¹ “Corrugated Maintains Dominance in Packaging, Multi-industry Survey Says”, The Packer, Feb 21, 2005.

It should be noted that this research was conducted on behalf of the Corrugated Packaging Alliance² (“CPC”). No information about the 500 respondents and their significance in financial terms has been included in the available literature. It is unclear whether this sample is fully representative of the industry the study is describing. Furthermore that information would not seem to be available on the CPC website or on the website of the firm that conducted the research³.

In recent years, in the face of significantly increasing competition from other packaging forms the corrugated container industry has markedly improved its levels of innovation and responsiveness to the needs of its customers. As a result of increased competition the industry developed and introduced the Corrugated Common Footprint (“CCF”) container. This was designed to reduce complexity and cost and provide a standardized design for corrugated containers. The CCF container eliminates the problem of unstable mixed loads that can topple during transport and helps increase the volume of produce that can be shipped on a pallet from a distribution centre⁴.

The standard was developed by the Fibre Box Association (FBA), with assistance from the American Forest & Paper Association (AF&PA), and in cooperation with box manufacturers, growers, packers/shippers, distribution centres, retailers, freight carriers and government agencies.

The introduction of CCF containers would seem to be very successful. A recent study⁵ shows that according to grocery retailers, the Corrugated Common Footprint is now used to ship 26 percent of retail produce volume, a healthy increase from one year ago. Additionally, this share is expected to grow to 30 percent by April, 2006.

Some observations are also relevant:

- The CPC industry body representing the fibre box producers in the United States would appear to be very effective
- The cost of corrugated containers in the US is likely to be relatively low thereby making other forms of packaging less attractive
- The rhetoric produced by the representative body for RPC’s in the US⁶ does not have the strength of argument of the Corrugated Packaging Alliance. A short review of the website shows that issues of environmental sustainability drive this packaging medium in the US.

3.4 Some Observations on RPC’s in Western Europe

A similar pattern would appear to the present in Western Europe. An analysis of the main European transit pack types in FMCG (Fast Moving Consumer Goods) markets from 1999 to 2004⁷ indicates that corrugated packaging has a market share of 63%. This survey was commissioned by FEFCO, the European Federation of Corrugated Board Manufacturers⁸. FEFCO’s objectives in commissioning this survey were to understand and analyse the perceived benefits of corrugated containers compared to other types of packaging in the short shelf life food sector.

² See <http://cpc.corrugated.org/>

³ See <http://www.bishopconsulting.com/>

⁴ See <http://cpc.corrugated.org/Commercial/CommFootprint.aspx>

⁵ CCF Implementation Study 3 News Release 5-13-2005, see <http://cpa.corrugated.org/>

⁶ http://www.rpcc.us/index.php?section_id=16&main_section_id=6

⁷ See <http://www.fefco.org/fileadmin/Fefco/images/Box/feeco.pdf>

⁸ See <http://www.fefco.org/>

The FEFCO study results indicate:

- RPC's have a 31% share of total retail sales in the short shelf life foods sector in Europe
- Corrugated packaging has 48%
- Wood and other materials provide the remaining 21%
- The attributes driving RPC penetration include:
 - Slow filling speeds
 - Expensive distribution systems
 - Lack of powerful brands
- Corrugated is expected to remain the leading pack type for short shelf life foods over the next 5 years
- RPC's will gain share at the expense of other types of packaging

The FEFCO report indicates that RPC's have approximately 6% of the FMCG market share, similar to that observed in the United States:

- Corrugated has 63% of FMCG
- 14% of corrugated is used for short shelf life foods
- Corrugated has 48% share of short shelf life foods
- RPC's has 31% share of short shelf life foods

The FEFCO report indicates some factors likely to limit the rate of growth of RPC's in Europe. Included is the observation that reusable systems operate best within a tightly controlled loop best achieved in localised markets rather than long haul markets. Other issues raised include:

- Inventory levels, trip rates (trips per year) and seasonal demand peaks
- Hygiene (washing and cleaning)
- System costs including backhaul, administration, pool "seepage" and losses
- Higher transport costs due to RPC's heavier weight
- Growers prefer corrugated due to printability and flexibility
- A lack of a universal European system.

As stated above, it should be noted that this research was conducted on behalf of the European Federation of Corrugated Board Manufacturers. While the study purports cover the whole FMCG market in Europe, no information about samples and methodology has been included.

4 RPC REPACKAGER MODEL

4.1 Site Visits

A total of 3 site visits were carried out. Two of these were conducted with Armour's and Schruer's, fresh produce suppliers close to Melbourne. These visits were conducted "face to face". The third interview was with Laver's from Mareeba in far North Queensland. This was conducted by telephone.

4.1.1 Armour's

Armour's introduced RPC's for delivery of apples to Woolworths approximately 12 months ago. The initial view of the introduction was that RPC's were significantly easier to handle and lower in cost.

The first instruction was to load each RPC's with 11 kg of fruit. This proved to be an easy task.

In recent weeks Armour's were instructed to increase the payload of the same dimensioned RPC to 12 kg. This has proved to be a very difficult task, and at the time of our visit, was causing some concern.

It should be stated that this concern is not related to RPC's compared to cartons, but the decision of the customer to achieve an increase in payload per container from its supplier.

At the end of each month Doug Armour compares the cost of cartons and RPC's. Following our analysis we reviewed both the RPC model's costs and those developed by Doug Armour. Armour's cost comparison was the cost of a carton (at approximately \$1.30) and the rental cost of an RPC (which totaled between \$0.60 and \$0.70). Doug Armour has assumed that all other elements were assumed to be the same for cartons and RPC's. We recognize that this is only an assumption.

4.1.2 Schruer's

It should be recognized that the discussion with Schruer's only focused on the use of RPC's for leeks.

The introduction of RPC's to Schruer's leek business significantly improved profitability as follows:

- Cartons were costing approximately \$1.20 - \$1.30 each
- RPC rental is \$0.05 per day and the average rental time is 5 days. Other rental fees apply including issue fee, delivery fee and relocation cost
- In most other respects the use of cartons and RPC's was at the same cost with the exceptions:
 - There is no input field in the RPC model to allow for the cost to shrink wrap pallets of cartons
 - There is no input in the RPC model to allow for the cost to add a sticker to cartons
- The RPC's are easier to handle, store and pack

- Cartons are purchased in large quantities and the stock holdings are very high (of the order of 70 days)

4.1.3 Laver's

Laver's grow both mangoes and avocados. Their property is near Mareeba in north Queensland south of Cairns. Laver's was chosen in order to compare cartons and RPC's where distance to market and (maybe) product storage (ripening) would result in longer RPC rental times.

The analysis at Laver's concentrated on avocados only. Laver's currently pack avocados in cartons stacked 8 to a pallet layer. Local rhetoric indicates that Coles will provide RPC's stacked 6 to a pallet layer. In order to complete the analysis in the RPC Produce Packager model we have assumed that the cartons and RPC's are equivalent. (Note that the RPC Produce Packager model does not allow different configurations of cartons and RPC's.)

Characteristics of Laver's avocados business is as follows:

- Approximately 50,000 cartons of avocados are picked p.a.
 - 90% are 5.5kg per carton
 - 10% are 10.0 kg per carton
- Carton cost of \$1.36 and \$1.80- respectively
- Total transit time to market is 9.0 days, on average, for east coast markets broken up as follows:
 - 2 days on the farm
 - 3 days storage
 - 3 days transport (average)
 - 1 day into store

Unlike Armour's and Schruer's, Laver's has no experience with RPC's. Therefore many of the costs are not well defined or researched. In general terms incremental costs in the model resulting from the introduction of RPC's were assumed to be included rather than excluded. Several other factors are worth noting:

- Laver's would have to extend their shed to accommodate RPC's at an estimated cost of \$20,000
- Additional equipment (labeling machine) would be purchased at an estimated cost of \$20,000
- Additional cards, labels and liners were assumed to be required
- Additional administration time would be required to administer RPC's
- Additional insurance costs on RPC's (should the producer decide to incur this cost)

With these assumptions RPC's were 25% higher in cost than their carton equivalent as follows:

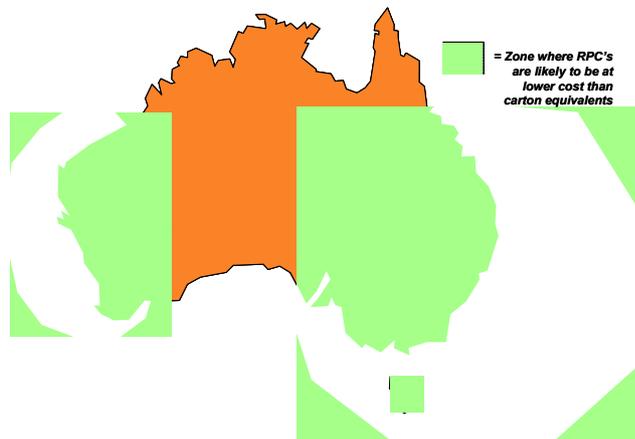
Cost Item	Costs \$			Comment
	Cartons	RPC's	Difference	
Carton cost vs RPC hire	\$ 70,200	\$ 81,370	-\$ 11,170	Lost and damaged RPC, Printed label cards Assemble RPC's Load insurance Additional capital cost
Additional Packaging cost	\$ 160	\$ 9,350	-\$ 9,190	
Labour	\$ 2,279	\$ 5,544	-\$ 3,265	
Freight	\$ 82,059	\$ 92,258	-\$ 10,199	
Other costs	\$ 23,683	\$ 34,609	-\$ 10,926	
Total	\$ 178,381	\$ 223,131	-\$ 44,750	
			25%	

4.2 Discussion of Site Visit Results

It is well recognized that our sample of 3 producers is small and is unrepresentative of the total industry. However the work carried out in this project indicates that the areas assumed to result in RPC's having a significantly higher cost did not generally eventuate with growers:

- Loss of RPC's
- Significant changes to pack house layouts to accommodate the storage and handling of RPC's; not an issue for either Armour's or Schruer's, an additional \$20,000 was assumed for Laver's
- In most other respects the cost of storage, packing, handling and transport of RPC and cartons were similar

Distance from market and requirement for medium term storage in RPC's will increase costs, and will inevitably cause RPC cost to be higher than carton cost in certain situations. There would appear to be zones where RPC's could effectively compete with carton equivalents as follows:



These zones, presented in an indicative manner above, represent the vast majority of the Australian population coupled with much of the primary production areas. Key determinants of this profitability equation are:

- Transport distance (obvious)
- Required product storage for ripening
- Time RPC is “on rental” with the producer
- Other costs

The boundary conditions require further analysis.

4.3 Profitability of RPC's

Prior to the commencement of the project the rhetoric indicated that the introduction of RPC's was going to impose a cost increase on the industry:

- Growers apparently have raised concerns with HAL concerning the introduction of RPC's at both Coles and Woolworths. We understood these concerns were centered on cost increases and how growers were going to be forced by the retailers to bear these cost increases. Indeed it was this concern that, seemingly, led to the requirement for this project
- Vince Grillo at Coles seemed to be indicating that costs may increase with the introduction of RPC's. He also specifically stated that Coles would provide relief to growers by lowering the rental cost of RPC's to exactly compensate growers for those cost increases
- The discussion with Steve Howe from ThreePL and the initial exposure to the RPC model strongly left the impression that growers would likely suffer cost increases with the introduction of RPC's

The first two meetings with growers, Armour's and Schruer's, strongly refuted this position, particularly in situations where production is close to market and storage of produce in RPC's is not a requirement. Laver's avocado production at Mareeba in far North Queensland was chosen as a third interview candidate. Costs in this case are higher for RPC's than for carton equivalents.

In general terms the cost comparison between cartons and RPC's is a simple equation where the cost of the carton is replaced by the rental charge on the RPC with all other costs being similar. There may be some additional factors to be taken into account (to be discussed below where relevant) but these are generally small.

There has been an additional issue raised that must be taken into consideration; how will rejected product and the RPC's it is transported in be handled into an alternative market; specifically

- Will it be repacked?
- Who will carry RPC cost risk?

Coles, at a recent meeting, has indicated the following:

- Coles will fund an ullage account with each supplier

- The rate has not been determined
- When product is rejected the cost to repack and transport to a more suitable market will be funded from the ullage account
- Coles will also change suppliers who have high rates of rejection, using the rejection rate as a KPI of supplier performance

The mechanics of rental and the transfer of responsibility of RPC's are not well understood by growers, particularly:

- When RPC's are sourced from long distances (as in the case of Laver's where RPC's must come from Townsville)
- Where transport operators consolidate loads (at their own initiative) and open the potential for loss of RPC's in transit

This was discussed briefly with Coles. Some comments are relevant:

- The introduction of RPC's will be staggered, beginning in Bundaberg tomatoes in October
- Western Australia and Tasmania will be the last states to transfer to RPC's
- Coles did not communicate the complete rollout plan at this meeting, but is possible available if requested
- Coles will only purchase from suppliers who undertake to use RPC's
- Coles will agree the time required by a grower to source, transport, pack and deliver a crate. Based on that agreement and relevant costs (ullage etc) a crate hire rate will be agreed.

4.4 ***Coles and Woolworths – Some Comparisons***

The site visits and interviews provide some data for comparison of Coles and Woolworths in respect of the introduction of RPC's

- Armour's are already using RPC's for supply to Woolworths
- Information provided by Coles in recent meetings

Relevant comparisons are presented below.

<i>Item</i>	<i>Coles</i>	<i>Woolworths</i>
Crate Supplier	Coles plan to undertake crate supply directly. However will contract out the work to Logtek	Chep currently provides RPC's for Woolworths
Use the Opposition RPC?	No	No
Hire Rate	To be determined by the mechanism outlined in Section 4.3	Believed to be \$0.075 cents per day for a 29 liter RPC with extra charges for: <ul style="list-style-type: none"> • Crate issue

Item	Coles	Woolworths
		<ul style="list-style-type: none"> • Relocation costs • Statement costs • Other costs
Impact on Grower	Coles state their objective is to not change the grower's cost base	It would appear that growers bear all costs and risks. For suppliers close to markets costs will reduce. For long lead time markets, or where product storage is a requirement, costs will increase. This is described in Section 4.2
Introduction Timetable	Begins in October 2005. Exact dates are not available at this stage	Currently in selected markets. Roll out procedure is unknown
Rejection of Stock	Coles will fund the cost of rejected stock in the manner described in Section 4.3 above	

4.5 Fitness for Purpose

There are 3 key issues:

1. Model Design Logic
2. Help Manual
3. Model Transparency

4.5.1 Model Design Logic

The Produce Packer model is designed to compare the (current use) carton packing medium with (the proposed) RPC. In the words of the RPC model's developer, ThreePL, the RPC model was designed to meet the following:

"The RPC model is not intended to give standalone calculations for different crate scenarios, it is intended to give a comparison of 'what you currently do now in cartons' vs 'conversion of what you do now into crates'."

Steve Howe, Managing Director ThreePL (Model Developer)

There are two broad approaches to developing a model that compares scenarios:

1. Develop each scenario (carton vs RPC equivalent) as a full cost
 - By task
 - Per kg

- Total cost

And compare all elements of cost

2. Develop the incremental scenario (cartons minus RPC's) in relevant detail

The Produce Packer model is neither of these approaches but uses part of both. It directionally works to be the full cost approach but does not compare all components of cost but only those that the developers believed would be impacted by the change of carton use to RPC use. An example is:

- The impact of additional forklift activity arising from the increased movements required to deliver a pallet of new cartons (say 650 units per pallet) with a pallet of RPC's (120 per pallet) to the packing line
 - The productivity is input to the RPC model along with the relevant labour and on costs per hour
 - The RPC model calculates the additional cost for RPC's (the logic being that approximately 5.5 additional pallet moves are required to deliver RPC's to the packing line)
 - The RPC model then recognises this as a cost impost against the introduction of RPC's.

It should be recognised that the concept at play here relates to whether this forklift cost is, in reality, fixed or variable with volume. All possibilities exist dependent upon the true nature of workflow in the specific shed:

- Cost is fully fixed and will not change with volume (unlikely)
- Cost is fully variable and will change with volume in a standard and predictable manner (unlikely)
- Cost is fixed with volume and productivity is such that a certain amount of additional activity can be completed without cost increasing. There exists a point, beyond which, any further activity increases will result in cost increases. This is the most likely scenario.

A similar modelling inconsistency exists in the treatment of the incremental cost of administration of RPC's where the extra activities required to administer RPC's are assumed to result in cash cost increases. The likely outcome is that a certain amount of this activity can be carried with no increase in costs, and costs will increase thereafter.

Neither Armour's nor Schruer's recognized these areas as additional costs (forklifts and administration). Both believe there is sufficient scope for the (dedicated) forklift driver, and administration clerk, to undertake this work and not impact other productivities costs.

Input assistance via a Help Manual would assist the User to better populate the model. A discussion of the costing issues in a "Guide to Interpreting Results" would greatly assist Users to understand the potential impact of increasing activity on these functions.

4.5.2 Help Manual

There is no Help Manual supplied with the RPC program on disk. Moreover there is no reference to an available Help Manual on the ThreePL web site. A Help Manual is referenced on the web site www.corrugated.com.au which (interestingly) refers the user to the web address www.3pl.com.au/3pl_help.html. Relevant references to help should be much clearer and easier to identify.

The Help Manual should contain two extra topics:

1. Instructions on when, and how, to determine average costs in relevant areas to allow for the fact of transport to different markets:
 - Average RPC rental time
 - Average transport cost
2. Guide to interpreting results which is particularly relevant in the discussion of fixed and variable costs outlined above (See Section 4.5.1)

4.5.3 Model Transparency

The RPC modelling logic is neither transparent nor intuitive. This is due to the lack of clarity in design logic (see Section 4.5.1) and the complexity in certain calculations (see Section 4.6.2).

In order to understand how the RPC model calculations are carried out the reviewer had to resort to a spreadsheet combined with trial and error iterations.

4.5.4 Other Issues

The current market reality is that RPC's are being introduced across the various fruit and vegetable industries by both Coles and Woolworths. As a tool for negotiation with customers and in the absence of any Help Manual or Guide to Interpreting Results, costs in the RPC model are neither accurate nor transparent enough to provide valuable information. Indeed it should be recognised that an experienced negotiator will (for Coles or Woolworths), with few specific encounters easily recognize that their supplier has used the RPC model as a basis for negotiation. In that circumstance he could immediately reject the RPC model as not providing an accurate basis, thereby leaving the supplier without a basis to continue the negotiation.

4.6 Produce Packager Model Structure

The RPC model has 3 broad sections:

1. Costs associated with all aspects of packing product
2. Costs associated with transport
3. Downstream costs

Each will be discussed separately below.

4.6.1 Packing Product Costs

The key component of this section of the RPC model is the determination of relevant RPC's to compare with carton scenario. In its development and as stated above, the RPC model was designed to take the current (real) carton scenario and compare with a (hypothetical) RPC scenario. The RPC model compares carton and RPC volumes and determines payload in the RPC based on the packing density of the carton and the volume of the RPC. While this is an acceptable method in the hypothetical case the current reality (certainly at Armour's, likely at Scherer's, indicated at Lever's) is that the user needs to be able to separately specify:

- Carton dimensions
- RPC dimensions
- Carton payload
- RPC payload.

That the model does not enable this is a weakness.

The RPC model forces the assumption that buffer stock of both cartons and RPC's will be the same. This is not the case at Schruer's where the following occurs:

<i>Item</i>	<i>Carton</i>	<i>RPC</i>
Buffer Stock	7 days	3 days
Order Quantity	70 days	2 days

The RPC model uses the carton assumptions for both cartons and RPC's. In the case of Schruer's this will introduce a significant error, particularly in terms of the rental costs of RPC buffer stock:

- Model calculates buffer stock to cost \$17,500 (based on 7 days buffer stock)
- "Correct" buffer stock cost is \$7,500 (based on 3 days buffer stock)

Please note that this safety stock is also incorrectly calculated. This will be discussed further below (see Section 4.7.2).

It is unlikely that the stock of cartons and RPC's will be the same for Laver's. Cartons are available locally and are delivered to the packing shed as part of the cost of the cartons. It is not clear how RPC's would be provided. They have to be transported from Townsville. It is unlikely that the same inventory policies will be used for RPC's and cartons at Lever's.

In addition there are several costs left out of these buffer stock calculations:

- Rental of pallets to store the inventory of cartons
- Rental cost of the unused portion of inventory of RPC's
- Cost of investment in carton inventory.

These are discussed further in Section 4.7.2 below.

4.6.2 Transport

This whole section is a major weakness in the RPC model. Key issues are as follows:

- Cartons and RPC's have very different stacking characteristics. While the RPC model allows for differing pallet configurations it forces the assumption that the vehicle is loaded in the same configuration for both cartons and RPC's
 - Schruer's stack 13 layers of both cartons and RPC's to a pallet. Crushing is an issue in the lower layers in the carton scenario. They may want to be able to compare 13 layers on a single pallet for RPC's with 2 pallets for cartons, 1 by 7 layers and 1 by 6 layers for cartons. The RPC model does not enable this
- Schruer's have 2 pallet configurations, a 7 layer and a 6 layer. The RPC model cannot accommodate this
- Armour's own and use a 14 pallet footprint tray truck which they often load to 22 pallets
 - 14 pallets on the floor
 - 8 pallets on a second layer over the back axle

The RPC model does not enable this to be calculated as a load configuration.

- The Transport page of the RPC model offers the user the capability to determine freight cost per pallet for both cartons and RPC's. The RPC model calculates the freight cost of pallets (cartons) in a simple manner:
 - Input Price per pallet space
 - Divide by the number of pallets occupying that space (either 1 or 2 dependent upon whether the stack is 1 or 2 high)
 - The RPC model offers the capability to calculate the corresponding RPC pallet cost by introducing the concept of "% split by weight" and "% split by distance". Advice on how this calculation actually works is not available with the RPC model (there is no Help section) and was only provided by Steve Howe as follows (by example):

"If a carton stack pallet has a total weight per pallet is 995.4 kg and an RPC stack pallet is 975.8 kg and the current cost per carton stack pallet is \$100 with 77% of this current cost determined by weight, then :

Cartons, \$23 + \$77 per 995.4kg (or 77 / 995.4 = \$0.077355836 per kg) = \$100 per pallet space.

RPCs, \$23 + (975.8kg x per kg rate) = \$23 + \$75 = \$98 per pallet space.

A lower per pallet rate for RPCs."

Two comments are relevant in respect to this calculation:

- It is a most confusing concept and calculation (self evident and not discussed further)
- It is unlikely to reflect the true cost as freight rates are not quoted or determined in this manner. Furthermore this calculation does not seem to approximate any known method for quoting transport rates

There are three main means of provision of transport to this industry:

- Own vehicle(s)
- Full truck load provided by a contractor
- Part load (by pallet space) provided by a contractor

The considerations when costing transport include (by no means an exhaustive list):

- Capacity both cubic and weight
- Utilization prior to move from cartons to RPC's
- Impact of move on utilization
- Full cost per load
- Number of pallets per load

% by weight/% by distance input comes into play when the load change (due to the move from cartons to RPC's) forces a change in the transport costing methodology from (say) cubic based to (say) weight based (or vice versa). This implies cost per pallet change due to the introduction of, or removal of, a constraint; i.e. the load is no longer cubic constrained and has become weight constrained.

It is impossible to determine the impact of a weight per pallet change in the simplistic manner presented in the RPC model. It should be recognised, however, that it is feasible to determine the impacts on transport outside the RPC model and use the % by weight/% by distance input cells to force the RPC model to use the (otherwise) determined cost per pallet space for RPC's.

To add balance to these comments it is worth noting that in the vast majority of circumstances the freight cost per pallet for both cartons and RPC's will not be impacted by considerations of weight vs distance.

- There is an input called "Fixed Operating Cost per Pallet Space". It comes into play on when the % by weight component is greater than zero. It is unclear how this calculation is carried out and no transparency or Help function is provided.
- The input fields "Number of pallet spaces per truck" and "Maximum Load weight per Truck" do not impact the freight cost calculations, thereby causing some confusion as to the use. However they do impact the relevant volumetrics.

4.6.3 Downstream Costs

None of the respondents, Schruer's, Armour's nor Laver's have any idea of the costs associated with downstream activity (D.C. Productivity and Store Productivity), not an unexpected result. However, and more importantly, neither firm showed any interest in the input, output or the role this data may play in any scenario generated. This issue may have been alleviated if there was a Help function or relevant preamble to this section.

These sections add further confusion to the RPC model, particularly given that they follow the equally confusing transport section.

4.7 *Specific Modelling Issues*

There were specific modelling issues identified that should be rectified:

1. Modelling errors
2. Calculation errors
3. Cost areas left out
4. Other

It is worth noting that this is not an exhaustive list but only those issues identified while this analysis was undertaken.

4.7.1 Modelling Errors

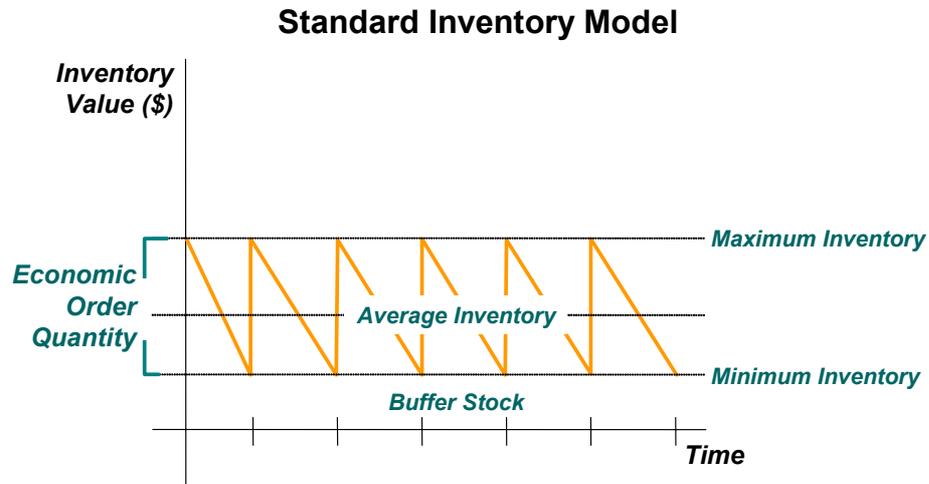
The screen "Total Time - Packing to Customer" has the following input categories:

- Bring Produce in from field
- Cooling
- Holding
- Collection from farm by transport company
- Holding, cooling, staging at transport
- Transport trip
- Unloading at market
- Display and sell
- Total

The screen "Downstream RPC's and Pallets" seeks inputs for all of these categories differentiated by Grower/ Packer, Transporter, D.C. Retail. There is a clear "double count" between these screens in that the Transport Trip input appears in both as Transport Trip (in the case of "Total Time - Packing to Customer") and Transporter (in the case of "Downstream RPC's and Pallets"). Furthermore it is not possible to set Transport Trip to zero as an input to the RPC model.

4.7.2 Cost Areas Left Out

A standard inventory model is depicted in the following schematic.



The key features of this model are:

- The existence of buffer stock below which inventory does not fall
- Economic order quantity (“EOQ”) which arrives into stock at the (theoretical) minimum inventory level

In this model the average inventory holding equals:

$$\text{Average Inventory} = \text{Buffer Stock} + \frac{(\text{Maximum Inventory} - \text{Minimum Inventory})}{2}$$

The RPC model does include any aspect of average inventory. The RPC model should have cost elements of:

- The average inventory of hired pallets to hold the average inventory of cartons and RPC’s
- The average inventory of hired RPC’s that are fed into the packing system as required

In the case of Schruer’s these costs are as follows:

	Pallet Hire for Average Inventory		RPC Hire for Average Inventory
	Cartons	RPC,s	
Units per day	192	192	192
Average days inventory	35	35	35
Total	6,731	6,731	6,731
Cartons per pallet	600		
RPC'e per pallet		120	121
Pallets	11	56	56
Rate per pallet per day	\$ 0.105	\$ 0.105	
Rate per RPC per day			\$ 0.050
Days per week	7	7	7
weeks per year	52	52	52
Total pallet rental cost	\$ 429	\$ 2,144	\$ 122,501

It should be recognised that the RPC model calculates these costs incorrectly (see Section 4.6.1). The “correct” costs are as follows:

	Pallet Hire for Average		RPC Hire for Average
	Cartons	RPC,s	
Units per day	192	192	192
Average days inventory	35	1	1
Total	6,731	192	192
Cartons per pallet	600		
RPC'e per pallet		120	121
Pallets	11	2	2
Rate per pallet per day	\$ 0.105	\$ 0.105	
Rate per RPC per day			\$ 0.050
Days per week	7	7	7
weeks per year	52	52	52
Total pallet rental cost	\$ 429	\$ 61	\$ 3,500

The most cost efficient manner to address this flaw is to

- Describe the logic of average inventory and safety stock in the Help Manual
- Provide a worksheet that enables the User to determine safety stock and average inventory
- Given the current RPC Packager Model logic, which is wrong, the correct inventory input figure is determined by the following:

$$\text{Inventory Input} = (2 \times (\text{Safety Stock})) + \text{Average Inventory}$$

However both the Help Manual and the Guide to Interpreting Results both must clearly state the limitation that the Model assumes that inventories of unused cartons and RPC's are the same. Furthermore, where a grower has a significantly different stock policy for RPC's vs. cartons (eg Schruer's) the User must choose that stock policy to model that lowers the total error in the calculations.

Both Schruer's and Armour's shrink wrap pallets of cartons and there is no input field to allow for this cost in respect of cartons. (The model does, however, have this input field for shrink wrap of RPC's to pallets.)The cost of this shrink wrap operation may be as much as \$2.00 per pallet dependent upon the cost of shrink wrap, how much labour is included and whether that labour will vary with volume. In order to dimension this cost in terms of other costs included in the RPC model, the total cost to shrink wrap for Schruer's would be approximately \$2,750.

Schruer's identified a further cost not included in the RPC model, the cost of a label for cartons. There is no input field for this cost.

The most cost efficient manner in which these omissions can be addressed is to provide a worksheet in the Guide for Interpreting Results that enables the User to add these costs to the Model's calculated results. The rationale for this approach should then be discussed in the “Guide for Interpreting Results”.

4.7.3 Calculation Errors

All calculations in respect of hire of pallets and RPC's are determined on a 5 day week rental basis whereas pallet rental is on a “per day”

basis where the renter pays for weekends and public holidays. This is illustrated by the following example taken from the Schruer's:

	Model Calculation	Correct Calculation
Number of cartons	50,000	50,000
Harvest season (weeks)	52	52
Working days per week	5	5
Cartons per day	192.3	192.3
Days pallets on hire	6.0	6.0
Cartons per pallet	36	36
Pallets on hire for produce (per day)	5.3	5.3
Total Pallets on hire for produce	32.1	32.1
Rate per pallet per day	\$ 0.105	\$ 0.105
Days per week	5	7
weeks per year	52	52
Total pallet rental cost	\$ 875	\$ 1,225

This incorrect calculation methodology is universally applied throughout the RPC model. Many of the other issues raised in the RPC Packager Model can be addressed by providing additional information (Help Screens or Help Manual) where input data can be modified to overcome a model weakness. However this is a significant issue and does need to be addressed:

- The Model must be modified to include an allowance for rental over weekends and public holidays
- The Help Manual must include a discussion of the issue with a guide to possible inputs
- The Guide to Interpreting Results should also address any relevant output issues

4.7.4 Other

Several other issues were identified:

- The Online version of the RPC Packager model does not allow for additional RPC configurations. Laver's were not able to use the Online version as their RPC configuration was not available in the provided model
- Information can not be saved in the Online version. This means that files cannot be shared and compared
- There seems to be a minimum height of 120 mm for input RPC dimensions using the "Configure – RPC Dimensions – Add". Laver's use a 94 mm high crate for avocados
- Adding a new RPC dimension using the "Configure – RPC Dimensions – Add" commands is not straight forward. In order for new RPC dimensions to be successfully added the user must load a saved file and ensure the question "Do you wish to apply new RPC dimensions to this scenario?" is observed and answered in the affirmative

5 IMPLICATIONS OF ERRORS, PROBLEMS AND OMISSIONS

A number of issues and problems have been identified with the RPC Produce Packager model. Correction of some of these problems is worth consideration but recommendations in this regard are also beyond the scope of this project.

Presented below are some implications of the issues identified and raised in this report:

1. A change from the initial scope “like-for-like” comparison to one similar to that described in Section 4.6.1 would significantly improve the general applicability of the RPC Produce Packager model. It should be recognised that this increased flexibility would improve calculations across all aspects of the comparisons.

This probably represents a dramatic rewrite of the RPC model logic. Relevant costs and benefits need to be identified and agreed before a decision to undertake this task is made

2. The transport section of the model limits flexibility. RPC’s, because of their rigidity and improved stacking characteristics could enable higher pallet stacks and higher density vehicle loads. On the converse side RPC’s are heavier than cartons and allowances may, in some cases, need to be made for this. The model should therefore enable different configurations:

- Carton to pallet
- Pallet to truck

This limited flexibility is a weakness in the RPC Model. If the changes identified in point “1” above were to be made then the transport section of the model should also be changed. Without the changes identified in point “1” above, Transport should be left as is.

3. The issue identified in Section 4.7.3 related to rental of RPC’s and pallets over weekends and public holidays should be corrected
4. The RPC Packager model does not calculate inventory correctly. It has not included any aspect of average inventory of units prior to use:

- The capital cost of cartons
- The rental cost of RPC’s
- The rental cost of pallets to hold either cartons or pallets

This needs to be addressed in several ways as described above in Section 4.7.2 corrected in order to more accurately reflect true costs in all cases

5. Certain costs are not included in the RPC model

- Cost to shrink wrap cartons to pallets (identified at 2 site visits)
- Cost to add a label to cartons

These issues are significant. Their absence may bring the overall credibility of the model into question with a User. Therefore they should be addressed in the Help Manual and Guide to Interpreting Results before HAL promotes the RPC model to its constituents.

6. The Help Manual should be improved to include

- Instructions on when, and how, to determine average costs in relevant areas to allow for the fact of transport to different markets:
 - Average RPC rental time
 - Average transport cost
- Guide to interpreting results which is particularly relevant in the discussion of fixed and variable costs outlined above (See Section 4.5.1)