



**DEFRA PROJECT FO0108**

**RESILIENCE OF THE FOOD SUPPLY TO  
PORT DISRUPTION**

**FINAL ANNEX REPORT 8:  
UK CITRUS FRUIT IMPORTS  
September 2012**

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## 1. EXECUTIVE SUMMARY

**Citrus fruit imports are critical for the retail and wholesale distribution sectors; and for food manufacturing and processing. The leading UK supply markets are Spain and South Africa. Principal entry routes are the container ports of Tilbury and Felixstowe for non-EU imports and the Dover Corridor for EU imports. Supply chains are well structured but with limited stocks operations are heavily dependent on capacity and reliability of 'just-in-time' transport links.**

This Defra project 'Resilience of the Food Supply to Port Disruption' involved an assessment of possible port disruptions, their potential impact on UK food supply and the options for remedial action in the short to medium term. It followed publication in 2009 of the *UK Food Security Assessment* which indicated that there were evidence gaps about UK port capabilities and food imports.

The project was undertaken by Peter Baker (PRB Associates) and Andrew Morgan (Global 78). This Annex Report contains the principal findings, recommendations and conclusions arising from their research on citrus fruit imports. Additional information can be found in **Annexes 3, 4 and 5**

The work programme included use and further analysis of requested HMRC / Defra import tonnage data (for 2010); work with industry stakeholders to compile an accurate description of 'as-is' import scenarios (i.e. product origins, modal formats, volumes, services used and frequencies, etc.); and an attempt to understand the stakeholders' approach to ensuring consistent supply and review strategies already in place (or planned) to mitigate likely possible effects of port disruption. Findings include:

<b>Code</b>	<b>Description</b>	<b>Non-EU tonnes k</b>	<b>EU tonnes k</b>	<b>Total tonnes k</b>
#805	Citrus fruit	391.9	276.0	<b>667.9</b>
	<b>Total</b>	<b>391.9</b>	<b>276.0</b>	<b>667.9</b>

- Demand for citrus fruit has risen inexorably over the past fifty years and has a high profile in UK retail and other sectors. Representing 20% of the c.3.3 million tonnes of whole fruit imported by the UK each year, and sourced from both Northern and Southern Hemispheres, citrus fruit imports provide a good basis for meaningful research. The lessons learned can be applied across other fresh produce sectors and to other industries requiring temperature-controlled logistics.
- The research found that supply chains are tightly integrated from the grower to the consumer, with pack houses overseas and in the UK playing key roles. As UK retailers have sought to extend their control, traditional wholesalers have re-positioned themselves as importers offering a 'one-stop-shop' across the entire supply chain. A variety of business models have been the result.
- Flow types can be segmented broadly into 1) deep sea refrigerated container liner services from non-EU sources arriving mainly at Tilbury or Felixstowe (with some conventional charter vessels providing a mix of refrigerated container and break-bulk services in support); and 2) refrigerated road trailer services from EU sources arriving mainly in the South East UK from Spain.
- EU supply is dominated by Spain, with citrus fruit arriving between November and April. Nearly all these imports arrive in refrigerated road trailers and enter the UK via the Dover Corridor. This can represent 80 to 100 vehicle arrivals from Spain over a 24-hour period for citrus fruit alone. Rail or short-sea alternatives as yet do not have the capacity, frequency, or transit times to compete.
- In essence these citrus supply chains work as stockless cross-dock systems from despatch in Spain, through UK pack house and customer distribution centre networks, to final delivery at the retail store. Serious interruption of supply would have a rapid and widespread impact on product availability and this would become visible to the consumer within a few hours.

**The research demonstrated that it is feasible to gather reliable information from industry stakeholders about UK citrus fruit import flows. Only by working at individual flow level is it possible to obtain the essential understanding to assess and mitigate supply risk. Although industry stakeholders will need to be persuaded about the merits of sharing information about their Business Continuity Planning, there is already a general awareness of the current risks.**

## 2. INTRODUCTION

### 2.1 Overview

The Defra-funded research project FO0108 'Resilience of the Food Supply to Port Disruption' involved an assessment of possible port disruptions, their potential impact on UK food supply and the options for remedial action in the short to medium term.

The project was undertaken by Peter Baker (PRB Associates), a ports and shipping specialist, and Andrew Morgan (Global 78), an international food supply chain specialist.

The research was prompted in part by the outcomes of the *UK Food Security Assessment* (published in August 2009; updated in January 2010) which indicated evidence gaps about UK port capabilities and food imports; and PRB Associates' follow-up report published in September 2009, *Background to Defra's Assessment of UK Food Security*.

The research included a series of food commodity Case Studies on imports of frozen meat and fish; citrus fruit; sugar; and palm oil. This Annex Report contains the principal findings, recommendations and conclusions arising from the research on citrus fruit imports.

### 2.2 Background

Citrus fruit comprises oranges, lemons and limes, grapefruit, and the soft citrus fruits, namely clementines, satsumas, and tangerines (mandarins). As regards terminology, 'tangerine' was the name originally used to describe all soft citrus, including clementines and satsumas. In addition crosses between oranges and mandarins are denoted by the self-explanatory term 'easy-peeler'.

World citrus production has risen inexorably over the past fifty years to meet rising demand driven in part by changing lifestyles, with consumer preferences for fruit, products that contain fruit, and fruit juices. Citrus is the leading fruit crop by value in international trade and global production volumes in tonnes are now more than six times greater than the c23 million tonnes produced in 1961.

Citrus fruit is grown in both the Northern and Southern Hemispheres as production 'follows the sun' to meet year-round demand. Growing seasons are reflected in fruit classifications such as 'early' or 'late'. Seasonality of production (and also of demand) can result in considerable supply chain complexity.

Oranges are the leading crop, typically accounting for over 50% of world citrus production, with Brazil, USA, India, China, and Mexico the top 5 producers. Looking at countries that grow oranges, the top 5 exporters are Spain, Egypt, USA, South Africa, and Turkey.

The absence of Brazil from this top exporters list is because it has focused on the export of orange juice, where it is by far the global leader, rather than export of whole fruit. Other countries have developed niche citrus market opportunities, such as Morocco's place in the supply of soft citrus.

This research has focused on the UK import of whole fruit, where the two leading suppliers are Spain and South Africa, but has not included the import of (orange) juice from countries such as Brazil.

As described in Section 4, these whole fruit imports are often destined for retail or wholesale distribution channels, but can also be directed to manufacturing and processing, either directly or via intermediate cutting or juicing operations.

The research has also examined the approach to stockholding across the whole supply chain, relevant technical issues, and the crucial strategic and operational roles played by UK citrus importers.

### 3. WORK PROGRAMME

The work programme for this Case Study had these objectives:

- Determine the extent to which particular features of domestic and international transport infrastructure and food supply chains are likely to ameliorate / exacerbate the impact of UK port disruption on the supply of food imports into the UK
- Determine the extent to which UK food (import) security is contingent upon the resilience of overseas port infrastructure (both within and without EU waters, and now and in the future)
- Explore the behaviour, over the short to medium run (up to six months), of individual port operators, shipping companies and land-based logistics and food supply chain agents in the event of port disruption.

The programme therefore had the following principal steps:

- Desktop analysis and scoping discussions with industry specialists
- Review of HMRC / Defra imports tonnage data for 2010
- Identification of stakeholders willing to participate in the research
- Work with such stakeholders to compile an accurate description of their 'as-is' import scenarios (in terms of product origins, modal formats, volumes, services used and frequencies, etc.)
- Understand the stakeholders' approach to ensuring consistent supply and review strategies already in place (or planned) to mitigate likely possible effects of port disruption
- Report on findings to Defra and provide feedback to the stakeholders.

When the research started in September 2011, the most recent complete year for which statistics were available was 2010 so this was chosen as the preferred sample year. Also, in order to understand the physical dimensions of the flows, data about volumes (in tonnes) was chosen in preference to data about values.

Maintenance of commercial confidentiality was a key concern and in line with this the identity of participating stakeholders will not be published. However, this Annex Report does include information about key players in the industry from material already in the public domain.

The following **Table 3.1 Citrus Fruit Case Study Evidence Base** provides an overview:

	Number
Participating organisations – industry sector players	17
Participating organisations – logistics services providers	5
<b>Total participating organisations</b>	<b>22</b>
Web based evidence; hard and grey literature	42
Site visits / face-to-face interviews	10
Telephone interviews	12
Additional major inputs requested from participants	7
<b>Total items in the evidence base</b>	<b>71</b>

This activity summary excludes the considerable effort required to initiate communication, encourage participation, and also to arrange conference calls and meetings. It should be noted that while some organisations responded quickly and favourably to the initial invitation to participate, others responded more slowly and needed encouragement, often over several months, to participate.

## 4. RESULTS

Research findings are summarised under these headings: Defra import statistics (2010); citrus fruit production and supply; UK industry players; and UK import flows.

### 4.1 Defra import statistics (2010)

The following **Table 4.1 Fruit and Vegetable Imports** shows the 'starting point' data for the research. These data provide a contextual summary, with citrus fruit imports appearing as a single line.

Code	Description	Felix.	Soton.	T/port	London	Imming.	L/pool	Belfast	P/mouth	Dover	Other ports	Non EU tonnes k	EU tonnes k	Total tonnes k	
#0801	Tba											0.0		0.0	
#0802	Tba											0.0		0.0	
#0803	Bananas	26.8	0.1	2.2	139.8				459.4	206.3	69.7	904.3	85.0	989.3	
#0804	Dates, etc.	21.7	0.1	0.8	61.5		0.1	0.1	76.4	41.8	2.0	204.5	35.0	239.5	
#0805	Citrus fruit	109.6	0.8	7.6	198.8	0.1			37.4	8.0	29.6	391.9	276.0	667.9	
#0806	Grapes	114.8	1.8	19.2	80.8	0.1	7.1	2.1	0.2	9.3	32.6	268.0	79.0	347.0	
#0807	Melons, etc.	5.3	0.1	5.8	66.2				2.9	7.5	0.1	87.9	110.0	197.9	
#0808	Apples, etc.	66.5	0.7	14.5	122.4		9.2	0.5		0.3	5.2	219.3	372.0	591.3	
#0809	Apricots, etc.	8.7	0.1	0.7	17.1		0.1			2.5	1.3	30.5	104.0	134.5	
#0810	Berries, etc.	4.2	0.6	1.2	9.7		0.6			6.2	0.2	22.7	94.0	116.7	
<b>Total tonnes k</b>		<b>357.6</b>	<b>4.3</b>	<b>52.0</b>	<b>696.3</b>	<b>0.2</b>	<b>17.1</b>	<b>2.7</b>	<b>576.3</b>	<b>281.9</b>	<b>140.7</b>	<b>2,129.1</b>	<b>1,155.0</b>	<b>3,284.1</b>	
<b>Non EU tonnes % by port</b>		16.8%	0.2%	2.4%	32.7%	0.0%	0.8%	0.1%	27.1%	13.2%	6.6%	100.0%			
		<b>Non EU vs EU tonnes %</b>											64.8%	35.2%	100.0%
<b>Ports</b>															
1 Felixstowe															
2 Southampton															
3 Thamesport															
4 London															
5 Immingham															
6 Liverpool															
7 Belfast															
8 Portsmouth															
9 Dover															
10 Other ports, e.g. Harwich, Medway (Sheerness), Middlesbrough, Ramsgate															

Code	Description	Felix.	Soton.	T/port	London	Imming.	L/pool	Belfast	P/mouth	Dover	Other ports	Non EU tonnes k	EU tonnes k	Total tonnes k	
#0701	Potatoes	79.0		1.5	1.0							81.5	167.0	248.5	
#0702	Tomatoes	0.4			0.1				6.8	9.5		16.8	363.0	379.8	
#0703	Onions, etc.	45.7	1.4	1.4	18.3			1.5		0.9	13.7	82.9	308.0	390.9	
#0704	Cabbage, etc	0.2	0.1		0.2				0.1	0.4		1.0	159.0	160.0	
#0705	Lettuce, etc.										1.0	1.0	164.0	165.0	
#0706	Carrots, etc	9.3	0.2					0.3		0.1		9.9	61.0	70.9	
#0707	Cucumbers, etc									0.2	0.8	1.0	152.0	153.0	
#0708	Peas,beans, etc.	1.3	0.1		0.9					2.3	0.4	5.0	4.0	9.0	
#0709	Other vegetables	9.1	1.0	1.3	8.3		0.1		3.2	15.9	0.4	39.3	408.0	447.3	
<b>Total tonnes k</b>		<b>145.0</b>	<b>2.8</b>	<b>4.2</b>	<b>28.8</b>	<b>0.0</b>	<b>0.1</b>	<b>1.8</b>	<b>10.1</b>	<b>29.3</b>	<b>16.3</b>	<b>238.4</b>	<b>1,786.0</b>	<b>2,024.4</b>	
<b>Non EU tonnes % by port</b>		60.8%	1.2%	1.8%	12.1%	0.0%	0.0%	0.8%	4.2%	12.3%	6.8%	100.0%			
		<b>Non EU vs EU tonnes %</b>											11.8%	88.2%	100.0%
<b>Ports</b>															
1 Felixstowe															
2 Southampton															
3 Thamesport															
4 London															
5 Immingham															
6 Liverpool															
7 Belfast															
8 Portsmouth															
9 Dover															
10 Other ports, e.g. Harwich, Ipswich, Medway (Sheerness) and Ramsgate															

As a general contextual comment, the above table shows that both fruit and vegetable imports have high volumes coming from the EU. While the overall EU fruit percentage is 35.2%, the individual Code #805 EU percentage is higher, at 41.3% of the total citrus fruit import tonnage.

As shown above, most non-EU citrus fruit imports arrive at the deep sea container ports of Felixstowe and London (Tilbury), with only small volumes arriving at Thamesport and Southampton. This would be in line with expectations because liner container services from citrus-growing countries, particularly in Africa and South America, call at these two principal ports.

Other non-EU traffic from countries such as Egypt and Morocco will arrive at the ports of Portsmouth and Dover. Finally, in the case of citrus, the port accounted for in the 'Other Ports' column is Sheerness on the Medway, which has traditionally received citrus in break-bulk cargoes (with some deck containers) from a variety of countries including Turkey and Israel.

As regards EU traffic in 2010, the total reported is 276,000 tonnes. Most of this will have come from Spain. According to Eurostat, in 2010 Spain's citrus fruit exports to the UK and Ireland totalled c.213,000 tonnes from which it can be seen, even allowing for the Ireland tonnage, that Spain is the leading EU supplier of citrus to the UK. The other principal EU citrus supplier is Italy.

Although out of scope for this research, it should be noted that there are also significant flower imports from the EU (particularly from the Netherlands) and these flows can use similar transport equipment and RoRo ferry resources to those deployed for fruit and vegetable imports from the Continent.

#### 4.2 Citrus fruit production and supply

Originally from China and India, citrus fruit is now grown and sourced from around the world. The leading citrus producers are Brazil, USA, India, China, and Mexico. In addition, Mediterranean Region citrus producers comprise in geographical sequence Spain (the leader), Italy, Greece, Turkey, Cyprus, Syria, Israel, Egypt, Algeria, and Morocco.

Other citrus countries by region include South Africa; Argentina, Uruguay, Chile and Peru; Iran and Pakistan; Indonesia and Australia. Not all these major producers are also major exporters.

As far as the UK is concerned, supply is dominated by Spain and South Africa. Information obtained from a group of UK importers, who collectively accounted for nearly 40% of UK citrus imports in 2010, gave the following aggregate picture:

	<b>Source Country</b>	<b>Hemisphere</b>	<b>%</b>	<b>Cum. %</b>
1	Spain	North	46.4%	46.4%
2	South Africa	South	20.9%	67.3%
3	Morocco	North	6.2%	73.6%
4	Israel	North	4.5%	78.1%
5	Uruguay	South	4.2%	82.4%
6	Peru	South	4.0%	86.4%
7	Turkey	North	3.8%	90.2%
8	Argentina	South	2.6%	92.8%
9	Brazil	South	2.4%	95.2%
10	Egypt	North	1.4%	96.5%
11	Cyprus	North	0.7%	97.9%
12	USA	North	0.7%	98.6%
13	Mexico	North	0.4%	99.0%
14	Swaziland	South	0.4%	99.3%
15	Italy	North	0.3%	99.6%
16	Chile	South	0.1%	99.8%
17	Croatia	North	0.1%	99.8%
18	China	North	0.1%	99.9%
19	Australia	South	0.1%	99.9%
20	Other countries	NA	0.1%	100.0%

Table 4.2 illustrates how citrus is sourced from both Northern and Southern Hemispheres as part of year-round sourcing by UK importers and retailers alike. However, although 'seasons follow the sun', because of the different harvest cycles for individual crops, supply flows will sometimes overlap between hemispheres, e.g. late season oranges could be coming from South Africa at the same time as early oranges from Spain or Morocco.

Also, certain countries have strength in particular fruits. As noted previously, Brazil is the clear world leader for production of oranges but most of its exports appear as orange juice rather than as whole fruit. Whole fruit examples include the USA for grapefruit; Argentina for lemons; Brazil and Peru for limes. In addition, certain importers have developed strong trading relationships with specific growers and / or exporters in individual countries – the above aggregate view masks the very different profiles that exist at importer level.

Other general features of citrus fruit production and supply are:

- A key parameter for supply is **quality**. Fruit therefore has to be packed within a short time of harvesting both to preserve its freshness and quality and also to ensure an efficient workflow within the pack houses. The result is that in any one country there will be large numbers of growers – sometimes organised into co-operatives – contracted to pack houses within a reasonable transportation distance from the citrus groves.
- The **role of the pack house** both in the source country and in the UK is important for several reasons: management of the upstream and downstream commercial relationships (i.e. with grower and retailer respectively), control and maintenance of fruit quality, and logistical management.

**In the country of origin**, the exporter's pack house handles physical consolidation of farm outputs and then preparation of the fruit for shipping. This can include post-ripening of fruit to achieve a saleable peel colour; washing to remove residues; wax coating or treatment with preservatives; gauging and packing (as loose or in retail pack); temperature-controlled storage if required; load assembly and vehicle despatch.

**In the UK** the importer's pack house undertakes vehicle receipt and unloading, quality checking, put-away and storage, ripening, packing, order picking, load assembly and vehicle despatch 364 days of the year. As an indication of scale, the key dimensions of one facility visited were as follows: investment £20 million; facility footprint 200,000 sq. ft; pack house footprint 50,000 sq. ft; 8 temperature-controlled chambers; 40 packing lines; 8 million packs annual throughput.

- Increasing retailer power over the past thirty years in the UK has led to their greater involvement in the upstream supply chain, i.e. closer to the grower. Initial involvement concerned fruit quality and appearance, with preparation of detailed **technical specifications** covering such things as approved varieties, fruit size, packing configurations, the Brix value (a measure of the fruit's sugar/acid ratio), juice content, colour, and permissible defects.

A retailer's technical manager, together with a representative of the UK importer, would therefore visit the pack houses and growers (possibly twice each year) to agree the quality standards which would then be monitored on an ongoing basis by the importer.

- Also, in parallel retailers have sought **greater control of their inbound supply chains**, with a view to ensuring security of supply and reducing costs. A reaction by the importers has been to move away from their previous role as wholesalers to one in which they can offer retailers (and other customers such as caterers) a 'one-stop shop' from product sourcing in the field to delivery at the UK distribution centres.

Different solutions have resulted. For example, one leading UK retailer acquired its importer and works closely with its parent and preferred third-party logistics service providers in the UK and overseas to operate a dedicated end-to-end supply chain. Other retailers have preferred to develop commercial ties with several importers who, it is argued, will have independent technical knowledge and sourcing relationships across many supply markets.



The preferred solution has depended in part on retailer culture and their attitude to importers, which can vary from 'we know everything and you'll do things our way' to 'you are the experts but we need your help'.

It can be appreciated therefore that supply chain networks are sophisticated and tightly-timed; and also that commercial and operational scenarios differ considerably according to the way in which the strategic and operational components have been configured.

Looking at the individual citrus fruits, although their characteristics and handling requirements are broadly similar, it is helpful to note some of the following details:

- **Oranges**

Oranges are the dominant fruit in terms of import volumes. As noted previously, fruit can be imported for UK juicing or cutting, as well as for distribution as whole fruit through wholesale or retail channels.

They are classified by seasonal availability: winter oranges from the Mediterranean countries from November to June; summer oranges from other countries from June to November. They are also divided into early, middle and late ripening varieties.

Oranges may be transported in cartons, standard boxes, wire-bound boxes and fruit crates made of corrugated board or wood, or in bulk jumbo pallets depending on the circumstances. Fruit from Spain will usually travel in 15kg cardboard trays, either loose for UK packing, or already packed (in nets) and labelled ready for retail sale.

Import movements will be in temperature-controlled break-bulk vessels (rarely), ISO containers, or road trailers, all with either fresh air supply or controlled atmosphere. Temperature regimes are typically between 4°C and 6°C depending on variety, while relative humidity requirements are between 85% and 90%. Storage times can be up to 16 weeks, longer if controlled atmosphere equipment is used.

Unless noted otherwise pack house operations and shipping requirements for the other citrus fruits are similar to those for oranges.

- **Lemons and limes**

There are many different types of lemon grown, depending on conditions in the country of origin. Leading producers are India, Mexico, Argentina, Spain, and China; leading exporters are Spain (Primofiori), Turkey, Mexico and Argentina (Eureka); Brazil and Mexico are key suppliers of limes to the UK market.

Temperature regimes are typically 11°C for early and 8°C for late varieties, while relative humidity requirements are between 85% and 90%. Storage times can be up to 20 weeks, longer if controlled atmosphere equipment is used.

- **Grapefruit**

Grapefruit can be classified into White (e.g. Marsh), Pink (e.g. Ruby Red), and Red (e.g. Sunrise and Star Ruby) and Pomelo varieties, each with their own taste and eating characteristics. The major UK suppliers in the Northern Hemisphere are USA (Florida), Cyprus and Israel; in the Southern Hemisphere, South Africa and Argentina.

- **Soft citrus**

For the purposes of this research the term 'soft citrus' was applied to mandarins, satsumas, clementines, and tangerines (the name originally given to all soft citrus). As eating habits have changed to include demand for convenience, 'food on the go' and year-round availability, soft citrus has become increasingly popular. As a general rule, satsumas are sweeter and have a more delicate flavour than clementines or tangerines.

Major suppliers to the UK in the Northern Hemisphere include Spain, Turkey, Israel and Morocco; in the Southern Hemisphere Argentina, Uruguay, Peru and South Africa. Some varieties such as Clemenules or Nadorcott in the case of clementines, are grown in both hemispheres, while others are associated with an individual country (e.g. Queen satsumas from Spain).

### 4.3 UK industry players

The following information provides an overview of UK citrus fruit importers. In recent decades the role of the traditional fruit and vegetable wholesaler has contracted and the industry has experienced consolidation. This has led to such related developments as UK importers being owned by overseas players, joint ventures with foreign partners, or even ownership by a UK retailer.

On the one hand, a new holistic end-to-end approach has developed in order to manage the supply chain from the field to the shelf. On the other hand, the traditional UK growing areas of Kent, Lincolnshire, the Vale of Evesham and Lancashire remain as key locations for UK pack houses, many of which also offer ripening facilities. As a rule long-distance supply will arrive in bulk for packing in the UK, while European supply may be packed in the source country.

Leading fruit importers (in alphabetical order) include:

- **A1 Fruit, Leamington Spa** is a specialist juicer importing whole citrus fruit for juicing in the UK, as an alternative to single strength and concentrated imports. With orange juice as its dominant product, the company supplies freshly squeezed premium fruit juices to retail and other sectors.
- **Capespan, Maidstone** originally had a South African focus when it was formed in 1994 from the merger of Outspan and Unifruito. It now offers year-round supply of fruit of all types from many different countries, with South African supply now representing only c.30% of its business.
- **Dole Fresh, Dartford**, owned by Compagnie Fruitière in West Africa, was at one time very active in the citrus sector but as a result of retailer rationalisation has since shifted its focus to bananas, and pineapples for the UK retail sector. Any citrus will now be handled by its general trading desk.
- **Chingford Fruit Packers, Crayford**, part of the privately-owned AG Thames Group, is a major citrus supplier to the UK retail sector. Solstor, another company within the Group, is a leading supplier of international and domestic temperature-controlled logistics services.
- **Greencell, Dartford and Spalding** is a niche specialist supplier of citrus to retail, wholesale, and foodservice sectors as well as to food processors supplying juices and fruit salads. Its strength includes the ability to supply when the larger mainline importers have supply difficulties.
- **Hain Daniels Group, Headcorn**. This US-owned industrial juicer, a major supplier of orange and other citrus juices to most UK retailers, also owns the **Johnsons Juice** retail and foodservice brand. Fruit arrives in c.500 to 600kg bulk pallets from Northern and Southern Hemispheres.
- **International Produce Limited (IPL), Normanton and Gillingham**. Now owned by ASDA, IPL provides dedicated supply to this retailer, with citrus operations at Gillingham in Kent. Deep sea imports arrive via Felixstowe or Tilbury, and Spanish imports by road via the Dover corridor.
- **MMG Citrus, Paddock Wood**. A joint venture with Spain's Martin Avarro, MMG Citrus is a member of the UK's extensive Fresca Group. It handles citrus fruit procurement, importing, packing and marketing; and is also a leading citrus supplier to many UK retailers.
- **MM(UK), Chatteris** is part of the Spanish AMC Group and is one of the largest citrus and grape specialists in the UK. In addition to strong connections with growers in Spain and Israel it sources from 20 countries worldwide. As such it is a leading supplier of citrus to the UK retail sector.
- **Poupart** is part of Argent Group Europe, a diversified food products group serving both multiple retailers and caterers. Originally a grower supplying 19<sup>th</sup> Century London at Covent Garden, the group supplies citrus to niche markets through both **Poupart Citrus** and **Poupart Imports**.

#### 4.4 UK import flows

UK citrus fruit imports, although all arriving as full unit loads, can be split into three distinct flow types. In addition there are several alternative flow types used to import citrus fruit from Spain. The way they align with the Defra import classification that was described earlier is shown below:

Table 4.3: Citrus Fruit Imports Flow Types		
Code	Description	Import flow types (and source)
#805	Citrus fruit	<ul style="list-style-type: none"> <li>• Deep sea container services (non-EU)</li> <li>• Deep sea break-bulk services (non-EU and EU)</li> <li>• Road trailer service via Dover Corridor (EU)</li> </ul>
		<ul style="list-style-type: none"> <li>• Alternative flow types from Spain (EU) include:               <ul style="list-style-type: none"> <li>○ Swap-body rail via Channel Tunnel</li> <li>○ Short-sea container service from Bilbao</li> <li>○ Road trailer via Western Channel RoRo service</li> </ul> </li> </ul>

Most citrus fruit from non-EU sources such as South Africa arrives by **deep sea container services**, typically at the ports of Felixstowe or Tilbury, as illustrated in **Annex 8: Appendix I**. Key features of these import flows are:

- Citrus fruit arrives in season (usually on pallets) in 40' refrigerated ISO containers
- Typical payload is 20 tonnes (split over 20 pallet spaces)
- Although palletised, non-EU product is rarely in final (e.g. retail) pack format
- Containers are moved by road from the port to the pack house
- Pack houses are clustered in the South East (particularly Kent)
- Movement may be done on a continuous 'closed-loop' system where full containers are dropped on their skeletal trailers at the pack house and the delivering road tractor unit collects the previous day's empty container for return to the port – this system keeps costs to a minimum, enables rapid clearance of the port, and maintains a steady flow of product to the pack house

Another point to note is that container vessels – such as those operated by Hamburg Süd – that sail on the North / South trades linking the Southern Hemisphere countries with Europe have a far higher proportion of electrical connections (reefer plugs) than do the larger container vessels on the East / West services linking Asia or the USA with Europe.

In addition, **deep sea break-bulk services** can arrive from either non-EU or EU sources at ports such as Sheerness, Dover or Portsmouth. Although this conventional traffic has declined steadily over the past thirty years as containerisation has taken hold, there are indications that there could be a niche opportunity for specialised reefer services that follow the seasons for fruit and other traffic from supply markets that include the Pacific countries, West Africa, South America and the Mediterranean.

In this connection, Seatrade Reefer Chartering is currently promoting services by vessels with refrigerated multi-compartment under-deck stowage combined with on-deck container capacity that provides electrical connections (reefer plugs) for up to 200 reefer containers. So while most non-EU traffic will arrive on liner services at major UK container ports, some traffic will no doubt continue to arrive on chartered conventional services at other UK ports.

As mentioned previously, EU citrus fruit supply is dominated by Spain. During the citrus fruit season (from November to April) most Spanish traffic (c. 10,000 loads) arrives on **road trailer services** via the Dover Corridor, as illustrated in **Annex 8: Appendix II**. Key features of these import flows are:

- Pack houses are concentrated in Murcia (although distributed between Valencia and Almeria)
- Road vehicles (13.6m refrigerated trailers) are routed across France via Bordeaux and Paris
- Typical payload is 22.5 tonnes (split over 26 pallet spaces)
- Vehicles enter the UK as accompanied RoRo traffic via Dover Corridor
- UK pack houses are clustered in the South East (particularly Kent)
- Peak delivery day is Thursday, ready for retailer peak trading
- Transit cycle times are short and tightly controlled
- Door-to-door transit time is 3 days / 2 days with two drivers at peak times (e.g. Christmas)

Control of the supply chain by the importer will include maintenance of visibility of stock status at the pack house in Spain; precise ordering to fill UK customer orders accurately, in full and on-time; and efficient control of their transport contractors. These operators have to meet stringent criteria and will be awarded transport contracts according to their inherent capability and actual performance.

It should be noted also that 1) the UK will be 'competing' for citrus supply from Spain with other EU countries such as Germany; 2) citrus traffic represents only c.17% of Spanish fresh produce exports to the UK and 3) the 'non-citrus' produce traffic is spread more evenly throughout the year. All these factors have to be considered when evaluating traffic demand and transport system capacity.

There are several **alternative flow types from Spain** that have been / are being used to some extent, although at present they have limitations as to service frequency, capacity and / or transit times. They are illustrated in **Annex 8: Appendix III** and their key features are described below:

- Movement of refrigerated 13.6m length (45 foot) swap bodies on **rail services from Spain** entering the UK as through rail freight via the Channel Tunnel. DB Schenker operates three roundtrip services each week for Ford Motor Company from Dagenham to Valencia and back. The timing of one of these three weekly services suited a long-term trial where product could be loaded onto the train in Spain on Tuesday morning, arrive at the Barking rail terminal in the UK on Thursday morning, and then be delivered by road in the London area in the afternoon.

This particular trial revealed several dependencies. These included the need for investment in suitable refrigerated swap bodies; availability of enough spare space on the train; measures to ensure that the train would not be delayed in France; and the requirement for the service to continue to operate over the Christmas holiday period when UK citrus demand would be at its peak. Other train operations have identified similar issues.

- Another possible alternative is the **short-sea container services from Bilbao** to the UK and Ireland operated by MacAndrews, although these services do not yet have the capacity, frequency, and short transit times required for citrus fruit traffic. Road trailer traffic is reloaded at the port of Bilbao into 13.6m (45') reefer containers which are then lifted onto the ship, each ship having a capacity of between 400 and 500 TEUs.

One service calls twice-weekly at Tilbury and Rotterdam; the other service calls up to three times each week at a mix of Bristol, Liverpool, Greenock and Dublin. Transit times to the first port of call on both of these services are usually c.48 hours, although subject to delays from bad weather in the Bay of Biscay. The overall transit time also has to take into account port handling and connecting road journey times in both Spain and the UK. The net result is a significant time penalty when compared with direct door-to-door all-road transport, via Dover.

- As for accompanied traffic, road trailers can also arrive via the **Western Channel RoRo services** such as those operated by Brittany Ferries from Roscoff, St. Malo, Cherbourg and Caen to the UK. Taking into account the fact that most vehicles need to take the quickest route to the pack houses in the South East, and also considering relative service frequencies and capacities, the Caen – Portsmouth route is the most attractive of those available.

This service is operated 2 or 3 times daily by the *Mont St. Michel* (118 trucks capacity) and the *Normandie* (84 trucks capacity). However, when compared with typical Dover Corridor daily throughput of c.3,000 import movements, it is evident that the Caen – Portsmouth route is not a high-capacity alternative under normal conditions.

Brittany Ferries now also provide a total of 6 sailings a week, for accompanied trailers, direct from Spain (Bilbao and Santander) to Portsmouth, Poole and Plymouth.

#### 4.5 Resilience of import flows

The resilience of import flows to port disruption can be summarised as follows:

- As regards deep-sea container flows, the capability, capacity, and risk profile of the **origin ports** are of a consistently high standard. This is because most of the container terminals are operated by a global operator such as APM Terminals, DP World, or Hutchison, who can be expected to apply best practice standards to cargo handling and vessel turnaround.

In comparison, break-bulk services will originate from conventional ports which may not always have the same consistency in standards. However, logic dictates it is in the exporters' interest to have appropriate cold chain and shipping arrangements to maintain fruit quality and have an efficient and reliable route to market for these perishable products.

- Resilience of the supply chain also depends on the availability of **suitable long distance sea freight capacity** for reefer traffic. In order to mitigate the effects of shipping overcapacity arising from the 2008 world economic downturn, some container services have been withdrawn or reduced in frequency. However, this is not understood to have created problems for citrus fruit import flows. Also the parallel reduction in the conventional reefer vessel fleet, with scrapped vessels not being replaced, has seen traffic flows moving to unit-load container services.

A related issue is the need for **adequate numbers of reefer plugs** on container vessels and at terminals. However, where there has been significant historic demand for temperature-controlled capacity, as in the South American meat and fruit trades with Europe, shipping lines like Hamburg Süd have invested in suitable vessels (and have also maintained high service frequencies).

- The capability, capacity, and risk profile of the **destination ports** is also fairly consistent across the larger UK container ports used for non-EU citrus fruit imports (see **Annex 4** and **5**). Tilbury in particular, as the key destination for North / South food trades, has invested in reefer plugs and in its Border Inspection Post facilities. Evidence from interviews also indicates that citrus fruit importers allow more time for non-EU arrivals and hold more stock in order to permit some variability in overall transit times.

Resilience of **origin and destination ports for EU arrivals** centres on the capability, capacity, and risk profile of the Dover Corridor terminals, as described in **Annex 3**. This reflects Spain's dominant supply position and because nearly all imports from Spain arrive via ferry from Calais at Dover or via Eurotunnel shuttle from Coquelles at Folkestone. As noted in **Annex 3**, with current low traffic volumes, disruption to one service (Dover ferries or Channel Tunnel freight shuttles) could feasibly be handled by increasing capacity on the other service. **However, if both Dover Corridor modes were interrupted simultaneously for anything more than a short time, the impact on UK food supply – bearing in mind that the fresh produce flows affected include a lot more than citrus fruit – would be catastrophic.**

#### 4.6 UK citrus fruit demand

Overall UK citrus fruit demand comes from a number of **different industrial sectors**. The one that is probably the most discussed, as a result of their acknowledged leadership in supply chain management thinking and practice, is UK grocery retail. However, significant demand can come from other important sectors such as wholesale distribution or food manufacturing and processing.

For example, one leading wholesaler supporting the catering trade imports full loads of fresh produce directly from Spain to one of its UK distribution centres each day. It also consolidates other EU import flows in northern France to feed into its UK distribution network via the Dover Corridor transport links. In the food manufacturing sector, Premier Foods reported on its website that in 2010 it purchased 3,500 tonnes of citrus fruit: 2,400 tonnes from EU sources and 1,100 tonnes from non-EU sources.

**High levels of time-based performance** are required. In all cases, imports move through well-planned logistics networks according to precise schedules. Notwithstanding the above comments about importers allowing for some variability in transit times for non-EU imports, an overriding message about all citrus imports is the fact that supply chains are very tightly-timed. For example, a Spanish truck that left on Friday for delivery to the UK pack house at lunchtime on the Sunday would be allowed to tip anytime during the afternoon without a penalty. This emphasises the significance of the Dover Corridor for the more than 3,000 freight vehicles using it to enter the UK each day.

The time that fruit then spends in the pack house, although short, will depend on which procedures it has to undergo before despatch. For example, fruit that is already packed and labelled for retail sale may require only quality checking before it is available for order picking and marshalling for despatch. Pallets, sometimes picked by retail store, will then be collected in full loads for the retailer distribution centres where they are cross-docked onto delivery vehicles for final delivery to the retail store. The whole operation works 24/7, i.e. around the clock every day.

Any examination of citrus import flows also has to take into account **seasonality of demand** within the week and within the year. As a general rule when supplying the retail sector pack house activity will be higher on Wednesdays and Thursdays and import flows will be running slightly ahead of this. Within the year citrus demand will increase to cover promotions and holiday periods, particularly at Christmas time.

The seasonality profile of citrus arrivals adjusts progressively by country for the different varieties. **Table 4.4** provides a summary of on-shelf appearance by country of origin at a typical UK retailer.

<b>Fruit</b>	<b>Period</b>	<b>Country of origin</b>
Oranges	Jan – Feb	Spain (Seville), Morocco, Italy
	Mar – Apr	Spain, Morocco, Italy, Israel (Jaffa), Cyprus
	May – Jul	Spain, Morocco, Italy, Israel, Cyprus
	Aug – Sep	South Africa
	Oct – Nov	South Africa, Spain, Morocco
	Dec	Spain, Morocco
Lemons	Dec – Feb	Spain
	Mar – Apr	Spain
	May – Jul	Spain, Argentina, South Africa
	Aug – Sep	Argentina, South Africa
	Oct – Nov	South Africa, Turkey, Spain
Limes	Jan – Feb	Mexico, Brazil
	Mar – Apr	Mexico, Brazil, Argentina
	May – Jul	Mexico, Brazil, Argentina
	Aug – Sep	Mexico, Brazil
	Oct – Nov	Mexico, Brazil
	Dec	Mexico, Brazil
Grapefruit	Jan – Feb	USA, Cyprus, Israel
	Mar – Apr	USA, Cyprus, Israel
	May – Jul	USA, South Africa, Argentina
	Aug – Sep	South Africa, Argentina
	Oct – Nov	South Africa, USA, Cyprus, Israel
	Dec	South Africa, USA, Cyprus, Israel
Clementines	Dec – Feb	Spain, Morocco
	Mar – Apr	Spain
	May – Jul	Spain, Argentina, Uruguay, South Africa
	Aug – Sep	Peru, South Africa
	Oct – Nov	Spain, South Africa, Australia
Satsumas	Jan – Feb	Spain
	Mar – Apr	Argentina, South Africa
	May – Jul	South Africa, Peru
	Sep – Oct	Spain
	Oct – Nov	Spain, Turkey
	Dec	Turkey
Tangerines	Jan – Feb	Spain, Israel
	Mar – Apr	Spain, Israel
	May – Jul	Spain, Israel, Argentina, Uruguay, South Africa
	Aug – Sep	South Africa, Uruguay,
	Oct – Nov	Spain, South Africa, Uruguay
	Dec	Spain

It will be noted that each fruit has its own sourcing profile depending on its various harvesting seasons around the world. Citrus fruit demand from the wholesale or manufacturing and processing sectors will have different patterns from retail, although they will have similar sourcing cycles. The seasonality aspects of citrus fruit supply and demand combine to create the need for resilient supply chains.

#### 4.7 Food stocks and the attitude of the supply chain to replenishing stock

The key findings are:

- Best practice in supply chain management has encouraged keeping stocks to a minimum to **contain costs**, not only those directly associated with storage and handling, but also the cost of capital tied up in stock. It has also encouraged the holding of stock upstream, closer to its source, in order to give (apparently paradoxically) higher levels of customer service. This latter feature has been enabled particularly by faster information flows and responsive transport systems.
- For the citrus fruit supply chains, interview evidence showed that low stock levels are also linked with objectives to maintain product freshness and quality; so **maximising shelf life** in the retail store, food service outlet, or factory as appropriate. Typical reported stock cover is c.1.5 days for products from Spain and c.10 days for non-EU products. As a result, although there are exceptions, temperature-controlled facilities like pack houses and retailer distribution centres are designed for sortation and consolidation of through flows, rather than for storage.
- As players have concentrated on efficient consumer response techniques, pulling stock through as required, they have become **dependent on frequent, reliable and fast deliveries** from their suppliers. Section 4 showed how this approach works in practice at pack house level, both for inbound container movements from port terminals and for inbound trailer movements from Spain. Similar 24/7 scenarios also affect outbound transfers to customer distribution centres (DCs), creating what is virtually a non-stop flow from pack house to retail store or catering outlet.
- The only variations to the above are when **stock build** takes place to cover such things as procurement opportunities, retailer promotions, or seasonal demand (such as over the Christmas holiday). In these situations, because the inbound supply chain could not cope with the traffic volumes if everything were done on a just-in-time basis, UK pack houses will employ additional third-party cold storage. With the exception of procurement opportunities, these events are planned well in advance.
- However, the main message for citrus fruit is that the only stock in the system is **transit stock**. The network infrastructure and operational procedures are designed accordingly. It would probably require a cross-sector debate among all the players to work out satisfactory contingencies to cope with major port disruption that lasted anything more than 12 to 24 hours.

#### 4.8 Behavioural aspects of the various players in the event of supply chain disruption

Although stakeholders regard their Business Continuity Planning as commercially sensitive, a reasonable body of evidence about behavioural aspects was compiled. The main findings are:

- The **competence and in-depth supply chain knowledge** of the stakeholders (especially the importers and their contracted transport providers) was evident. Managers knew their subject and could either provide a detailed description of how the upstream supply chain worked or make the right introduction to the knowledgeable person in the UK or overseas. Transport operators too are used to 'thinking on their feet' when faced with disruption such as temporary port closure and finding alternative routes and ferry services.
- **Information systems** provide visibility of the entire supply chain, so that order and shipment status can be, and is, monitored. GPS systems, often linked to data loggers monitoring quality aspects such as container or trailer load temperatures, provide real-time information on progress. Combined with a pro-active management culture and style, this supports resolution of problems.

- There was **only one report of different organisations working together** to decide how to mitigate the effects of major disruption. However, competent and pro-active management cadres, with effective information and communications technology support, could underpin successful problem resolution. Also, despite competing fiercely in the market place, importers already know and assist each other and so would no doubt be willing to collaborate to meet a joint threat.



## 5. DISCUSSION

### 5.1 Overall assessment of the results

Although the pattern of UK import flows can be complex when the full range of supply markets is taken into account, there are a number of factors that emerge for discussion as follows:

#### *Relevant factors*

- As shown in **Table 4.1** citrus fruit imports represent 20% of all fruit imports and >12% of all fruit and vegetable imports combined. Although citrus fruit imports are second in tonnage only to bananas, whenever assessing the potential impact of port disruption it is important to look at any issues within the wider context of 1) all fresh produce and 2) overall temperature-controlled traffic.
- It should also be borne in mind that significant volumes of (orange) juice originally produced in Brazil are imported daily from storage in Belgium or the Netherlands. Although out of scope for the research, these flows are important for the UK food retail and foodservice sectors.
- UK citrus fruit supply comes from a wide range of countries but with significant dependency on South Africa (non-EU leader) and Spain (EU leader). A major problem in either country would disrupt existing sourcing arrangements which could in turn require rapid reconfiguration of supply chain arrangements, assuming that alternative supply countries have replacement capacity.
- Existing supply chains are sophisticated as a result of development not only by importers but also from increasing retailer involvement in the upstream supply chain. However, it would be a mistake to assume that UK grocery retail is the only sector involved with supply chain innovation. Possible scenarios for risk management should also take into account the needs of wholesale food distribution; foodservice; and food manufacturing and processing.
- The complexity of the supply chain is illustrated by the following list of possible entities:
  - Growers (including co-operatives)
  - Exporters
  - Forwarding agents
  - Port and terminal operators
  - Port health authorities
  - Shipping lines
  - Land-based logistics service providers (including multi-modal operators)
  - Importers
  - Retailers
  - Foodservice wholesalers
  - Food manufacturer or processors
  - Trade associations
  - Government (at national, regional or local level)

This means that when attempting resolution of port disruption it might (not) be within the authority and capability of a single entity to find a solution. The nature and duration of port disruption can also determine the appropriate response(s). For example, while a road transport operator (or an individual driver) can decide at short notice to use the Eurotunnel Shuttle in the event that the Calais – Dover RoRo ferry service is suspended for a few hours, longer-term port disruption will require interaction between multiple entities with differing levels of authority and responsibility.

- Similarly, longer-term change such as a modal shift in the interests of sustainability from road to rail for imports from Spain can be difficult because each entity has its own perspectives and commercial imperatives. For instance, there is interview evidence from a variety of sources that slow train handover between individual rail regions in France can compromise the reliability of transit times. So there can be tactical considerations for the entities involved as well as the fundamental strategic issues of train capacity, frequency and standard transit times.

## 5.2 Difficulties and risks associated with current systems

Difficulties and risks associated with current systems include the following:

- Non-EU deep sea container flows are concentrated on Tilbury and Felixstowe and alternative UK terminal capacity at Southampton and Thamesport is very limited. If disruption were severe enough to require vessels being diverted to Continental ports, feeder vessel capacity for transport back to the UK would also be likely to be constrained; as would space on RoRo ferries.
- EU flows are dependent on the Dover Corridor. It is the most direct route to the UK pack houses and the high service frequencies provide the greatest flexibility to compensate for any delays experienced en route from Spain. Depending on time of day and seasonality, disruption at Calais will cause vehicle queues to build rapidly and congestion can be slow to clear; especially if Eurotunnel cannot respond quickly to the extra demand for Shuttle services.
- Feasible alternatives to the Dover Corridor for refrigerated traffic comprise: intermodal LoLo rail services; short sea LoLo services; and Western Channel RoRo ferry services. At present these lack the capacity, frequency and short transit times to be a feasible alternative to the Dover Corridor for citrus fruit traffic. Development of rail would require sustained political and commercial impetus. The maritime options would work only if cycle-times were lengthened.
- Spain's current economic problems are affecting its import volumes and the viability of hauliers. For example, after unloading in the UK, vehicles now have to wait three or four days (in Belgium, the Netherlands or northern France) before being able to reload for Spain. This has a serious adverse effect on vehicle utilisation. The main transport operators can handle these lower traffic volumes with their core vehicle fleet but some sub-contractors are going out of business.
- Although there is already a general awareness of the current risks, industry stakeholders have only limited understanding of the details. They must be persuaded about the merits of sharing information about their Business Continuity Planning for contingency planning. This should be addressed by (perhaps jointly) by government and the appropriate trade bodies.

The most likely pinch points, which vary by import flow, can be summarised as follows:

	<b>Import flow (and source)</b>	<b>Appearance</b>	<b>Port group(s)</b>	<b>Pinch points</b>
1	Deep sea container service (non-EU)	ISO reefer container	Tilbury or Felixstowe	Port access channel or terminal
2	Deep sea break-bulk service (non-EU)	ISO reefer container or industrial pallet	Sheerness, Dover or Portsmouth	
3	Road trailer service via Dover Corridor (EU)	13.6m reefer trailer via RoRo ferry or Eurotunnel Shuttle	Dover Corridor	Ports of Calais and Dover; or Channel Tunnel terminals at Coquelles and Folkestone
4	Alternative flow types from Spain (EU)	13.6m reefer intermodal swap body on through train via Channel Tunnel	Dagenham rail terminal (or alternative)	Channel Tunnel
		13.6m reefer container via short sea LoLo service	Tilbury (possibly Bristol, Liverpool, or Greenock)	Port access channel or terminal
		13.6m reefer trailer via Western Channel RoRo service	Portsmouth (possibly Plymouth or Poole)	

## 6. CONCLUSIONS

The research showed that as UK supply of citrus fruit 'follows the sun' in Northern and Southern Hemispheres, there is high dependency on supply from Spain (EU) and South Africa (non-EU).

Key features of existing supply chains are that: they work on short cycle times; have limited stock (typically 1.5 days' cover for EU imports); UK pack houses play a critical role in consolidating and sorting incoming supply flows; and because road supply from Spain has very high volumes that are nearly all channelled through the Dover Corridor it would be difficult to find alternative routes.

Severe port disruption on this route would be reflected in the retail store within 24 hours; with food service and manufacturing sectors also affected quickly. Although road transport has inherent flexibility advantages over modes such as rail, it would be a mistake to assume that flows from Spain could be switched easily to other routes or equipment modes in the event of serious disruption.

Current supply from EU and non-EU sources is dependent on well-established commercial relationships between growers, exporters and importers. These might not be easily replicated if a need arose to activate alternative sources. However, because both UK retailers and importers have worked (either independently or together) to create end-to-end supply chain visibility and control, an initial judgement is that the industry would have the requisite ability to reconfigure supply if necessary. The commercial implications would require investigation and evaluation.

A fair appraisal of the Citrus Fruit Imports Case Study would therefore be:

	<b>Objective</b>	<b>Result</b>
1	Determine the extent to which particular features of domestic and international transport infrastructure and food supply chains are likely to ameliorate / exacerbate the impact of UK port disruption on the supply of food imports into the UK	A substantial base of meaningful evidence by individual flow type has been compiled, enabling a preliminary assessment of risk. Amelioration features are few; factors that exacerbate the situation are the dependencies on the Dover Corridor and Tilbury / Felixstowe with limited suitable UK available alternatives
2	Determine the extent to which UK food (import) security is contingent upon the resilience of overseas port infrastructure (both within and without EU waters, and now and in the future)	There is a significant dependency for EU citrus fruit flows on the terminals at Calais and Coquelles. For non-EU imports there is a wide spread of ports of origin and most are operated by global players with high levels of operational competence
3	Explore the behaviour, over the short to medium run (up to six months), of individual port operators, shipping companies and land-based logistics and food supply chain agents in the event of port disruption	Likely behavioural responses include a) changing import route and mode of transport; b) trying to increase stock in the system and / or c) identifying alternative supply sources. There is understandable stakeholder reluctance to provide information about their Business Continuity Planning in view of its commercial sensitivity

The work programme also segmented imports into high-level categories, first of all into individual import flow types, and then into more detailed information about routes. At this level it was possible to show how the flows depended on infrastructure, transport equipment and services of different types.

It showed that it is feasible to gather reliable information from industry stakeholders about UK citrus fruit imports. Although compilation of evidence was time-consuming and encountered setbacks, such as when stakeholders were cautious about whether to participate, the overall result was positive. More work is now required on how to reduce supply chain risk for imports from Spain and on how to encourage industry players to prepare robust scenario plans to cope with serious port disruption.

## 7. MESSAGES AND FINDINGS

The recommendations arising from the research are as follows:

1. A scenario planning exercise combined with detailed modelling is required to evaluate business risk, particularly for fresh produce flows from Spain (including citrus imports) that rely heavily on the Dover Corridor (Port of Dover and Channel Tunnel); and for non-EU deep sea container flows relying on Felixstowe and Tilbury.

Although UK citrus imports are concentrated on these few entry channels the overall complexity of fresh produce supply chain networks argues for scenario planning based on adequate information and understanding at individual flow level.

This could possibly be undertaken on a collaborative basis by the industry's leading players with UK government encouragement and involvement. A parallel exercise should also look at how some of this traffic could be switched to rail or sea in the interests of longer term sustainability

2. A suitable framework and forum must be devised in which industry stakeholders can be persuaded to share information about their Business Continuity Planning processes and conclusions. This could also support the first recommendation described above.
3. There are also some evidence gaps such as those relating to the implications of increased sourcing from countries other than the current supply leaders (i.e. alternative sources of supply involving different import channels to the UK market). These gaps need to be filled through continuing investigation using the approach and methodology employed for this research.

**Appendix I: Citrus Fruit Arrival via Felixstowe or Tilbury**

Import flow classification		
A	Food commodity	<i>Citrus fruit</i>
B	Source region / country	<i>Southern hemisphere (e.g. South Africa)</i>
C	Temperature / atmosphere regime	<i>Chill (temperature depends on variety)</i>
D	Transport mode(s)	<i>Deep sea</i>
E	Flow type	<i>Temperature-controlled unit load</i>
Logistics information		
1	Commodity format	<i>Packed in trays or boxes</i>
2	Shipping unit	<i>Container</i>
3	Vessel / vehicle type	<i>Container ship</i>
4	Terminal handling	<i>Deep-sea container terminal</i>
5	Storage on arrival	<i>Pack house</i>



Reefer container



Deep-sea container vessel



UK deep-sea container terminal (Tilbury)



UK container road transport

Pictures © 2012 London Container Terminal, Maritime Transport.

## Appendix II: Citrus Fruit Arrival via Dover Corridor

Import flow classification		
A	Food commodity	<i>Citrus fruit</i>
B	Source region / country	<i>Spain</i>
C	Temperature / atmosphere regime	<i>Chill (temperature depends on variety)</i>
D	Transport mode(s)	<i>RoRo ferry service or Eurotunnel Shuttle</i>
E	Flow type	<i>Temperature-controlled unit load</i>
Logistics information		
1	Commodity format	<i>Packed in trays or boxes</i>
2	Shipping unit	<i>Reefer trailer (accompanied)</i>
3	Vessel / vehicle type	<i>RoRo ferry or Eurotunnel Shuttle train</i>
4	Terminal handling	<i>Ferry or Eurotunnel terminal</i>
5	Storage on arrival	<i>Pack house</i>



RoRo ferry arriving at the Port of Dover



Reefer truck leaving Eurotunnel terminal at Folkestone



Reefer truck unloading at UK pack house



Citrus fruit from Spain in UK pack house

Pictures © 2012 Global 78; P&O Ferries, Solstor

### Appendix III: Citrus Fruit Arrival via Alternative Routes

Import flow classification		
A	Food commodity	<i>Citrus fruit</i>
B	Source region / country	<i>Spain</i>
C	Temperature / atmosphere regime	<i>Chill (temperature depends on variety)</i>
D	Transport mode(s)	<i>Rail or Short-sea (LoLo); Ferry (RoRo)</i>
E	Flow type	<i>Temperature-controlled unit load</i>
Logistics information		
1	Commodity format	<i>Packed in trays or boxes</i>
2	Shipping unit	<i>Reefer container or reefer trailer</i>
3	Vessel / vehicle type	<i>Train or ship (container); Ferry (road trailer)</i>
4	Terminal handling	<i>Container terminal or ferry terminal</i>
5	Storage on arrival	<i>Pack house</i>



Rail swap-body service from Spain



Short-sea container service from Spain



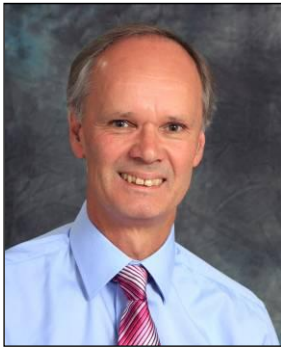
UK short-sea container terminal



RoRo ferry on Western Channel service

Pictures © 2012 Brittany Ferries, MacAndrews, Solstor

## ABOUT THE AUTHORS



**Peter Baker**, the founder and owner of PRB Associates, specialises in operational, financial and market analysis in the ports and shipping sectors; with working experience in the ports sector and in RoRo ferry operations.

In addition to a range of project commissions in the UK and internationally, Peter has researched and produced the '*UK Short Sea Freight RoRo and LoLo Capacity Analysis and Report*' every year since 2000 and for the first time in 2009 produced an Irish equivalent. The report and database information provide a detailed analysis and assessment of the capacity provision and spread in the market, with comprehensive route, service, vessel and port information contained in detailed appendices.

**PRB Associates Limited** specialises in providing shipping and transport consultancy and analysis services for private and public sector organisations. Founded in 1998, PRB Associates has successfully completed commissions for freight generators, freight transport service providers (shipping lines and road transport operators), port operators and various public sector organisations. Assignments have ranged from service analyses, feasibility studies, financial modelling and economic impact studies, to market research and appraisal and national transport strategy formulation.



**Andrew Morgan**, the founder of Global 78, has extensive international business and logistics experience gained in projects across many industrial sectors, including food supply projects in Europe, Brazil and India. These advisory and implementation projects have ranged in scope from agri-business, through manufacturing and processing, to wholesale and retail distribution in final consumer markets.

A Chartered Member of the Chartered Institute of Logistics and Transport (UK), Andrew is the author of '*Making the Brazil Connection – managing risk in the international food supply chain*' and also co-author of the UKIBC Report '*India Agri-Food Supply Chains: Overview and Opportunities*'.

**Global 78 Limited** is focused on helping commercial clients discover new perspectives for success in local and international markets and for delivery of real bottom-line improvements. It also undertakes research for public sector policy-making. Food supply chains are complex. Innovation, resilience and sustainability are all vital elements for successful policy, strategy, and operations. The Global 78 team therefore provides clients with quality research, specialist advice, and support for implementation.

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