Project FLOW Flow report 1: Developing sustainable regional foodscapes

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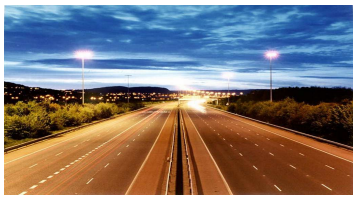
Project FLOW
FLOW Report 1:
Developing Sustainable Regional Foodscapes



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MAY 2008

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Abbreviations

SHU = Sheffield Hallam University
UHLI = University of Hull Logistics Institute
RFGYH = Regional Food Group Yorkshire and Humber
YF = Yorkshire Forward

Project FLOW
Introduction: FLOW and sustainable regional foodscapes

Understanding distribution patterns for food and drink supply chains is an essential prerequisite for implementing logistical frameworks that aim to provide sustainable distribution systems that enable efficient business development. Previous research reported by the partners in the FLOW consortium (FLOW 2008)[1] provided initial evidence from which we propose the development of a sustainable 21st century distribution network for the regional food system in the Yorkshire and Humber region. The initial FLOW report has identified centres of production for food and drink within the Yorkshire and Humber region covering the production of meat, seafood, fruit and vegetables, diary and ice, oils and fats, tea and coffee, brewing drinks, bakery foods, confectionary and general foods. Data has been collated from the Yorkshire Forward Food and Drink Cluster database and the Regional Food Group database.

Regionally, Yorkshire Forward's (2007)[2] economic trends identify road pricing and taxing as a major concern of companies. This view is strengthened by the findings of the current FLOW project using evidence from Regional Food Group member companies, many of whom cite distribution cost has a major area for improving business efficiency in the future. Regional economic trends have reported businesses expect greater fiscal regulation of transport in the future and this will impact on business activities. It is clear to many of these businesses that fiscal impacts are relatively out of the direct control of their businesses. However, they recognise changes in business practice such as the use of specialist distributors, public transportation, home-work, video conferencing and investment in less-intensive carbon technologies (such as biofuels) will ameliorate the impact of road pricing, rising fuel costs and congestion charging. FLOW will provide a framework for these businesses to make more effective management decisions about logistical planning in this changing policy and fiscal environment.

The Focus of the FLOW Project is the logistical planning and distribution innovations that will be required for regional food producers to sustainably develop markets at regional, national and international levels in the foreseeable future. The FLOW project will stimulate the development of sustainable logistical and distribution systems that will shape and support a lead market vision for regional food in a globalised industry.

The FLOW project will identify areas of research (Innovation focus Areas - IFAs) that can have greatest impact in shaping food logistics and distribution. The IFAs will place microprojects that will be communicated outside of the FLOW Consortium as case studies. The impact and demonstration data coming from microprojects will be integrated into a RFG knowledge transfer framework that will deliver an on-line portal, conferences and publications. The knowledge transfer framework will shape a self-sustaining food system distribution vision for the region that will apply to policy, research and business development.

Objectives of the FLOW project

- Identify a sustainable food and beverage distribution system based on the evidence generated in the FLOW project. The FLOW Project will provide an example of excellence and best practice that will stimulate business generation in the supply chain from regional producers to large retailers and ultimately export.
- To establish coherent linkages between other organisations who have interests in developing more efficient supply chains.
- To collate market intelligence and research to develop procedures and models of knowledge transfer to stimulate the market vision for regional food.
- To utilise data strategy and collection from knowledge transfer and networking activities to help enable the development of change required for shaping more efficient food distribution.

[1] FLOW (2008), A preliminary analysis of distribution and logistics solutions for the Yorkshire and Humber region. Ed. Martindale W, Jones J, Johnson D, Knight J, Fitzpatrick S and Grant DB
[2] **Yorkshire Forward (2007)** Survey of regional economic trends

The impetus for FLOW

In the UK, the Climate Change Bill will set a long-term framework to cut total UK domestic CO_2 emissions by 26-32 per cent by 2020, and 60 per cent by 2050[3]. Defra[4] report UK food transport produced 18 million tonnes of CO_2 in 2004 and suggest transport has direct environmental, social and economic costs of over £9 billion each year[5]. Transport CO_2 emissions are key drivers and pressures for the development of national sustainability indicators. For this reason alone the food and beverage sectors must remain diligent and aware of resource efficiency improvement and policy development. The clear impetus of fuel costs will provide strong drivers within businesses to improve efficiency in logistical planning.

The Defra Food Industry Sustainability Strategy (FISS) 'Transport Champions Group', who have developed from consultations associated with the publication of Defra's 2006 FISS,[6] suggests dramatic changes in the food supply chain can be accounted for by globalisation, changes in regional food supply base, logistical system planning and supermarkets. At present transport is highlighted by Government as the largest barrier to meeting its overall climate change targets. Total Green-House Gas (GHG) emissions from all forms of road transport amounted to 125.3 million tonnes in 2002, an increase of 13 per cent since 1990, and greenhouse gas emissions from road transport in 2002 constituted 18 per cent of a total compared with 14 per cent in 1990. The Government expects these emissions will continue to rise until 2020.

It is essential that the FLOW consortium is clearly integrating the goals of DfT's and Defra's policy outlook with the distribution activity of regional food and beverage producers. Indeed, the ability to show a system of best logistics and distribution practice based on evidence will be of significant value to the RFGYH.

The FISS Champions Group concluded that a 20% reduction by 2012 in GHG emissions associated with food and beverage transport was achievable. Particular note should be made of the Publicly Available Specification (PAS) 2050. The British Standards Institution (BSI) is currently leading the development of a Publicly Available Specification (PAS) for a method for measuring the embodied GHG emissions from products and services across their lifecycle. This has been requested by Carbon Trust and Defra in response to broad community and industry desire for a consistent method for measuring the embodied GHG emissions of products[7]. The 2012, 20% reduction goal was prioritised through the following initiatives, the initiatives have been captured in this FLOW proposal:

- **Transport Collaboration:** Combining manufacturing, wholesale, retail and service systems.
- **Logistic Systems Design:** Improvement of stores to distribution centres.
- **Greater Capacity Vehicles:** Increasing potential amount transported.
- **Vehicle Telematics:** Improving route planning and fleet utilisation.
  examples include: Paragon (www.paragonrouting.com), MJC2 UK (www.mjc2.com), Systecon UK (www.systecon.co.uk)
- **Engine Specifications:** More energy efficient and lower emission vehicle designs.
- **Out of hours deliveries:** Removing 'out of hours' restrictions.
- **Local sourcing:** Enabling local food producers to sell food much closer to its point of origin
- **Modal shift:** Typical journey shifted from to a more environmentally sensitive form
- **Alternative fuels:** Converting a vehicle fleet to operate on fuels with a lower carbon footprint. The Renewable Transport Fuel Obligation (RTFO) aims to make at least 5% of all fuel in the UK to be from a renewable source by the 2010.[8][9].

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[3] Department for Transport (2008) - Sustainable distribution: a strategy (http://www.dft.gov.uk/pgr/freight/sustainable/sustainabledistributionastrategy)
[4] Defra (2007) Food statistics pocketbook
[5] Defra (2005) The Validity of Food Miles as an Indicator of Sustainable Development
[6] Defra (2006) Food Industry Sustainability Strategy
[7] BSI (2008) PAS 2050 – Specification for the measurement of the embodied greenhouse gas emissions in products and services
[8] Department for transport (2007) Towards a Sustainable Transport System Supporting Economic Growth in a Low Carbon World
[9] Renewable Fuels Agency http://www.dft.gov.uk/rfa

Distribution and logistics solutions for the Yorkshire and Humber region

Regional population and area (data were obtained from the UK National Statistics)

County	Population	Size (km^2)
North Yorkshire	569 660	8 297
South Yorkshire	1 266 338	1 552
East Yorkshire	314 113	2 409
West Yorkshire	2 079 211	2 023

Regional distribution of food and drink companies
Two data sets were utilised for the analysis. These were:

1. Yorkshire Forward Food and Drink Cluster
2. The Regional Food Group[10] (RFGHY, 2007)

These data are presented in figures 1-25. The graphs provide a means to identify potential trends and procedures for improving logistical planning regionally across the food and drink sector.

Interpretation of regional food production and distribution data
These data represent the initial evidence that the FLOW project will use to develop sustainable regional logistics solutions.

Specialist centres of production: Type1
Figures 1 (oils and fats), 2 (tea and coffee) and 3 (seafood) show discrete centres of food production. Specialist areas of production are located in specific areas because of specific resource availability or the development of specialist ingredient production and knowledge. The identified centres of production are associated with supply via ports in the case of oils and fats, and, seafood. The centre of production for tea and coffee (Leeds) is associated with population. The analysis of Figures 1, 2 and 3 provides the FLOW project with relatively specialist areas of the food and beverage production industry in the Yorkshire and Humber region. These can provide case studies in the distribution for the identified specialist areas of the food and beverage sector.

Distribution (route) dependent scattered centres of production: Type 2
Figure 4 shows the distribution of fruit and vegetable product producers. The distribution is scattered and variable. The location of fruit and vegetable producers needs to be coupled with primary (agricultural) producers and high population densities (employees and consumers). Effective transport routes are critical to the supply chain for these Type 2 producers to link ingredient supply, employees and consumers.

Population dependent scattered centres of production: Type 3:
Figure 5 (food manufacturers), 6 (confectionery) and 8 (bakery) show scattered and variable distribution of producers. The production of food and drink products associated with population centres are coupled with supply of employees at production sites and the delivery of product to consumers.

Distribution and population dependent scattered centres of production: Type 4
Figure 7 (brewing and drinks), 9 (dairy and ice cream) and 10 (meat production) show scattered and variable distribution of producers. The production of these products are coupled with population centres and transport routes.

[10] Regional Food Group Yorkshire and Humber Directory (2007)

Regional Food Group Yorkshire and Humber company distribution
The distribution of RFG member companies largely match the distribution of food and drink producers from the YF database. There are some notable omissions of RFG member companies in particular counties as compared to the YF database. Figure 11 shows the Regional Food Group member distribution is in accordance with the distribution of producers obtained using the Yorkshire Forward database. That is, dairy and ice cream producers are predominantly in West Yorkshire, near population centres and oil and fat producers are predominantly in East Yorkshire , near ports. Figure 12 again matches the Yorkshire Forward database distributions with meat producers in West Yorkshire close to population centres and seafood producers in East Yorkshire close to ports. Fruit and vegetable producers are scattered across all four counties for the Regional Food Group members. Figure 13 shows bakery producers are associated with population centres in West and South Yorkshire, with general food producers centred in West Yorkshire population centres. Confectionery is associated with West and North Yorkshire. Figure 14 shows tea and coffee producers centred in West Yorkshire and there was a notable lack of Regional Food Group brewery members in East Yorkshire. Figure 15 shows the distribution of preserves and prepared food producers scattered across the region and there was a notable lack of ingredients producers or suppliers in South Yorkshire.

Food specialist food haulage and warehousing
Figure 16 shows food haulage provision to be scattered throughout the region and food warehousing to be associated with East Yorkshire.

The logistical requirement of Regional Food Group members
A questionnaire survey was carried out with the 200 Regional Food Group member companies. The data presented in Figures 18-25 show the responses from 52 of the questionnaires. The survey aimed to determine logistics and distribution practices amongst member companies. Table 1 summarises the responses of the RFG member companies. A typical RGF member company will use their own transport resources that account for 10% of their company's financial turnover, they distribute less than 1 tonne of product each day nationally, the product is ambient or chilled on pallets, and, many RGF members have spare storage capacity.

FLOW case studies
The data analysed suggest FLOW case studies should include the following to obtain significant logistic impact across the food and drink sector.

1. Two regional Food Group companies that distribute less than 1 tonne of product per day nationally.
2. Two SME's, could be Regional food Group members. Larger SME's with less than 250 employees
3. Two groups with high capacity and financial turnover.
4. It is suggested that 20 SME's and 20 micro-company studies will need to be carried out to implement the development of models for sustainable regional food distribution networks.

Discussion and outcomes of the initial development of FLOW
Initial FLOW research has shown there are clear centres of production for oils/fats, seafood and tea/coffee where there are lower numbers of companies. These mightl provide 'transport hub' case studies that are relatively easy to manage (low number of companies, possibly large numbers of customers or lower numbers of wholesalers). Confectionery may fit within this low number of companies' category, that is, low company number and more definable centres of production. Other data distributions from the YF database generally show centres of production associated with population and road transport networks. Further analysis in FLOW will explore the relationship of these distributions with turnover and employee number. The distributions of business obtained from the RFG directory will be cross referenced to the YF database. This will provide potential strategic information for developing business planning for regional food and beverage businesses. Maintenance and continued development of a FLOW database within the RFGYH framework is critical to the success of FLOW.

Table 1. Analysis from a questionnaire survey of 200 Regional Food Group member companies. The analysis has been obtained from 52 returned questionnaires. The table summarises what a typical RFG member currently does with regard to distribution of food and/or drink products and includes and analysis of what might be possible using the Work Programmes developed by FLOW. The data for this analysis is presented in Figures 18-25 show the responses.

What the RFG companies currently have	What RFG companies might achieve
• Own distribution resources used	• Group distribution. Cooperate with RFG members and use specialist haulage
• Distribution cost is 10% of turnover	• Implement new cost-saving technologies. Increase fuel and transport costs create need to implement cost saving technologies and networks
• Distribute nationally	• Develop internet and international retail. Impetus for internet marketing and international growth
• Distribute less than 1 tonne of product daily	• Cooperation between RFG members to rationalise high amounts of small load distribution
• Distribute ambient and chilled	• Utilise frozen and other forms of preservation
• Distribute using pallets	• Utilise retail ready, reusable and recyclable packaging
• Own spare storage capacity	• Cooperation between RFG members to optimise storage

The data collated in the initial phase of FLOW provides an opportunity for FLOW to**:**

1. develop and test a hub and spoke distribution model for the region. A two tiered approach for such a model has been suggested by the FLOW working group.
   Tier 1 hubs (5-6 hubs) will be clearly associated with larger cities/towns and be concerned with distribution to major retailers.
   Tier 2 hubs (5-6 hubs) will be associated with SMEs/ingredient suppliers and lower population centres. The Tier 2 hubs will distribute to tier 1 hubs and direct to customers.
   The development of the tiered hub model and determination of how products are transported to potential hubs will be an outcome of FLOW microprojects and case studies, computer simulation and scenario generation.
2. The hub model for FLOW (see below) will be placed into a framework of microproject delivery. Microprojects will be 20-30 days in duration and tackle supply chain and whole product life cycle issues associated with distribution and logistical improvements cited above. Microprojects will be selected using the evidence obtained in work Package 1.

Case studies and microprojects: examples of microproject format proposed in FLOW have been delivered in previous projects with the focus of food and beverage supply chain management. Tools and models generated from these data will be based on robust research and evidence, and, remain practically grounded in company procedures. The projects cited below are Innovation

focus Areas (IFAs) that provide examples of previous supply chain interventions that have enabled companies and SMEs to implement innovations.

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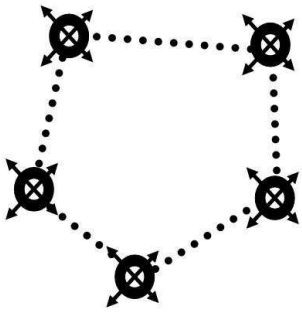
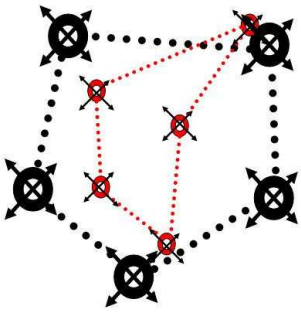
<td> 
Tier 1 distribution hubs to retailers and RDCs</td>
<td> 
Tier 1 and Tier 2 hubs from regional producers to retailers and RDCs</td>
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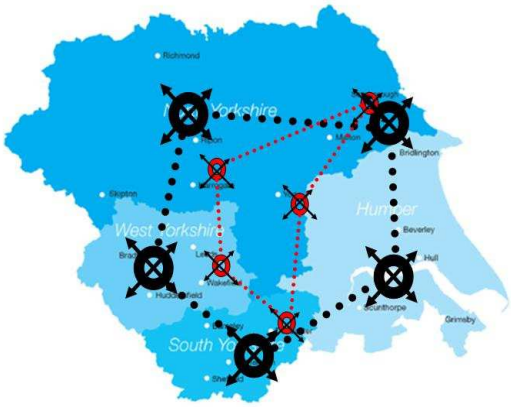
<td> 
Tier 1 and tier 2 hubs regionally</td>
<td>Initial model of regional distribution developed by FLOW. The two tier model will be refined with microproject, case-study and modelling data.</td>
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Innovation Focus Areas (IFAs) for the FLOW Project

IFA 1: Greenhouse Gas (GHG) emissions from the farm to the kitchen
Further information:
An assessment of bakery supply chain GHG emissions
http://www.foodinnovation.org.uk/download/files/carbonfootprint.pdf
Communication GHG emissions, health considerations and distribution ('food miles') issues to consumers
http://www.foodinnovation.org.uk/download/files/envhealthchoice.pdf

IFA 2: Preservation and production capacity
Further information:
Novel preservation methods developed by the FLOW lead partner that have resulted in regulatory compliance, cleaner labels, lower production cost and improved distribution capacity
http://www.foodinnovation.org.uk/download/files/sulphitereplacement.pdf
Improved product formulation that reduce syneresis and skinning of products in transit to retail outlets
http://www.foodinnovation.org.uk/download/files/sauces.pdf

IFA 3: Understanding waste, co-products and by-products in food and beverage distribution
Further information:
The lead partner of the FLOW project has experience of developing co-product solutions where waste generation has been diverted to alternative products. Without the

implementation of such production assessment the company involved in this study would have invested greater resource in waste distribution.
http://www.foodinnovation.org.uk/download/files/coproduct.pdf
The lead partner in the FLOW project has experience of implementing Waste Management Plans, Environmental Management Systems and identifying areas of the waste cycle where greater resource efficiency can be realised.
http://www.foodinnovation.org.uk/download/files/waste.pdf

IFA 4: Consumer behaviour, ethical food, packaging and labelling
Further information:
Communication GHG emissions, health considerations and distribution ('food miles') issues to consumers
http://www.foodinnovation.org.uk/download/files/envhealthchoice.pdf

IFA 5: Logistics systems, management and production
Developing traceability and regional brands (PGI and PDO):
(see http://www.foodinnovation.org.uk/download/files/GMfoods.pdf).
Modelling production, batch, capacity and distribution processes: influence of food production planning on distribution capacity
Management systems for distribution, processes and production: include Environmental Management Systems, Life Cycle Analysis (LCA), Six sigma, Lean manufacturing, computer simulation and Statistical Process Control.

It is suggested that FLOW should develop data collation and reporting procedures that will provide toolbox/kit-type methodologies that will enable companies and policy makers identify lead market areas where research, development and management activities can be applied effectively. Business development and innovation models will be placed in the context of the impact assessments, risk assessments and results of the FLOW microprojects. Data structures will be trialled with FLOW companies using an on-line portal. A dissemination plan (including conferences) will report FLOW projects and findings.

FLOW will apply research activities across the food and beverage supply chain to accommodate reviews and case studies in logistics, waste, packaging, ingredients, recipes, manufacturing process; and, health and wellness.

FLOW Project data- January 2008-April 2008

Figure 1. Oil and fat production in the Yorkshire and Humber region. Figure 1 shows a total of 10 oil and fat producers in the Yorkshire and Humber region. The data indicates that there is one centre of production in Hull (5).

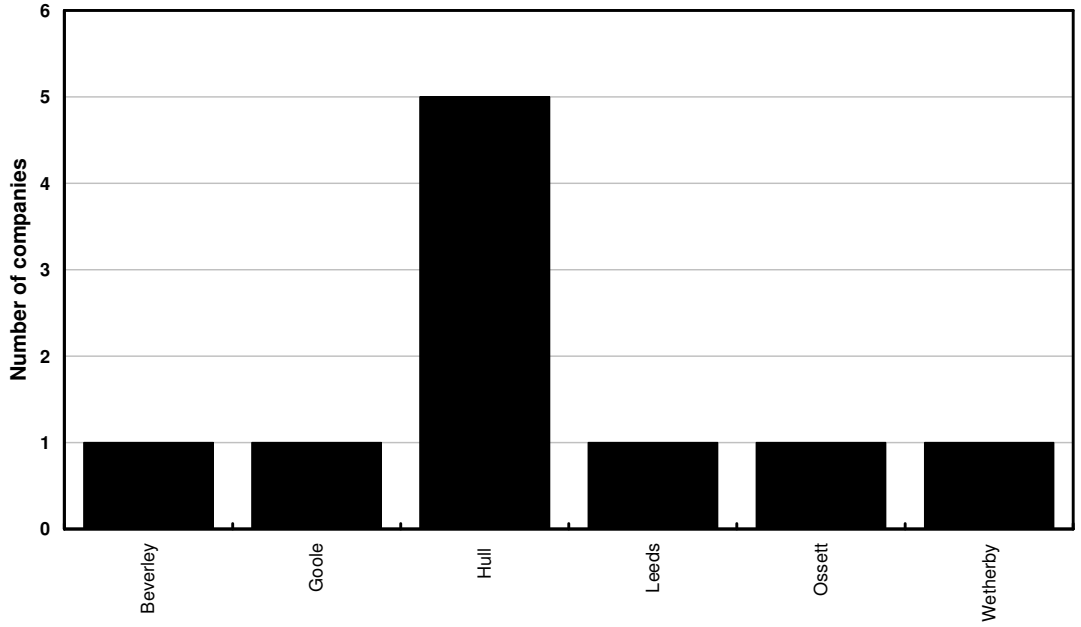


Figure 2. Tea and coffee production in the Yorkshire and Humber region. (Yorkshire Forward database)

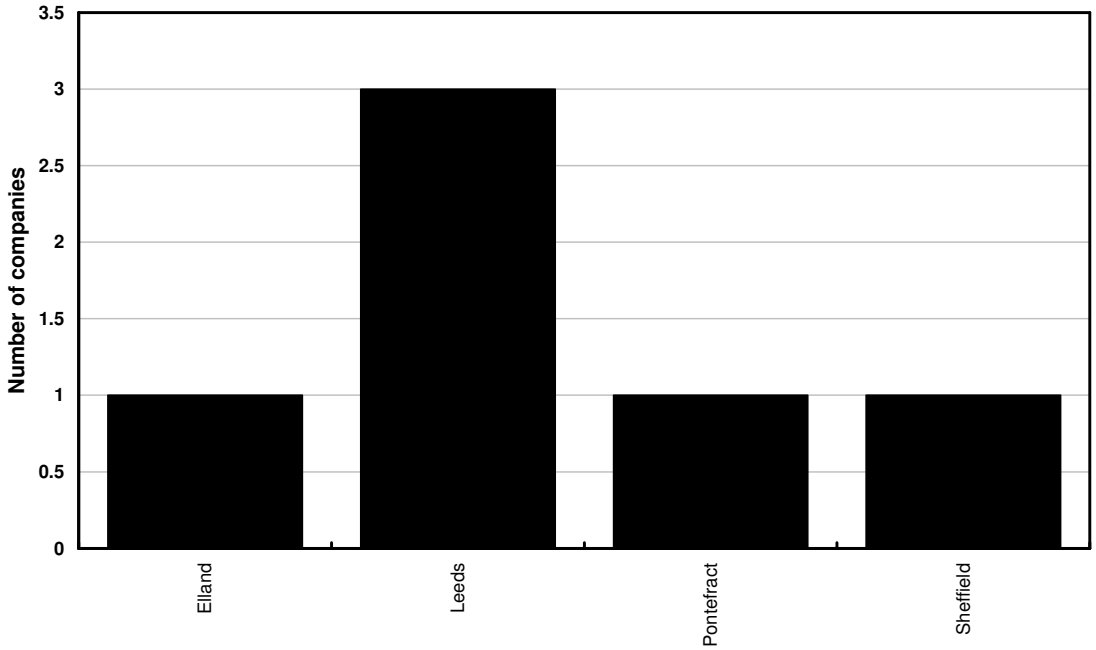


Figure 3. Seafood production in the Yorkshire and Humber region. Figure 3 shows a total of 53 seafood producers in the Yorkshire and Humber region. The graph highlights two major centres of production in Grimsby (27) and Hull (16), both of which are in East Yorkshire.

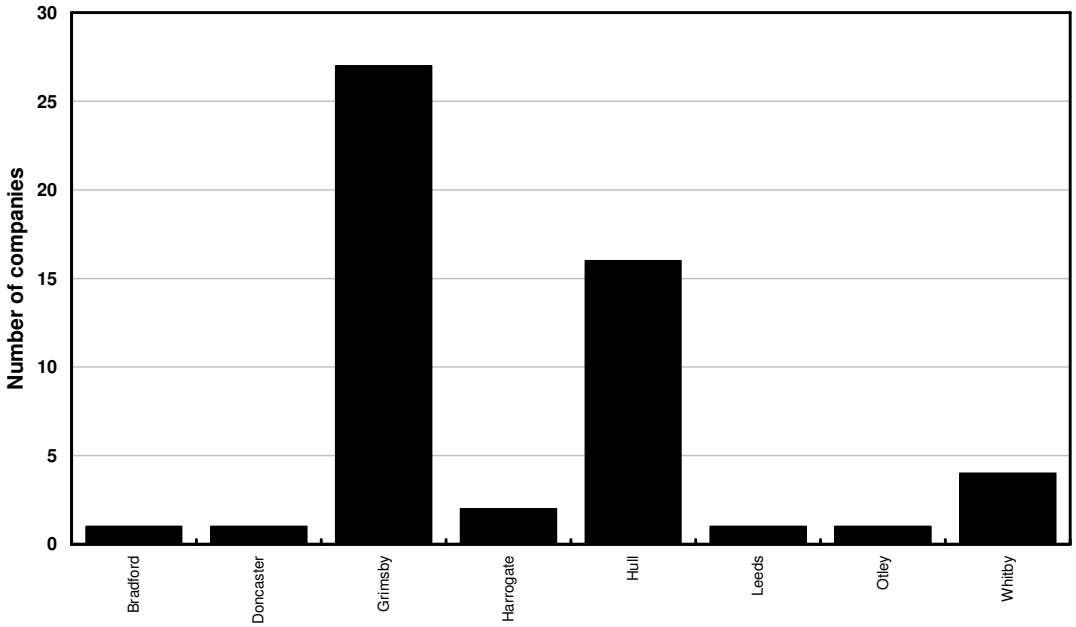


Figure 4. Fruit and vegetable production in the Yorkshire and Humber region. Figure 4 shows a total of 76 fruit and vegetable producers in the Yorkshire and Humber region. The graph highlights 5 centres of production in Doncaster (4), Driffield (5), Hull (7), Leeds (6) and Ripon (8). There is also with a large proportion of towns with only one producer (20 out of 34).

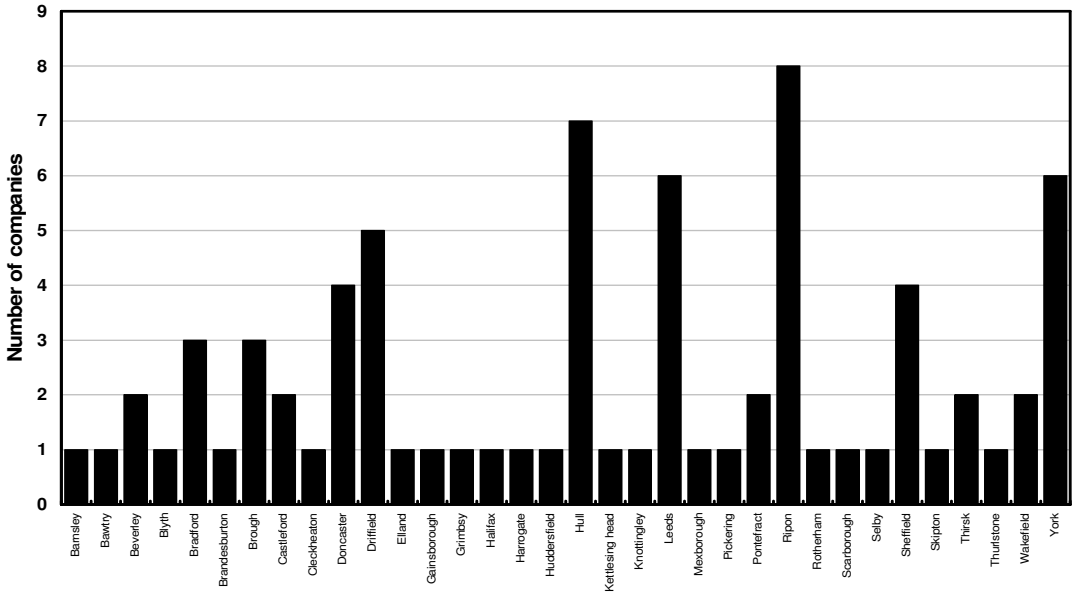


Figure 5. Food manufacturers in the Yorkshire and Humber region. Figure 5 shows a total of 242 food manufacturers in the Yorkshire and Humber region. The graph highlights four major centres of production in Bradford (23), Hull (24), Leeds (27) and Sheffield (19).

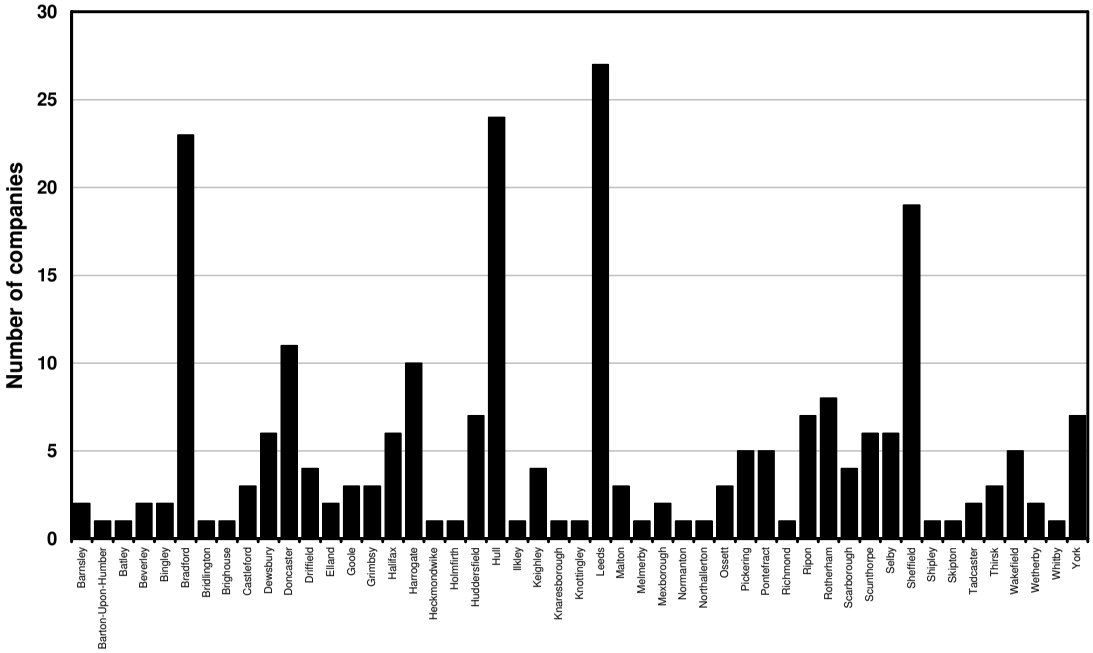


Figure 6. Confectionery production in the Yorkshire and Humber region
Figure 6 shows a total of 62 confectionary producers in the Yorkshire and Humber region. The main centre of production for confectionery is in York (9) followed by Leeds (6) and Pontefract (6).

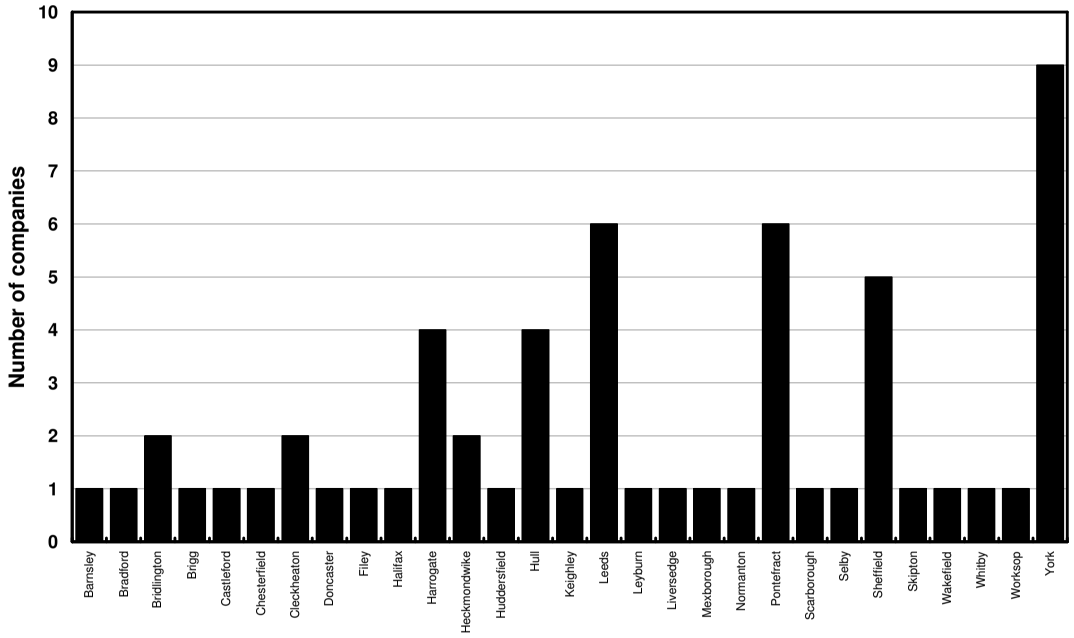


Figure 7. Brewing and drinks in the Yorkshire and Humber region. Figure 7 shows a total of 64 brewing and drinks producers in the Yorkshire and Humber region. There are seven centres of production in Barnsley (5), Bradford (6), Huddersfield (4), Leeds (5), Ripon (4), Wakefield (5) and York (4).

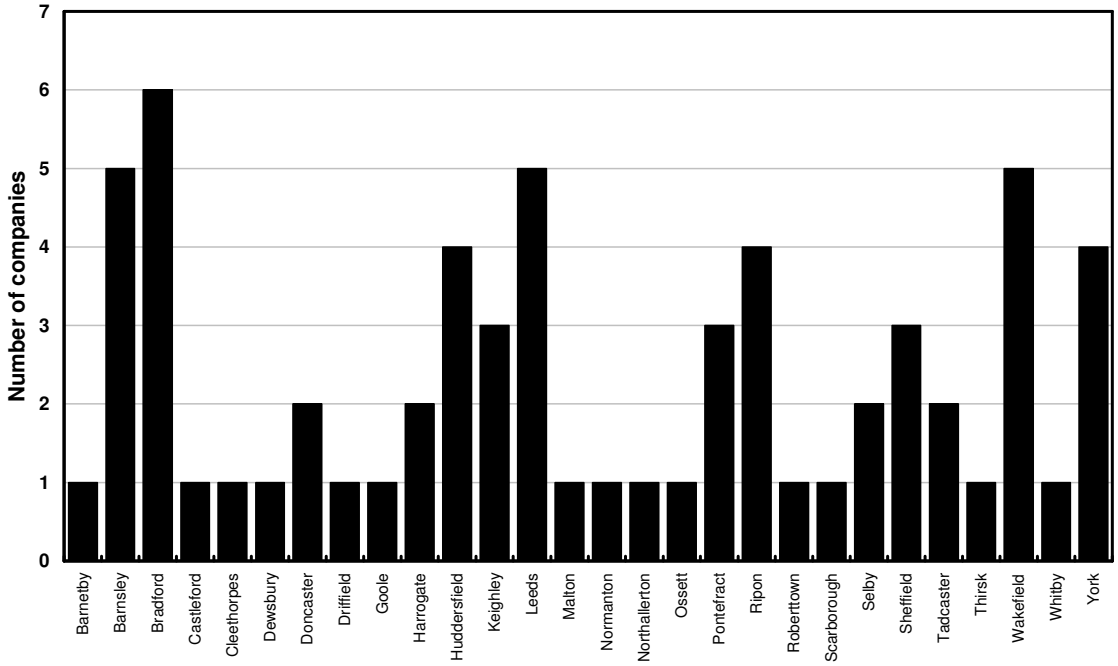


Figure 8. Bakery production in the Yorkshire and Humber region. Figure 8 shows a total of 108 bakery producers in the Yorkshire and Humber region. There are four centres of production in Leeds (19), Hull (12), Sheffield (11) and Bradford (10).

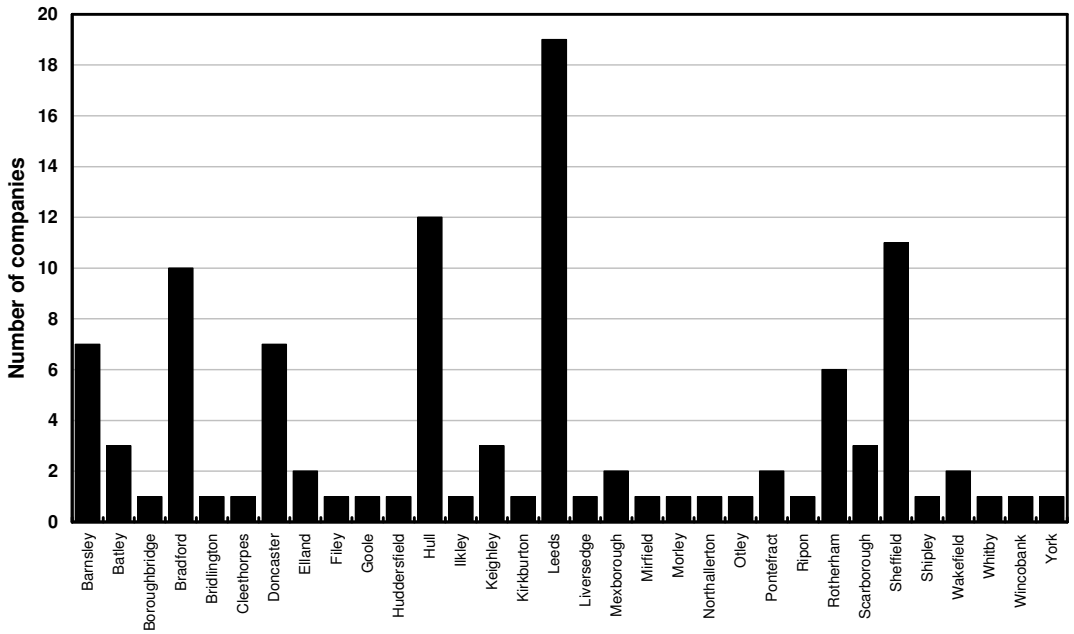


Figure 9 Dairy and ice production in the Yorkshire and Humber region. Figure 9 shows a total of 175 dairy and ice producers in the Yorkshire and Humber region. The main centres of production are Leeds (14) and Sheffield (16).

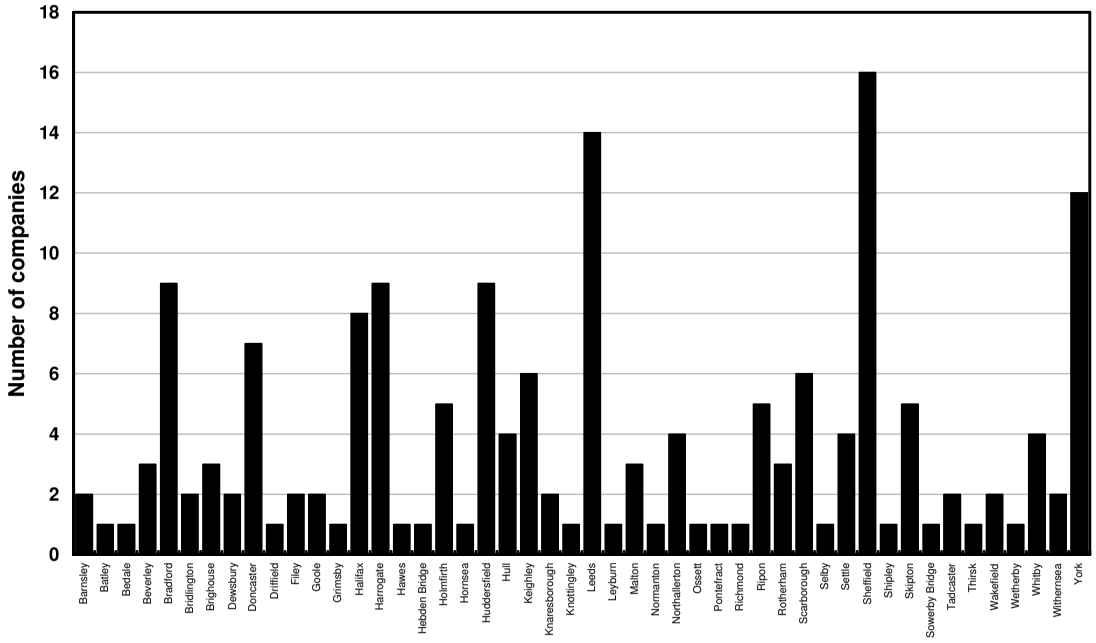
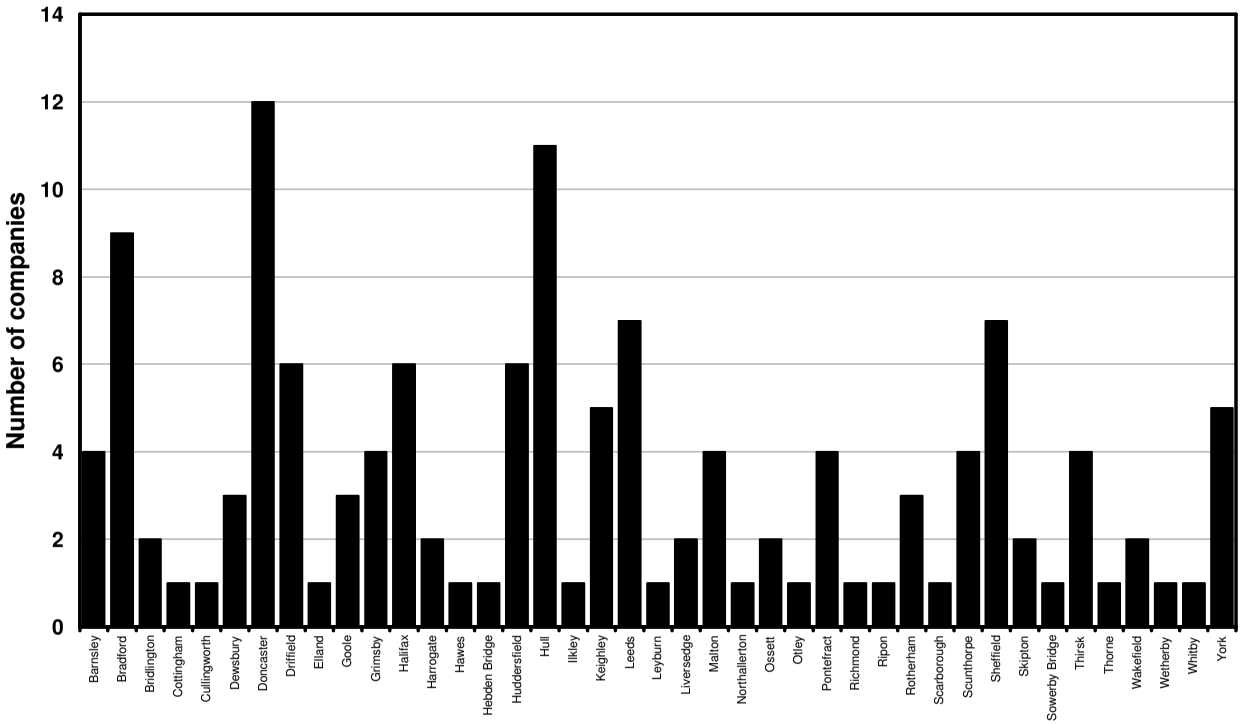


Figure 10. Meat production in the Yorkshire and Humber region. Figure 10 shows a total of 233 meat producers in the Yorkshire and Humber Region. Major centres of production are in Doncaster (12), Bradford (9) and Hull (11).



Regional Food Group Directory data
Analysis of the centres of production for counties in the Yorkshire and Humber region was conducted using regional food group data for producers[11].

Figure 11. Dairy, ice, oils and fats production in the Yorkshire and Humber region. Figure 11 shows a concentration of dairy and ice producers in West Yorkshire (45%) and a large number also in North Yorkshire (28%). The graph also shows a concentration of oils and fats production in East Yorkshire (70%).

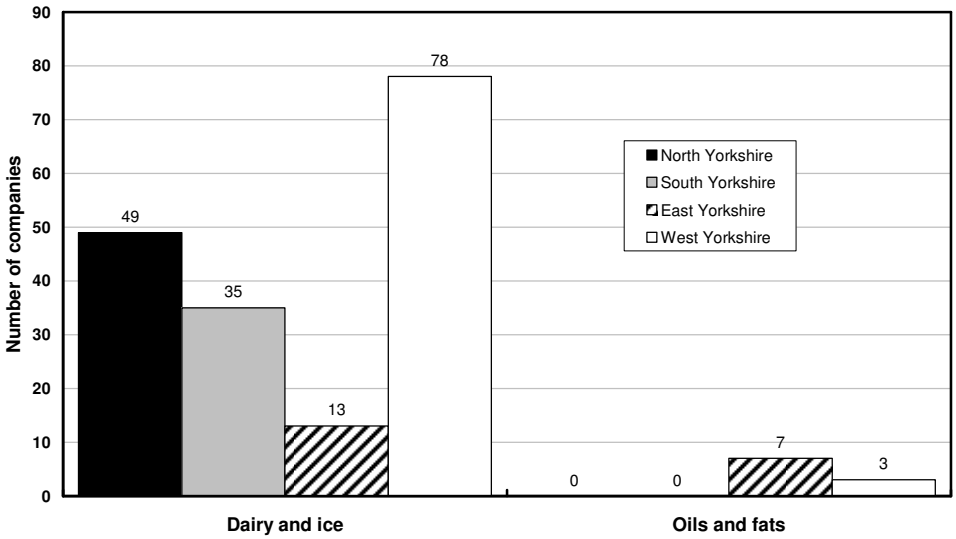
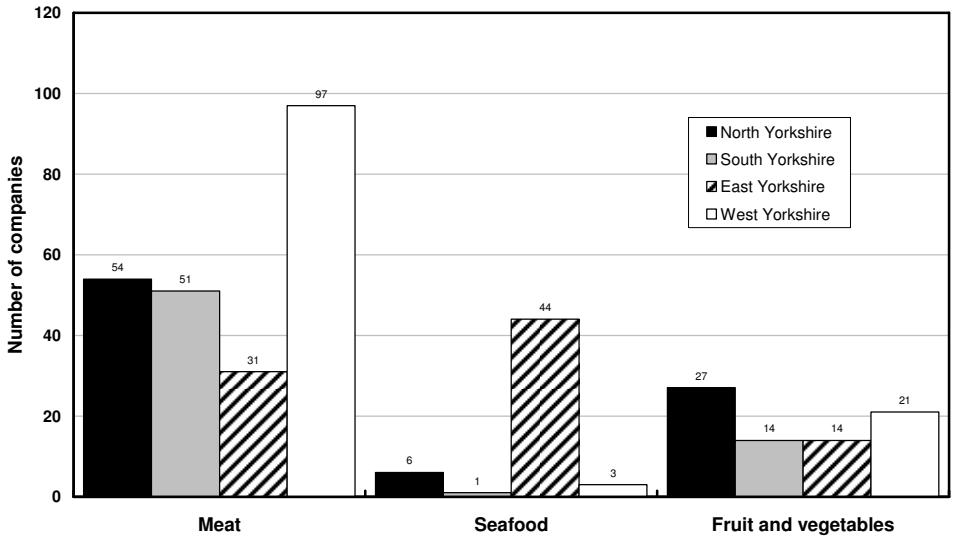


Figure 12. Meat, fish, fruit and vegetable production in the Yorkshire and Humber region.
Figure 12 shows a concentration of meat production in West Yorkshire (42%). Seafood production is heavily concentrated in East Yorkshire (81%). Fruit and vegetable production is more focused in North Yorkshire (35%) but generally evenly distributed over the whole region.



[11] Regional Food Group Yorkshire and Humber Directory (2007)

Figure 13. Bakery, general food & confectionary producers in the Yorkshire and Humber region. Figure 13 indicates that there is a concentration of bakery production in West Yorkshire (45%) and South Yorkshire (33%). General food production is concentrated in West Yorkshire (45%). Confectionary production is mainly situated in West Yorkshire (42%) and North Yorkshire (30%).

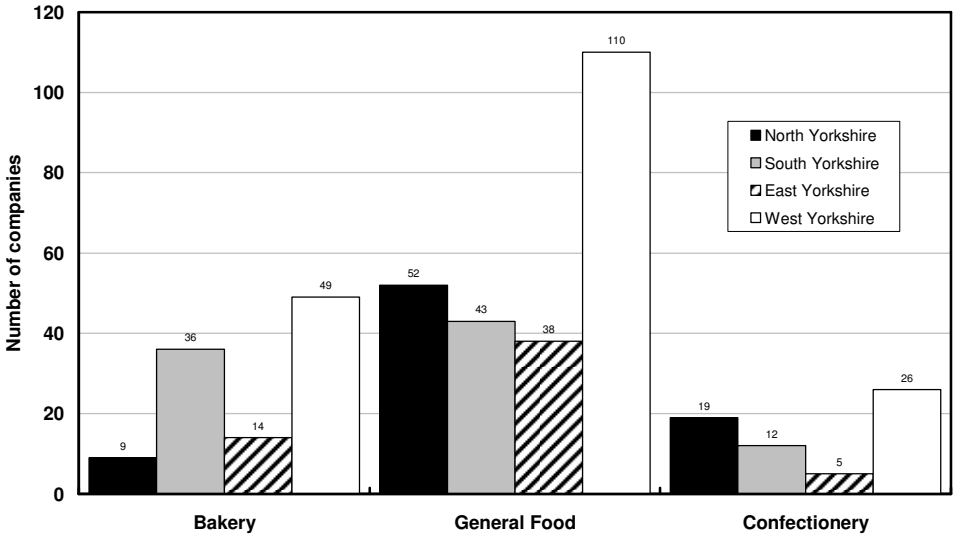


Figure 14. Tea, coffee, brewing and drinks producers in the Yorkshire and Humber region. Figure 14 shows a concentration of tea and coffee production in West Yorkshire (86%). Brewing and drinks production is concentrated in West Yorkshire (56%).

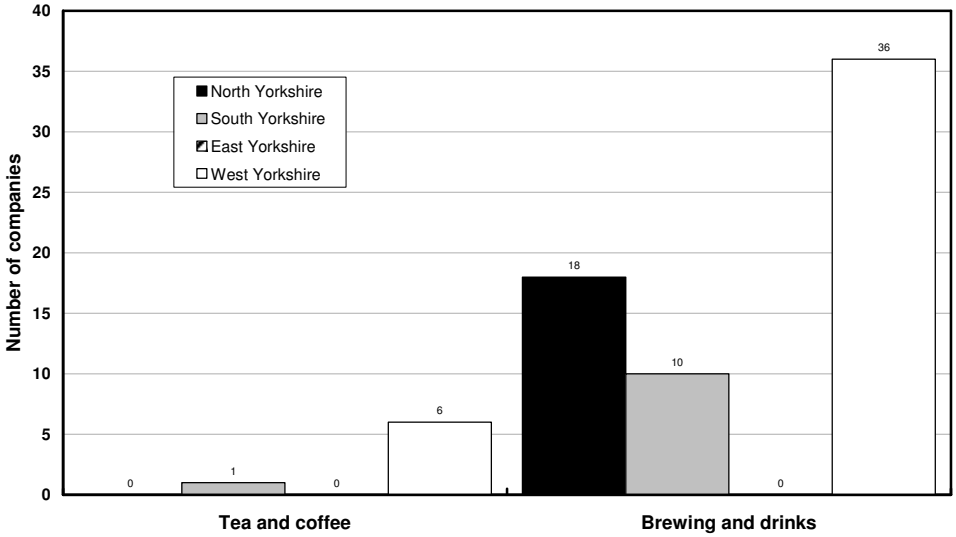


Figure 15 Ingredient related, prepared food and preserve producers in the Yorkshire and Humber region

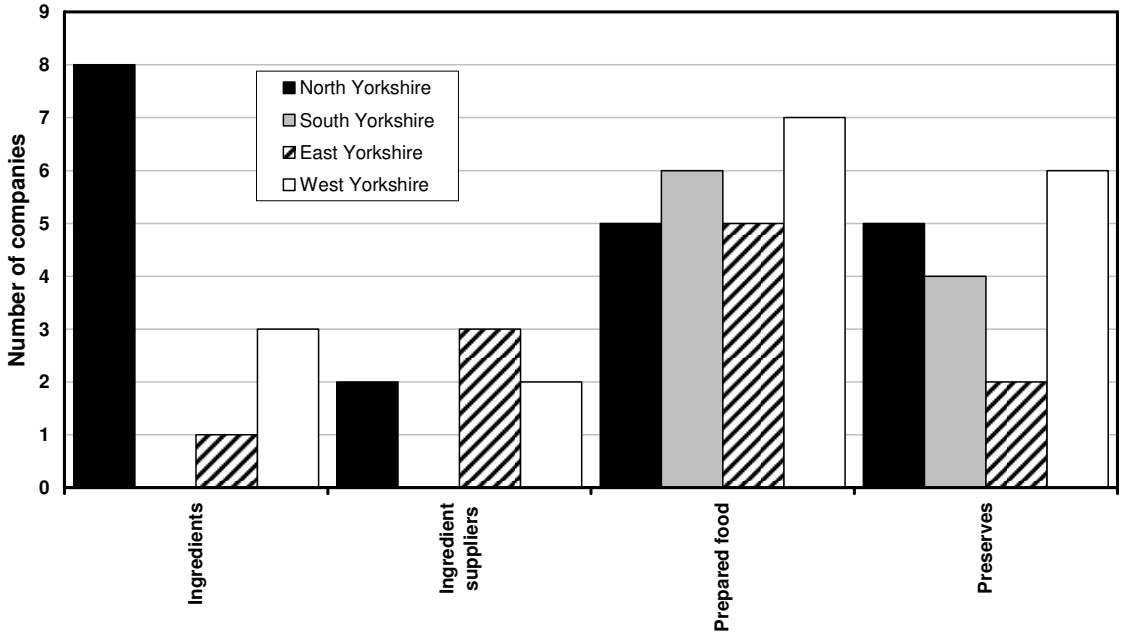
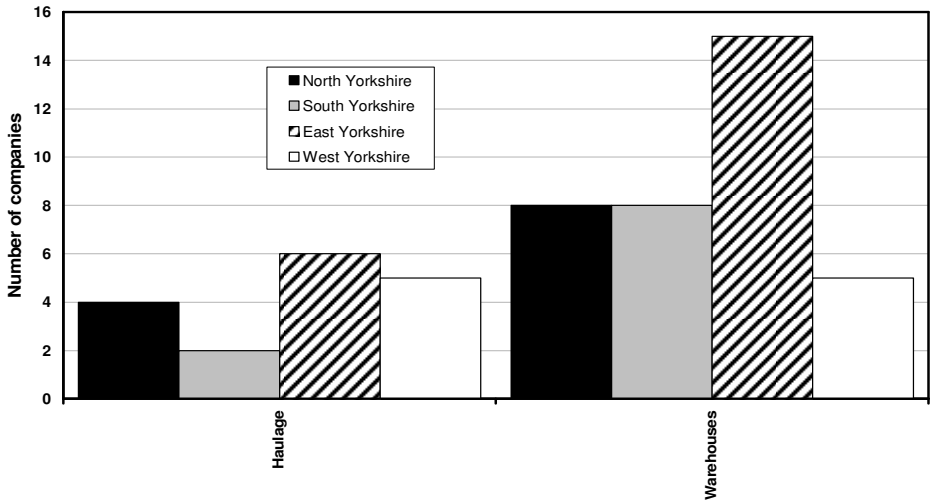


Figure 16 Haulage and Warehouse companies in the Yorkshire and Humber region (data from RTA web database). The data for figure 4 was based on an internet based search. Haulage data was obtained form the Road haulage Directory (http://www.roadhaulage.com) and warehouse data from the UK Warehouse Association (http://www.ukwa.org.uk). The selected data show that 41% of warehouses are situated and only 14% in East Yorkshire. Hauliers are mainly situated in the East and West Yorkshire.



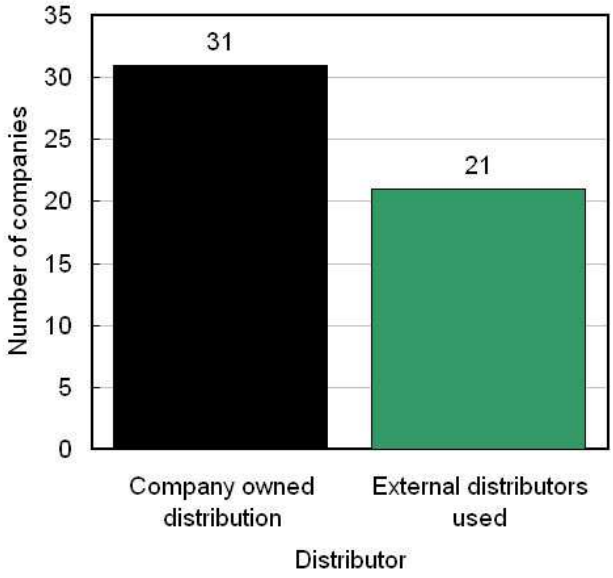


Figure 18.

Most RFG companies utilise their own distribution, however, many utilise external distribution companies

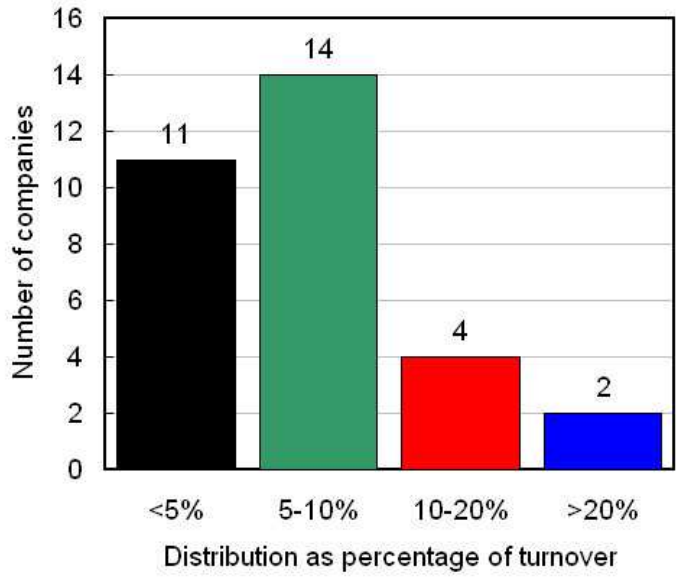


Figure 19

Most RFG companies operate with distribution costs below 10% of their turnover

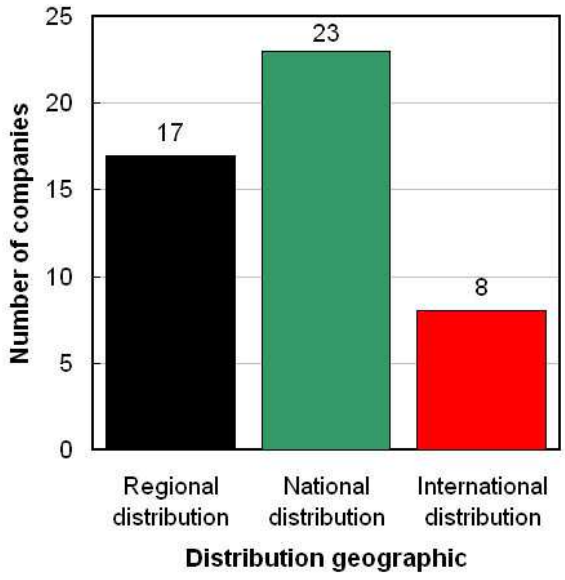


Figure 20

Most RFG companies distribute nationally

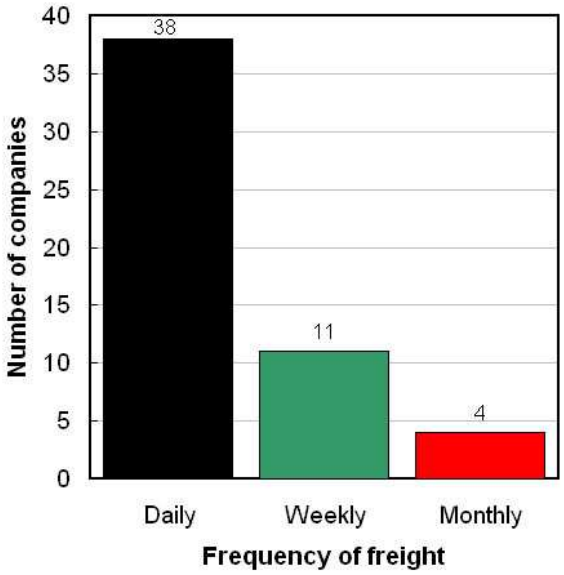


Figure 21

Most RFG companies distribute daily

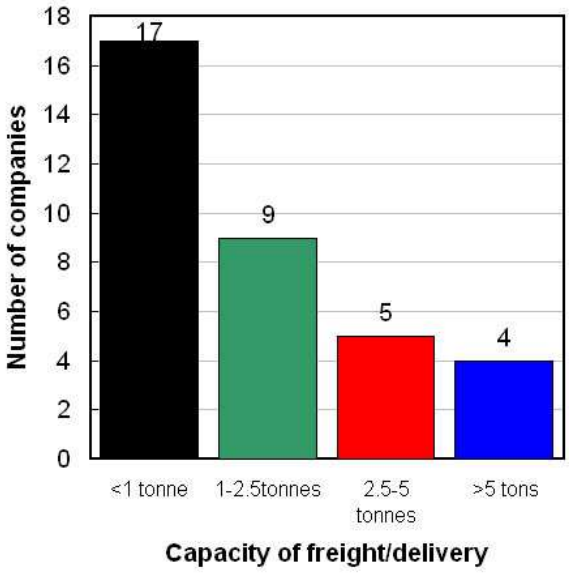


Figure 22

Most RFG companies distribute loads of under 1 tonne

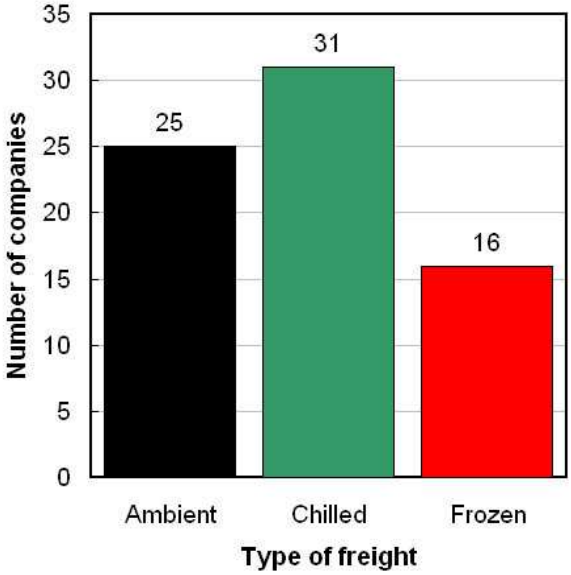


Figure 23

Ambient distribution accounts for almost half of the distribution with the remainder split 75:25 chilled:frozen.

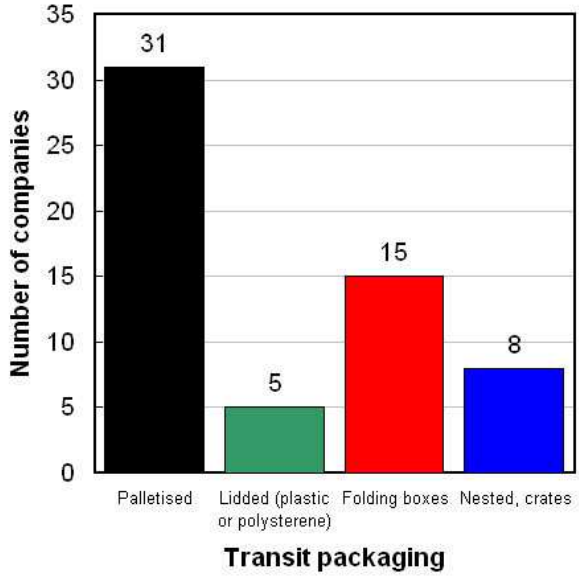


Figure 24

The packaging type of choice is pallets at 50% of the transit packaging type. This is followed by folding boxes (25%) with lidded polystyrene and crates making up the remainder.

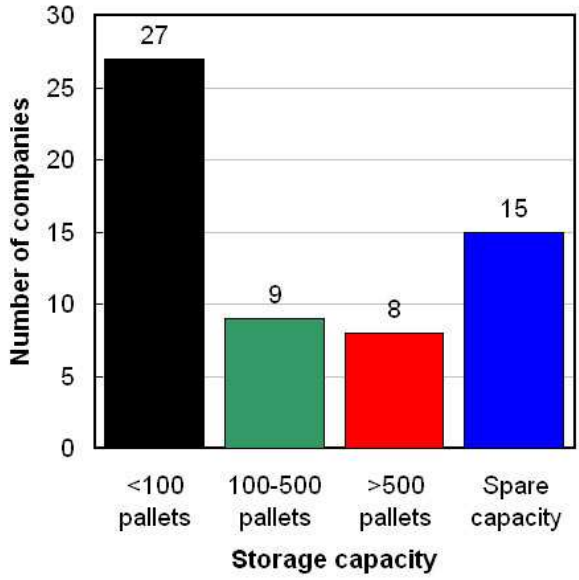


Figure 25

Storage capacity of RFG members is general below 100 pallets (60%). Approximately 30% of members have spare storage capacity.