Market development strategies to promote compost produced from biodegradable waste in Wales.

Dawson, Gemma Francesca

Market Development Strategies to Promote Compost Produced from Biodegradable Waste in Wales.

by

Gemma Francesca Dawson, BSc (Hons)

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School of Business and Economics

University of Wales Swansea

Singleton Park

Swansea

SA2 8PP

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SUMMARY

In the UK there has historically been a reliance on landfill as the main method of waste disposal. However, EU legislative drivers have been put in place to reduce the quantity of waste sent to landfill, with a particular emphasis on biodegradable waste. Recycling and composting have been identified as preferred methods of waste treatment, but adopting these measures will create the need to find markets for the end products of the processes. This thesis investigates the challenges faced in Wales to achieve recycling/composting targets and examines ways to develop markets for the composted fraction of biodegradable waste.

The research explains current waste management practices, specifically looking at composting processes. Case studies to highlight the various options available to waste managers are presented, and the theory and practice of marketing recycled products is examined.

The aim of the thesis is for the research to culminate in market development strategies to promote the uptake of compost produced from biodegradable municipal waste in Wales. Development of the strategies required an empirical study to determine the main actors within the composting industry in Wales and to establish the potential contribution of each of their roles. This was achieved by conducting qualitative depth interviews, followed by a larger scale survey of selected stakeholder groups in the industry. Consumer preferences were predicted using conjoint analysis. Although conjoint analysis is a technique which is well established in the marketing field, its use is novel within waste management research.

The findings of the study identify the current barriers to the market and how these barriers might be overcome through the use of Welsh sustainable procurement initiatives. Recommendations are made regarding product development, marketing and the specification of green waste compost.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

Signed ..... (candidate)
Date 22.02.06

STATEMENT 1

This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

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I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

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To Mum and Dad

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CHAPTER 1

INTRODUCTION

1.1 Introduction and scope of the research

The subject of waste and its management is an ever increasing problem for governments throughout Europe and in particular for the UK. In recent years, various legislative drivers have been introduced by the European Union to place controls on the levels of waste being sent to landfill. Although these legislative drivers will have an impact upon all European countries, the UK's historic reliance on landfill as its primary method of waste disposal means that the UK will face a far greater waste management challenge than many other member states whose reliance on landfill is less pronounced.

Options currently adopted by EU states for the treatment and disposal of their municipal waste include landfill, recycling and composting, and incineration. Table 1.1 indicates the scenario in 2002 when this research study commenced, showing the UK's position in relation to a number of other countries. With over three quarters of the UK's municipal waste stream being assigned to landfill, it is clear that any limits imposed on landfill would create significant management problems. Alternative waste management options would have to be identified, and measures

put in place to ensure the success of these options. This thesis will focus on options currently being considered in the UK and more specifically, within Wales.

Table 1.1 Treatment and disposal figures for municipal waste in Europe in 2002

	Treatment and Disposal (%)		
Country	**Landfill**	**Recycling/Composting**	**Incineration**
Belgium	13	52	35
Denmark	6	38	56
Finland	64	28	8
France	39	27	34
Germany	23	52	25
Greece	91	9	0
Italy	57	35	8
Netherlands	9	54	37
Spain	61	32	7
Sweden	20	40	40
United Kingdom	78	15	7

(Source: Eurostat, 2005)

In the UK, public perception of incineration (with or without energy recovery) is poor. The proposed solution in Wales in particular, is to increase levels of recycling and composting as a means to divert waste from landfill. Recycling and composting have been identified as preferred methods of waste treatment, however adopting these measures will create the need to find markets for the end products of the processes. The need for strategies to develop and market these end products will underpin this research project.

Biodegradable waste presents a particular waste management problem because of its nature, and because of the quantities produced. Biodegradable municipal waste consists of paper, natural textiles, food and garden waste, and this fraction of the municipal waste stream accounts for approximately two thirds of the total waste arisings (AEA, 2003; Environment Agency 2005).

Biodegradable municipal waste can be collected and composted to produce an organic product which can have a variety of potential uses within the growing media industry. However, the method of collection of this waste will affect the quality of the composted product. If the biodegradable waste is collected together

with other municipal solid waste (MSW), in mixed waste collections, it will be contaminated with other waste materials such as glass and plastics. It can then be treated, for example, by mechanical biological treatment (MBT) processes involving a prolonged composting treatment after the removal of dry recyclables. However, the quality of the end product will be poor, and the material produced may still need to be disposed to landfill.

Waste management operations in Wales have therefore begun separately collecting a portion of biodegradable municipal waste and composting this material. Currently this portion has been predominantly the green garden waste fraction of municipal waste, though potentially the other biodegradable components could also be composted. Composting green garden waste that has been segregated at source could provide the producer with a product which has the potential to achieve a good quality and could be marketed as a growing media product to a number of end user markets. End uses for compost have been identified within the following sectors: horticulture, amateur gardening, agriculture, landscaping, grounds maintenance, land restoration and landfill engineering (Composting Association, 2005).

Compost suitable for the growing media market could potentially also be produced using catering and food wastes and ultimately this fraction of the waste stream will need to be diverted from landfill in order for the UK to achieve the legislative targets set by the EU. At the time this research commenced however, the development of facilities suitable for composting food waste in Wales was in its very early stages. The composting industry is working in a very dynamic environment and advances are continually being made to composting systems. Health concerns about the composting of food wastes are dictating many of the changes to composting systems and processes. During the period of the research there has been a level of uncertainty regarding how proposed regulations for composting food and catering waste would affect producers. This had a bearing on the decision to concentrate the initial research on markets for green waste compost. Early indications also suggested a worrying level of scepticism regarding the value of green waste compost and similar, if not more complicated problems could be envisaged for food waste derived compost.

1.2 Contribution and methodology of the research

Composting the garden waste fraction of municipal waste is an obvious solution to the challenges presented by EU legislative targets, as it can potentially divert large quantities of biodegradable waste away from landfill. For waste managers the further appeal of producing green waste compost is the potential to generate income from sales of the product within the growing media industry. However, trying to break into the growing media industry and to establish a sound customer base will be a significant challenge for many green waste compost producers. If green waste compost is to be part of a sustainable waste management programme, then viable outlets for the compost must be identified and appropriate strategies must be employed to market the product. The intention of this research is to devise these market development strategies to be used to promote the uptake of compost produced from municipal waste by displacing currently used materials within the growing media industry.

Schaltegger et al (2003) identified market development strategies as a means of reducing the barriers that limit the potential sales turnover of environmentally friendly goods. Areas relevant to compost production and the growing media industry as a whole might include;

- Well-established life and consumption habits, reflecting lack of knowledge in a large part of the population
- Absence of transparent, reliable and generally valid quality standards, product information and eco-labels
- Bureaucratic hindrance to environmentally oriented businesses in the service sector

This research will investigate some of these issues relating to the development of the green waste composting industry in Wales by identifying the current barriers to the market and suggesting potential solutions which will result in the identification of suitable market outlets for the product. These strategies will address the need to create awareness of the product, to change well established purchasing behaviour

within the identified market sectors and to achieve government objectives through involvement of all the actors within the production and consumption chain.

The research methodology will comprise a series of depth interviews with each of the seven main stakeholder groups identified. These stakeholder groups consist of government bodies, landscape consultants, landscape contractors, growing media suppliers, independent retailers, horticulturalists and agriculturalists. Figure 1.1 identifies each of the stakeholder groups and their role within the composting industry. The qualitative research will be followed by a larger scale postal survey which will be largely quantitative. The results of the qualitative interviews will be used to identify which stakeholder groups to target for the survey and what factors will need to be taken into consideration when designing the survey questions. Follow-up interviews will be conducted to discuss the findings of the survey and address any possible developments within the industry which have occurred during the course of the study.

1.3 Structure of the thesis

The intention of this study is that the research will culminate in a market development strategy to facilitate the sustainable management of biodegradable waste in Wales. In achieving this objective it will be necessary to develop an understanding of the waste management industry in Wales, with particular reference to the composting industry and the impacts which EU legislation and targets will have upon these processes.

Chapter 2 will outline the relevant legislative drivers, the UK and Welsh strategies which have been devised to achieve the targets, and will provide detailed information about composting technologies and processes in Wales.

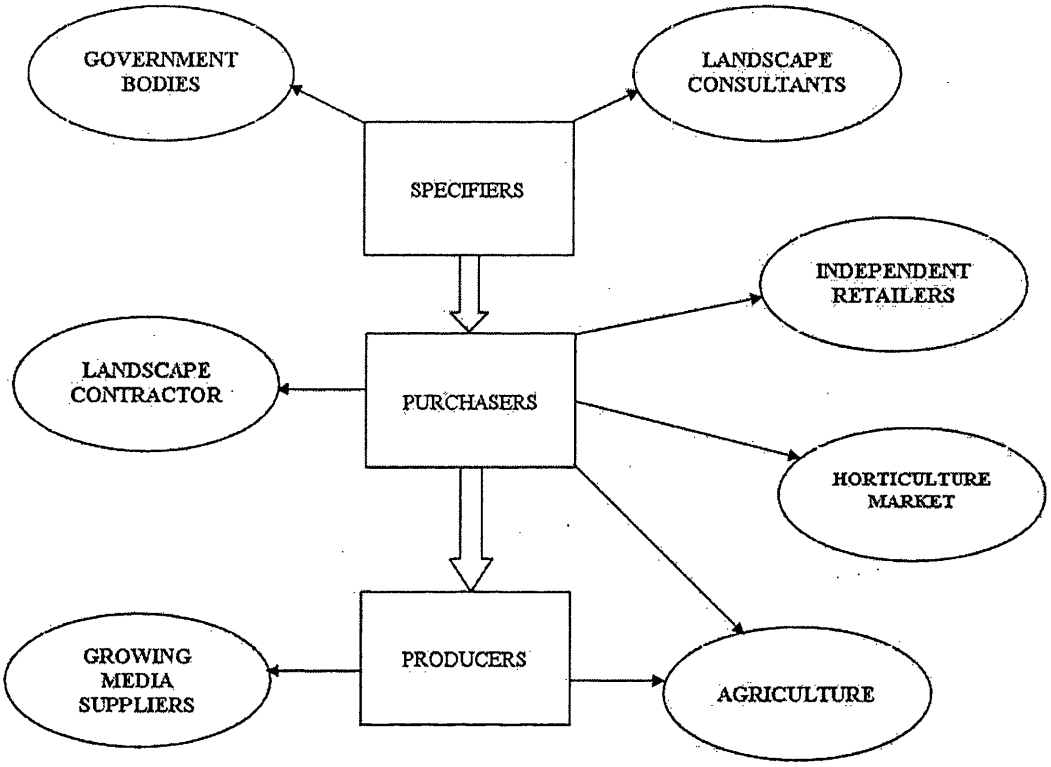

Figure 1.1 Diagram to show main stakeholder groups within the compost industry in Wales

Chapter 3 presents case studies which attempt to highlight the different options available to producers of green and mixed waste compost. The case studies are examples of either innovative or pioneering practices within the composting industry investigating the potential to create value from waste derived products. A key theme with the case study examples is to promote the use of recycled and sustainable materials.

In Chapter 4 the topic of marketing green and recycled products is investigated. Examining previous research and the literature available the purpose of the chapter is to establish whether green marketing techniques have been effective in the past, and how the marketing of 'green' and recycled products has developed since they were first introduced. This information will inform the empirical research and help to design strategies to develop markets for waste derived compost.

The empirical research is presented in Chapter 5 and Chapter 6. During the course of the study depth interviews were conducted with members of each stakeholder group to develop an understanding of the hierarchy within the composting industry in Wales. The results of the interviews are reported in Chapter 5. The quantitative research element consisted of a postal survey sent to the primary purchasers of green waste compost, the landscape contractors and the independent domestic retailers. The survey comprised of two elements, a traditional questionnaire and a statistical model used to analyse consumer preferences. The results of these investigations are presented in Chapter 6.

The results of the qualitative and quantitative research suggest a number of barriers to successful market development of green waste compost which could be apportioned to the industry. Some of these barriers are specific to Wales and a Welsh perspective could be used to overcome them. In Chapter 7 further qualitative research is reported with a view to establishing solutions to the barriers identified and recommendations for action by two Welsh sustainability initiatives.

Finally, Chapter 8 provides a summary of the key findings from the empirical research including the barriers identified to the market and the limitations and values of the research. The chapter concludes with a series of recommendations aimed at the development of markets for green waste compost and areas of further research to compliment the work in this thesis.

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CHAPTER 2

BIODEGRADABLE WASTE MANAGEMENT

2.1 Introduction

In the UK approximately two thirds of the total amount of municipal waste is composed of material that is biodegradable, such as paper, natural textiles, food and garden waste (AEA, 2003; Environment Agency, 2005). Biodegradable waste presents a particular problem to the waste industry because its nature changes as it decomposes, and the most appropriate manner of managing this waste must be determined.

The waste hierarchy is a tool commonly used to assess the best practicable environmental option (BPEO) for managing waste. This hierarchy implies that although zero waste production would be preferable it is, in the majority of cases impossible. The purpose of the hierarchy is to present a number of waste management options in order of preference with prevention the ideal option and disposal the least sustainable option:

The Waste Hierarchy

- ⇨ **Prevent** waste production to reduce environmental impact from production
- ⇨ **Reduce** waste production and hazardousness to ensure efficient use of resources
- ⇨ **Re-use** of raw materials, packaging and refurbishment of raw materials
- ⇨ **Recover materials** by recycling as a means of reintroducing materials into the economic cycle and composting as a means of returning materials to the environment in a useful and harmless form
- ⇨ **Recover energy** – by combustion or mechanical means for energy recovery
- ⇨ **Disposal** – incineration or landfill

The principles set out in this waste hierarchy have been generally accepted, and the waste legislation which has been produced in recent years is based on the preferences which the hierarchy presents.

2.2 Key Legislative Drivers

2.2.1 EU Landfill Directive

Several EU Directives have been implemented over the last ten years, which have a direct influence on waste management in the UK and which have highlighted the need for an alternative approach to the production and disposal of waste materials. Two of these Directives have a particular bearing on the recovery of biodegradable waste.

The first of these Directives was the Framework Directive on Waste[1], which outlined a number of recommendations to the Member States. The aim of this Directive is to try and encourage the prevention or reduction of waste and, where that is not possible, to recover or recycle the waste without endangering human

[1] Council Directive 75/442/EEC as amended by 91/156/EEC and 91/692/EEC on waste

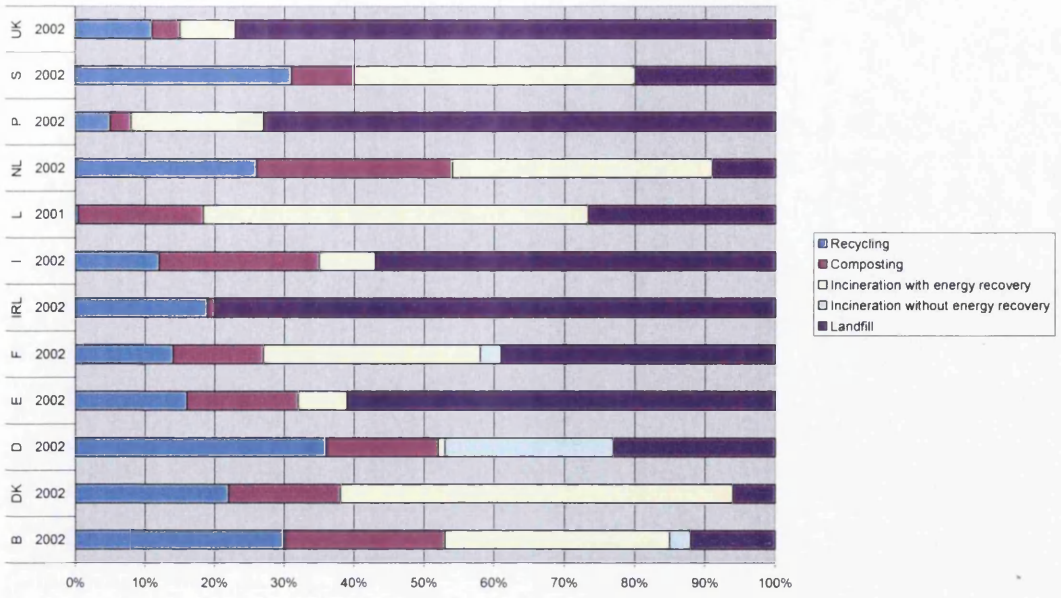
health and harming the environment. More recently (1999) however, the EU has introduced the Landfill Directive[2], which goes a step further and introduces a maximum disposal figure for all Member States concerning the landfill of biodegradable waste. The Directive has set the following targets:

- a substantial reduction in the amount of biodegradable municipal waste (BMW) sent to landfill:
  - by 2010 to reduce BMW landfilled to 75% of that produced in 1995
  - by 2013 to reduce BMW landfilled to 50% of that produced in 1995
  - by 2020 to reduce BMW landfilled to 35% of that produced in 1995

The targets that have been outlined are generic to all Member States, however the way in which they are to be implemented and the level of impact they have on each individual country can differ significantly. Obviously, those countries whose primary method of waste disposal has traditionally been via landfill will face a far greater challenge than those who have used alternative treatment routes such as recycling or incineration with energy recovery.

Figure 2.1 provides a breakdown of the disposal/recovery methods employed by each Member State[3] at the time of the introduction of the Directive. It is interesting to note the disparity between the use of landfill as a method of waste management by the UK and Ireland compared to its use by Holland, Belgium and Denmark. Both the UK and Ireland landfilled over 75% of municipal waste in 2002, in comparison Holland, Belgium and Denmark all had landfill levels of 25% or less (Figure 2.1).

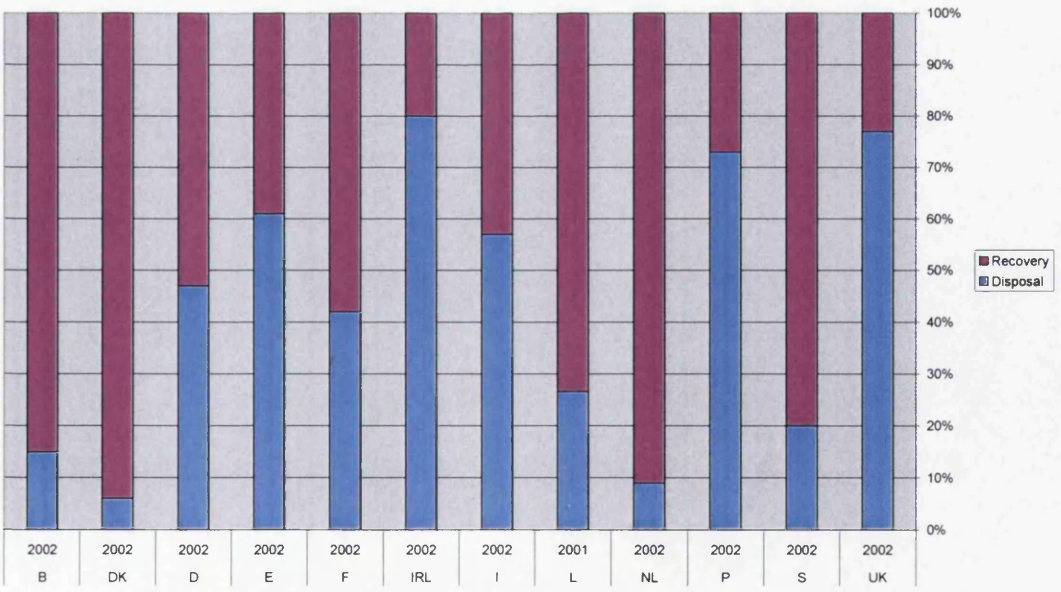
[2] Council Directive 1999/31/EC on landfill of waste
[3] All Member States before May 2004



(Source: Eurostat, 2005)

Figure 2.1 Treatment and disposal of municipal waste in Western Europe in 2001/2002

Figure 2.2 separates the data into two categories, recovery and disposal. Recovery will include recycling, composting and incineration with energy recovery. Disposal combines landfill and incineration without energy recovery, however, as Figure 2.1 highlights, the latter disposal method is not widely employed by any country.



(Source: Eurostat, 2005)

Figure 2.2 Percentage recovery/disposal operations in Europe in 2001/2002

Initial observations in response to the data may suggest reluctance from certain countries such as the UK and Ireland towards more sustainable waste management and a more proactive approach from others. Although this may be correct in one sense it is unlikely that sustainability was the main driver for the alternative waste management strategies used in the Benelux countries. Due to the physical geography of both Holland and Denmark in terms of their particularly high water tables it is unlikely that landfill was ever a viable option and Luxembourg's low landfill rate is probably explained by the lack of land area available.

Historically, the reasons behind the UK having such a high reliance on landfill can be partly explained by its physical and economic development. The UK is an economically well-developed country, which in comparison to other EU states is relatively small in size with a high population density of 242 people per sq km (European Commission, 2004a). The development of its industry and cities required large amounts of materials for construction including stone and clay, for bricks, both of which were readily available. Quarrying for both stone and clay has resulted in large voids, some of which still affect the landscape within the UK. These 'holes in the ground' have in the past provided what seemed to be an ideal solution to the waste management issues facing local communities. Clay pits worked as natural liners to contain waste and leachate, and landfilling also presented an opportunity to reclaim land for pasture and amenity value by filling it in a cheap and relatively safe manner. Unlike some of the Benelux countries a high water table is generally not an issue in the UK and therefore there was little impetus to find alternative waste management solutions and to invest in recycling operations.

This situation has been changing gradually in recent years, and the advent of the Landfill Directive will herald a step change. The Directive ensures that as a Member State the UK must achieve the targets outlined regarding the reduction of biodegradable municipal waste sent to landfill.

2.2.2 UK Landfill Allowance Trading Scheme

Biodegradable waste presents a particular problem to waste managers because of its nature and also its quantity; in 1995 the UK produced approximately 29 million tonnes of municipal waste, of which it has been calculated that about 60% was biodegradable (Department of the Environment Transport and the Regions, 2000). Since then waste production has continued to increase, and the waste management industry has expanded in line with this trend. Society as a whole has also been encouraged to assume a certain amount of responsibility for the management of its waste, and to adopt measures which will enable waste to be dealt with in a manner which causes reduced harm to the environment.

In the UK the Waste and Emissions Trading (WET) Act 2003 has provided the framework for a Landfill Allowance Trading Scheme (LATS) which has been designed as a scheme to help achieve the targets outlined within the Landfill Directive. The trading scheme has been described as a 'market-based mechanism that introduced progressively tighter restrictions on the amount of paper, food and garden waste that authorities can landfill' (Composting Association, 2005). The scheme has been devised so that each local authority is allocated an annual landfill allowance for municipal biodegradable waste. Although each authority is under a duty not to exceed these allowances the LAT scheme does have some provision for 'banking' any unused allowances that can be carried forward, and also within England, Northern Ireland and Scotland local authorities are permitted to trade unused allowances. The idea behind trading allowances is that the local authorities who are proactive with recycling and composting may sell their allowances to other local authorities.

Within the UK, the devolved regions of Scotland, Northern Ireland and Wales each have responsibility for meeting a share of the Landfill Directive targets and a number of differences in landfill permitting arrangements exist. The English, Scottish and Northern Ireland policies propose tradable permits for local authorities, restricting the amount of biodegradable municipal waste that can be landfilled. The permits allocated in Wales however will be non-transferable and local authorities

will need to remain within the restricted landfill quota set down by the Welsh Assembly.

The landfill allowance scheme has been introduced across Wales since October 2004 and was rolled out to the rest of the UK in April 2005. The scheme will be monitored by the Environment Agency, Scottish Environmental Protection Agency, and Environmental Heritage Service (Northern Ireland) collectively.

2.2.3 National Waste Strategy for Wales

The targets stipulated by the EU in the Landfill Directive relate to the UK as a whole and therefore it is necessary to establish what percentage Wales will be expected to contribute to achieving the goals. One way to express the challenges the Landfill Directive poses to Wales is to calculate the maximum tonnage allowed to be sent to landfill in the coming years:

- by 2010 no more than 710k tonnes of biodegradable municipal waste can be landfilled
- by 2013 no more than 470k tonnes of biodegradable municipal waste can be landfilled
- by 2020 no more than 330k tonnes of biodegradable municipal waste can be landfilled

To put these figures into perspective, in 2003/4 Wales landfilled approximately 922k tonnes of biodegradable municipal waste.

As a response to the Directive, in June 2002 the Welsh Assembly Government produced 'Wise About Waste', the National Waste Strategy for Wales (Welsh Assembly Government, 2002). This strategy details targets that, hopefully, will enable Wales to move in the direction of a more sustainable waste management practice. More specifically, the strategy outlines the targets for local authorities in

terms of minimum recycling and composting rates. The primary Wales specific targets are as follows:

- by 2003/04 achieve **at least** 15% recycling/composting of municipal waste with a minimum of 5% composting (with only compost derived from source segregated materials counting) and 5% recycling
- by 2006/07 achieve **at least** 25% recycling/composting of municipal waste with a minimum of 10% composting (with only compost derived from source segregated materials counting) and 10% recycling
- by 2009/10 and beyond achieve **at least** 40% recycling/composting with a minimum of 15% composting (with only compost derived from source segregated materials counting) and 15% recycling

These targets differ slightly from those imposed throughout England. The Welsh strategy includes specific instructions regarding recycling and composting rates. This differs from the English strategy, which seeks to recover value from waste either by recycling or by composting. The Welsh strategy has a specific requirement, and targets, to compost the biodegradable fraction of municipal waste. In addition, the Welsh Assembly has stated that biodegradable waste must be source segregated in order for materials diverted from landfill to be counted towards the composting targets. The emphasis on composting is therefore greater in Wales than in other parts of the UK, and significant quantities of compost will be produced in Wales as a consequence.

Figures produced for the Welsh Assembly Government (Welsh Assembly Government, 2002) estimate that in 1999/2000 Wales land-filled approximately 1.038 million tonnes of biodegradable municipal waste. Assuming a growth rate of 2%, it is estimated that 1.258 million tonnes of biodegradable municipal waste will need to be diverted from Welsh landfill by 2020. An obvious solution to divert biodegradable waste from landfill is to compost, and this technique is already being adopted by many waste management facilities.

2.2.4 Animal By-Products Regulations

Within the context of this research the main focus will concern the development of markets for compost produced from green garden waste. However, in order to fully achieve the EU Landfill Directive targets composting initiatives in future will also need to include kitchen and catering waste. The production of compost from kitchen or catering feedstock brings with it a number of additional regulatory requirements specified under the Animal By-Products Regulations (ABPR) 2003. The regulations apply to catering waste from premises (including domestic kitchens) handling meat or products of animal origin. These regulations have been introduced in response to public health concerns in the UK about meat waste products, in the wake of the recent outbreak of foot and mouth disease and the problems associated with Bovine Spongiform Encephalopathy (BSE) in cattle. Consequently these wastes must be composted under an authorisation granted by the State Veterinary Service (SVS) (Department for Environment Food and Rural Affairs, 2004) but there are exceptions for cases such as schools, hospitals and prisons if the waste is composted there and is used at those premises.

In order to comply with the ABPR all catering waste must be treated in accordance with any one of the four systems shown in Table 2.1.

Table 2.1 Minimum treatment standards for catering wastes

Treatment system	Minimum temp	Minimum time at minimum temp	Maximum particle size
Composting (closed reactor)	60°C	2 days	40cm
Biogas	57°C	5 hours	5cm
Composting (closed reactor or biogas)	70°C	1 hour	6cm
Composting (housed windrow)	60°C	8 days – during which windrow must be turned at least 3 times, at 2-day intervals	40cm

(Source:Department for Environment Food and Rural Affairs, 2004)

2.2.5 Licensing and exemptions for composting

The waste management industry in England and Wales is regulated by the Environment Agency which acts as a non-departmental public body and is largely sponsored by the Department for Environment, Food and Rural Affairs (DEFRA) and the Welsh Assembly Government.

As with all types of waste, the biodegradable fraction of waste currently used for composting is subject to a number of regulations. All waste management facilities within England and Wales are required to have a waste management licence, unless they can meet the exemptions criteria set out within the Waste Management Licensing Regulations 1994 [as amended] (Environment Agency, 2005). The Environment Agency will grant certain exemptions from waste management licensing mainly for small-scale waste storage and waste recovery operations, subject to certain limitations. These limitations are general rules under which the waste activity can take place and cover such details as the types and quantities of wastes permitted, the methods of disposal or recovery, and pollution control measures.

The regulations have within them specific instructions for composting and storing biodegradable waste. Previous to July 1st 2005 the majority of compost producers in Wales were able to produce compost under the exemption guidelines which required only that waste must be recovered without endangering human health and without using processes or methods which could harm the environment. Changes to the exemption rules were due to come into force on July 1st 2005, and these changes would mean that compost producers could have a maximum of 400 tonnes of waste on site at any one time. The expected changes to the exemptions would have resulted in the majority of compost producers currently producing under an exemption being required to apply for a waste management licence. However, a last minute announcement from the Department of Environment, Food and Rural Affairs (DEFRA) suspended the enforcement of the new regulations, allowing the majority of compost producers to continue operating under existing exemptions (1000 tonnes), although this is probably not a long term decision.

Although the impending changes to the exemption regulations were received with an element of criticism due to the costs associated with applying for waste management licences, the licence would grant compost producers the facility to sell their compost, which is not permitted under current exemption laws.

2.3 The Composting Process

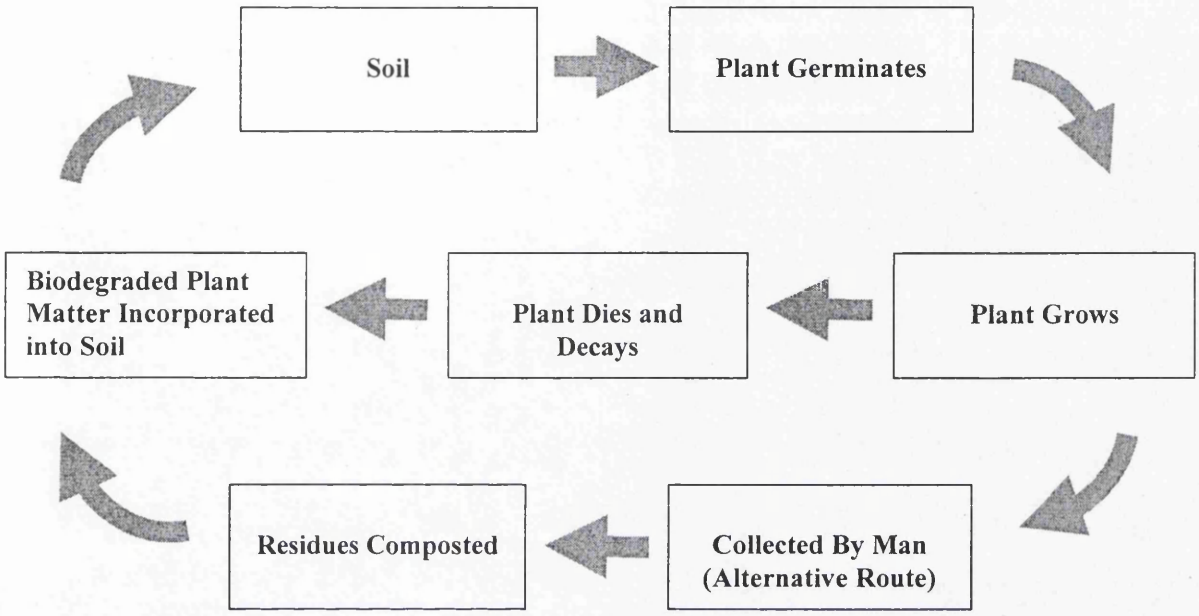
The process of composting has been defined as the following:

'The controlled biological decomposition and stabilisation of organic substances, under conditions that are predominantly aerobic and that allow the development of thermophilic temperatures as a result of biologically produced heat. It results in a final product that has been sanitised and stabilised, is high in humic substances and can be beneficially applied to land', (Haug, 1993).

The resulting product of the above process is *compost* and has been defined by the Department of Environment, Transport and the Regions (1999a) as:

'*Biodegradable municipal waste which has been aerobically processed to form a stable, granular material containing valuable organic matter and plant nutrients which, when applied to land, can improve the soil structure, enrich the nutrient content of the soil and enhance its biological activity'.*

Composting is essentially a natural process of returning organic matter to the environment. The process can occur naturally or in a controlled environment (Figure 2.3) and is principally carried out by bacteria and fungi which convert the feedstock into a soil like material by continually breaking down the larger molecules into smaller ones to be used as food, resulting in the formation of compost. The feedstock can be formed by any mix of biodegradable material such as garden waste and kitchen waste.



(Adapted from Gilbert *el al*, 2001)

Figure 2.3 Composting Process

With the advent of agricultural science and the introduction of fertilisers as an alternative soil nourishment the practice of composting was in decline for many years and it was cheaper to simply landfill biodegradable waste than to compost materials. The reintroduction of composting as a means to manage waste has required changes to waste management practices and has also resulted in an increase in cost, although these costs can usually be offset by the increases in gate fees payable to waste management facilities for the disposal of biodegradable waste.

Regardless of the method employed to compost the material, the collection and treatment process is relatively generic to all compost producers. This process can be broken down into the following nine consecutive stages (Gilbert *et al*, 2001):

1) **Collect and deliver** – 'feedstocks' can be comprised of almost any material derived from a living organism, to include garden trimmings, kitchen waste, commercial paper pulp and catering wastes

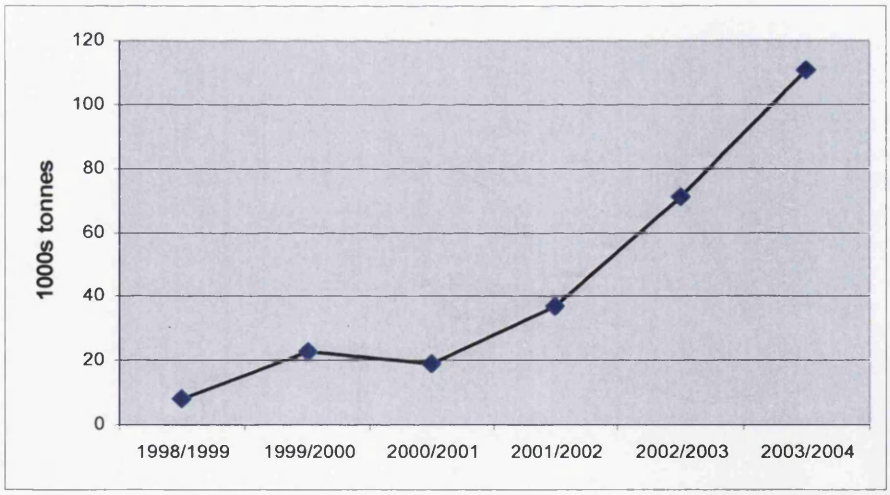
2) **Assess** – materials should be checked for the presence of contaminants that may affect the quality of the end product such as plastics and glass and for moisture content and composition
3) **Prepare feedstocks** – often will need treatment to ensure a conducive temperature, supply of water, oxygen and composition
4) **Process** – usually put into aerated piles. Feedstock will endure a number of temperature changes, in which the micro-organisms will either thrive or die off, until it has reached the 'sanitisation' stage where the material has broken down sufficiently and composting has finished.
5) **Monitor** – monitoring the temperature is important to gauge the progress of composting. Materials must have reached thermophilic temperatures for a long enough time to ensure a sanitised product has been produced. Too hot may kill off beneficial micro-organisms, so it must be monitored effectively.
6) **Cure** – Although material no longer heats up significantly it is not necessarily ready and must be left to 'cure' for at least a month once having been moved to stabilise.
7) **Assess** – when the product is almost ready it must be assessed for beneficial qualities, is it worth screening and bagging as a product? Are all potential pathogens not present and is its appearance similar to other compost material?
8) **Post-process** – further processing will depend on the intended end use of the material, it can be screened, blended to be used as a top soil or soil conditioner or just used as a mulch
9) **Use** – the use of the product should be one of the first considerations as this can determine the type of feedstock selected and the method of composting that is employed

2.3.1 Compost Producers

The size and complexity of composting operations across the UK will vary considerably, from small domestic compost bins in gardens to large centralised operations. Composting operations in the UK can be largely apportioned to centralised facilities, on-farm composting operations, community composting and

home composting. For the purposes of this research, figures relating to compost production in the UK, and in Wales in particular, will largely concentrate upon the centralised and on-farm composting operations as they account for a substantial proportion of composting activity. Although figures for home composting can be counted towards the composting targets it is difficult to produce accurate data and the total compost production is unlikely to impact greatly on the overall production targets.

The quality of waste composted by the UK industry has grown steadily over recent years. Since 2001/02 composted wastes have increased from 1.66 million tonnes to 1.97 million tonnes, an average growth rate of around 10% per annum (Composting Association, 2005). In Wales the waste strategy appears to have been very effective in giving an impetus to compost production. Figure 2.4 shows the amount of compost that has been produced from biodegradable municipal waste in Wales in recent years (Welsh Assembly Government, 2004a). The data indicates that, since the introduction of the Welsh waste strategy in 2002 the amount of compost produced has sharply increased, rising by 56% between 2002-03 and 2003-04.



(Source: Welsh Assembly Government, 2004a)

Figure 2.4 Quantity of compost produced from municipal waste in Wales from 1998-99 to 2003-04

The number of composting facilities has also risen significantly over the same period. Table 2.2 indicates that the greatest rise in Wales is in the introduction of on-farm composting sites, however it should be noted that in a number of instances

these on-farm sites will be contracted to take municipal waste and function in a similar way to centralised sites.

Table 2.2 Number and type of sites in each nation in 2001/02 and 2003/04

	Number of sites in 2001/02			Number of sites in 2003/04		
Nation	**On-farm**	**Centralised**	**Other**	**On-farm**	**Centralised**	**Other**
England	66	111	4	97	113	2
Wales	**4**	**8**	**1**	**30**	**13**	**1**
Scotland	6	9	2	41	19	0
N Ireland	2	3	1	5	4	0
Total	78	131	8	173	149	3

(Source: Composting Association, 2005)

2.3.2. Methods of composting

Detailed descriptions of composting methods can be found elsewhere (Misra and Roy, 2002; Gilbert *et al,* 2001) but a brief outline of the main processes will be given here, for completeness. There are a number of methods of composting available to producers. Methods range from relatively simplistic options to systems which have been built to high technical specifications and involve sophisticated monitoring equipment. The two main considerations for any compost producer when deciding upon which method to use will be, what are the main feedstocks used in the compost and what will be the intended end use of the product. Composting any material which is animal derived will require in-vessel processing to conform to the Animal By-Products Regulations.

2.3.2.1. Windrow Composting

Windrow composting is the most commonly used method of composting green waste outdoors. The process will usually involve placing a large amount of biodegradable raw material (usually shredded) into long narrow piles, similar in shape to a triangular prism (see Figure 2.5). The material is mechanically turned periodically to aerate the waste as it degrades. The exact shape and size of the

windrows will depend on the machinery used to turn the material, although typically windrows would be 2ft to 4ft high for dense materials and up to 12ft for lighter materials with a width varying from 10 to 20 feet (Misra and Roy, 2002).

Figure 2.5 Outdoor windrow composting of green waste

The size of a windrow must often be determined by its ability to allow aeration or rate of air exchange into the pile. If the windrow is too large, anaerobic zones occur near its centre which release odours when the windrow is turned. On the other hand, small windrows lose heat quickly and may not achieve temperatures high enough to evaporate moisture and kill pathogens and weed seeds. It is advisable to construct windrows in a way that will, as far as possible, retain the heat generated by composting micro organisms, allow diffusion of gases and enable moisture content to be controlled.

The frequency of turning depends on the rate of decomposition, the moisture content and porosity of the materials. The decomposition rate is greatest at the start of the process and the need to turn the material will decrease as the windrow ages. With the windrow method, the active composting stage generally lasts anywhere from three to nine weeks depending upon the nature of the materials and the frequency of turning. Windrow composting can also be conducted within an enclosed building and therefore can be classified as in-vessel composting.

Passively Aerated Windrows

Passively aerated windrows are formed in a similar fashion to the technique described previously but, rather than employ a turning motion to aerate the piles, perforated pipes are embedded in each pile and these supply air to the composting material. As the feedstock is not turned after the windrows are formed it is important for the material to be thoroughly mixed before being placed in the windrow to avoid compaction of materials. Aeration pipes are placed on top of the peat/compost base and when the composting period is complete, the pipes are simply pulled out, and the base material is mixed with the compost.

Aerated Static Pile Processes

The aerated static pile method passively aerates the composting materials providing direct control of the process and allows for construction of larger piles. No turning or agitation of the materials occurs once the pile is formed. As the pile does not receive additional turnings, the selection and initial mixing of raw materials are critical. Poor air distribution and uneven composting may occur if the mix is unbalanced. Often a bulking agent such as wood chippings or straw is added to the mix and if not properly composted this can be screened out later and reused. Assuming that the pile has been properly formed and if the air supply is sufficient and the distribution is uniform, the active composting period will be completed in approximately three to five weeks (Misra and Roy, 2002).

2.3.2.2 In-Vessel Composting

In-vessel composting refers to a group of methods which confine the composting feedstocks within a building (see Figure 2.6), container (see Figure 2.7), or vessel. These methods rely on a number of forced aeration and mechanical turning techniques which allow a greater level of control to make composting more efficient. In-vessel systems are usually described using a number of terms which often relate to the way the feedstock is contained and managed to produce compost.

Figure 2.6 Typical in-vessel composting building for housed windrows

Bins

The feedstock is composted on the floor and contained within a bin or an enclosed hall with walls and a roof. The material can be stacked much higher than with free-standing piles whilst occupying less floor space. The majority of bins will have a type of forced aeration system to oxygenate the pile, similar to aerated static piles. The advantages of bins include the elimination of weather problems, containment of odours and better temperature control.

Bays

The agitated bay system is usually designed to accommodate larger quantities of waste than container and bin systems. The feedstock is placed in long rectangular beds where the material is separated by low walls. The system usually combines controlled aeration and periodic turning which mixes the compost and systematically moves it from the front of the bed to the back over the duration of the process. Most in-vessel bays will also have a set of aeration pipes which supply air to the compost between turnings to aerate and cool the composting materials. As the compost is moved along the bay throughout the process it is known as a continuous flow system.

Silos or Towers

These systems typically consist of vertical units which operate on a continuous basis with feedstock loaded in from the top. The material composts as it moves down through the unit. An aeration system will blow air up through the compost

and when the process is complete the compost is removed from the bottom of the tower. The main benefit of these systems is that they minimise the area needed for composting, however, stacking material can sometimes result in compaction so adequate airflow is essential.

Rotating Drums

This method consists of large rotating cylinders that are slightly inclined and the feedstock is introduced at the top and mixed as it moves toward the bottom. In the drum, the composting process starts quickly, and the highly degradable, oxygen-demanding materials are decomposed. Often further decomposition of the material is necessary in windrows or aerated static piles. The drum method is not widely used as it is a generally expensive in-vessel composting method and although the process takes considerably less time than conventional windrow methods there is often speculation as to whether the product is fully matured when discharged from the drum.

Containers

Containers are generally used for small scale composting operations and when dealing with food waste processing and catering wastes. Often the containers will have aeration pipes connected to a blower which forces air into the composting material.

Figure 2.7 In-vessel container system designed to compost food waste

2.3.2.3 Vermicomposting

'Vermicomposting' refers to the use of earthworms for composting organic matter. Earthworms can consume all kinds of organic matter and can eat their own body weight per day; their excreta are rich in nitrate, phosphorous, potassium, calcium and magnesium. The introduction of worms into a compost heap has been found to mix the materials, aerate the heap and hasten decomposition. Turning the heaps is not necessary if earthworms are present to do the mixing and aeration.

The main advantages of vermicomposting compared to the more traditional methods of composting are the increased levels of nitrogen and plant-available nutrients in the resulting compost therefore producing a higher quality product. However, the construction of a working vermicomposting operation can often be a lengthy process and require careful monitoring to prevent the worms from escaping. Also as vermicomposting must be conducted at lower temperatures than more traditional windrow methods to prevent killing the worms, there is always a risk that the compost will not be heated sufficiently to kill off all pathogens.

2.3.3 Why In-Vessel Composting?

Although the more traditional windrow and aerated static pile composting methods are generally regarded as being more economically viable solutions, choosing an in-vessel system also has a number of advantages. In-vessel composting facilities offer increased process control, shorter composting time, more effective odour control and the facility to continually monitor the progress of each batch of compost which will usually ensure a higher quality product (Naylor, 2000).

The most important advantage of in-vessel composting in the UK is its ability to compost kitchen and catering waste, which is currently not permitted with outdoor composting operations under the new Animal By-Products Regulations (2003). Currently, garden waste accounts for approximately 21% of municipal waste and if all of this fraction can be composted then it will contribute 60% towards meeting the first Landfill Directive target in 2010 (Short, 2002). If kitchen waste, which

accounts for a further 17% of municipal waste, is also composted rather than being sent to landfill then the first target in 2010 can be met completely by composting. Many of the current in-vessel composting methods will be able to satisfy the criteria specified within the ABPR outlined earlier, and therefore it seems that this may be an option for many local authorities to adopt in order to achieve the Landfill Directive targets.

2.4 Compost as a Product

Waste-derived compost can be used in a number of applications and these have been highlighted by the Department of the Environment, Transport and Regions (1999a). The following list comprises the many applications suitable for waste-derived compost:

- **Soil improver** – added to soil mainly to improve its physical condition, either by improving soil structure or increasing water holding capacity
- **Planting compost** – the main properties of planting compost are a high organic matter content to allow good water and nutrient content. The main aim of using such a product is to improve the soil in the planting area physically and chemically so that the new plant establishes quickly
- **Mulches** – surface mulches have two main functions: to suppress weed growth and to conserve soil moisture. For these purposes the product must be of very coarse particle size and a low nutrient level is preferable to further discourage weed growth
- **Topsoil manufacture** – there is often local shortage of suitable topsoil for use in landscape work. Landfill sites and derelict land need to import topsoil. Mixing compost with subsoil can produce successful topsoil substitutes. The design of the product for this sector depends on the end use.
- **Growing media** – stringent specifications for growing media make it more difficult, but not impossible, to use waste derived composts as a peat alternative. Composted waste has significant and variable nutrient content which introduces uncertainty and risk of damage to plants if used on its own

as a growing medium. It will be necessary to procure a material which has been diluted with other low nutrient subtrates such as coir, soil or bark.

- **Organic manures** – the addition of other high nutrient wastes, such as poultry or livestock manure, to the composting process can produce effective organic manure. On its own, waste-derived compost does not usually have a high enough nutrient content to be classed as an organic manure
- **Turf dressings** – turf dressings for surface application to grass and sports fields may be prepared by screening composted waste. This is subsequently mixed with sand or soil, sometimes with nutrient enrichment, and addition of fine peat or lignite, to reduce compost pH

2.5 Composting Standards

There is at present no universal or European statutory standard in place regarding the quality assurance of waste derived compost, although most countries have voluntary proposals in place to help regulate the promotion and sale of compost as a product. The recognised standard for green waste compost in the UK is the British Standards Institution PAS 100 (British Standards Institution, 2002) which was introduced in October 2002 as a result of collaboration between the Waste Resources Action Programme and the Composting Association, and has been developed around the original Composting Association Certification Scheme (Gilbert *et al*, 2001)

The standard applies to compost which has been produced from source segregated biodegradable material such as green garden waste. The Publicly Available Specification (PAS) is however not a fully accredited British Standard but rather an intermediary point which can provide an industry-wide standard which draws on drafting and consultation without requiring the 100% consensus demanded by a British Standard. The PAS 100 has been reviewed since its initial release and was recently updated on 1st June 2005 (British Standards Institution, 2005). The new

PAS100:2005 standard has been streamlined to further encourage the production of quality composted products.

The main reason for developing the standard came as a direct result of a WRAP (Waste Resources Action Programme) study (Hogg *et al,* 2002) which investigated current composting standards and the ways in which these might need to be developed. The study incorporated research conducted in North America, Australasia and a number of EU countries.

The main purpose of the BSI PAS 100 standard is to provide "minimum requirements for the selection of input materials, process of composting and the quality of composted materials, as well as for the marketing and information labelling of the product" (British Standards Institution, 2002). The minimum quality requirements for human pathogens and potentially toxic elements (PTEs) are shown in Table 2.3 and 2.4 respectively. The intention is that the standard will provide a benchmark or basic industry standard which can be recognised and understood by both producers and consumers. The standard can be used as a base line for specification documents which may involve more specific requirements. The standard does however only refer to source segregated biodegradable materials that have been composted at centralised, on-farm and community composting facilities.

Table 2.3 Compost Quality Requirements – Human Pathogens

Human Pathogens	**Minimum Requirement**	**Test Method**
Salmonella	Absent in sample of 25g	BS EN ISO 6579
Escherichia coli	< 1000 CFU/g	BS ISO 11866-3

(Source: British Standards Institution, 2002)

Table 2.4 Compost Quality Requirements – Potentially toxic elements (PTEs)

Element	**Upper Limit** mg/kg dry matter	**Test Method**
Cadmium (Cd)	≤ 1.5	BS EN 13650
Chromium (Cr)	≤ 100	BS EN 13650
Copper (Cu)	≤ 200	BS EN 13650
Lead (Pb)	≤ 200	BS EN 13650
Mercury (Hg)	≤ 1	ISO/DIS 16772
Nickel (Ni)	≤ 50	BS EN 13650
Zinc (Zn)	≤ 400	BS EN 13650

(Source: British Standards Institution, 2002)

The standard has been set up jointly through WRAP and the Composting Association who also provide assistance to compost producers with the guidance and expertise necessary to achieve the standard. The idea of the PAS 100 is to break down the key elements of the composting process and ensure that each of these elements conform to the minimum standards as defined in the specification. The key elements are outlined in Figure 2.8.

The final stages of the standard are designed to help the consumer when purchasing green waste compost and require that producers must classify their product as one of the following:

- Soil conditioner
- Mulch
- Growing medium
- Growing medium constituent
- Turf dressing
- Turf dressing constituent
- Top soil constituent (manufactured)
- Biofilter
- Biofuel
- Other (to be specified by the producer)

The conditions of the PAS 100 standard also require the producer to clearly label all compost products with information regarding all aspects of the product's content and provide a clear history of each batch. Labelling requirements aim to ensure that sufficiently comprehensive and accurate product information is readily available to specifiers and end-users.

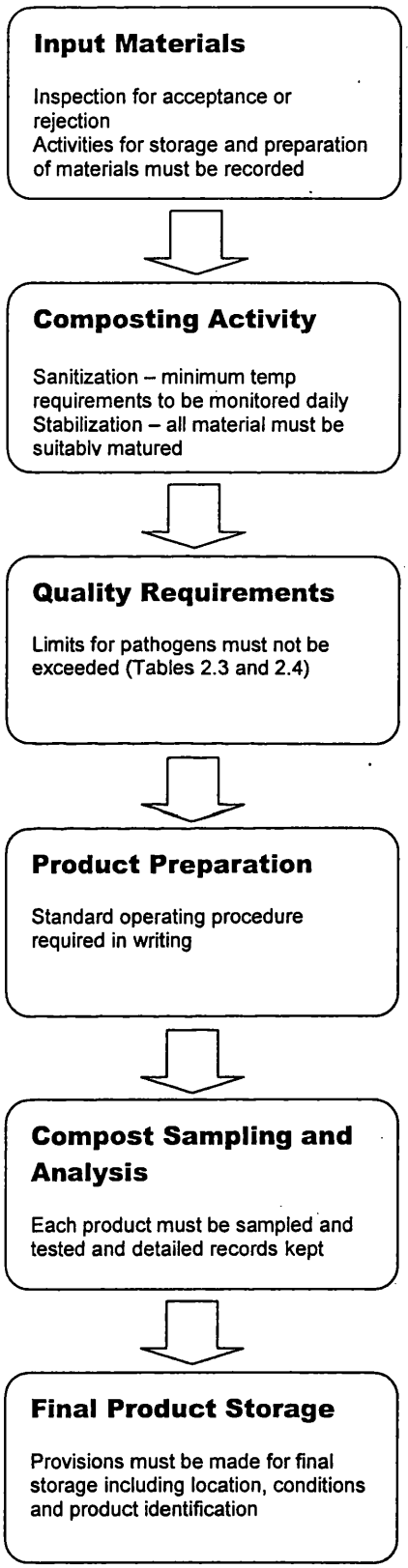


Figure 2.8 Elements covered by BSI PAS 100

2.6 Summary

It is evident that the EU Landfill Directive will have a significant effect on waste management operations within the UK. Composting the biodegradable fraction of municipal waste is one option available to the waste industry in its effort to reduce the quantities of BMW sent to landfill. In Wales there will be a particular emphasis on composting, and local authorities are encouraged to compost source segregated biodegradable waste in order to meet the targets set by the Welsh waste strategy. Regulations make the composting of kitchen and catering waste a potentially expensive option, which needs to be carried out using in-vessel equipment. Consequently the initial focus will be to compost the green garden waste component of municipal waste. A new standard has been developed to assist quality management of this green waste compost, and the effect of both legislative and quality drivers on the development of composting within the waste industry in Wales will be examined in the following chapters.

CHAPTER 3

PIONEERING COMPOST PROJECTS: CASE STUDIES

3.1 Introduction

The previous chapter outlines the composting process and how the introduction of recent legislation is having a direct effect on composting operations and the level of compost production in the UK, particularly in Wales. Due to the increasing amount of compost forecast to be produced over the next few years a number of projects have been initiated to find alternative uses for the end product.

This chapter presents case studies showing examples of projects which attempt to pioneer the use of compost from waste. Three examples are given: Project New Earth, Capita Symonds and the Transport Regions Laboratory. These case studies are all examples of either innovative or pioneering practices within the composting industry. Not all such projects will be entirely successful, and potential problems are discussed, in addition to the opportunities which are highlighted.

3.2 Case Study 1 - Project New Earth

Project New Earth is a composting research project set up to provide a practical working solution to the EU Landfill Directive with the aim to 'recover value from waste economically and in an environmentally acceptable way' (Gunner, 2003). The project is based in Bournemouth and is a partnership between Dorset County Council and Canford Environmental Ltd, an environmental body. It is partly funded through Landfill Tax Credits which Canford Environmental receives from SITA, the waste management company with whom Dorset County Council have their principal waste disposal contract. Canford Environmental's activities involve supporting community organisations and research into sustainable waste management in Bournemouth and the surrounding conurbation.

Composting of municipal waste has been carried out in the County of Dorset for a number of years. In 2002/3 Dorset County Council collected some 22,700 tonnes of green waste through their Household Recycling Centres (or Civic Amenity sites). SITA arrange for this material to be composted, with some of the material going to the two composting sites which are operated in Dorset by an independent company, EcoCompost, and some of the material being delivered to Project New Earth's composting facility.

In addition to green waste, the Project New Earth research facility receives residual municipal solid waste from the Bournemouth area. This waste is the residual household and commercial waste which remains after recyclables such as glass, cans and paper have been removed via separate kerbside recycling schemes. Project New Earth is intended to examine the feasibility of producing usable compost from this residual MSW stream. The facility receives 300 tonnes of residual waste from the Bournemouth local authority, which is delivered once a month. Canford Environmental will charge an amount equivalent to the current landfill gate fees to dispose of this waste. The company does not take any private wastes.

3.2.1 Construction of Compost Facility

The chosen method of composting is a windrow system within a steel clad building, containing aerated pipes within the floor to allow forced aeration and to ensure that microbes receive sufficient oxygen throughout the composting process. The building is separated into three processing rooms, reception and pre-treatment area, composting hall and a screening room. The screeners and bio-filters will enable the separation of non-biodegradable materials to leave a composted green waste material with minimal contaminants.

The research plant differs slightly to most in that rather than source segregate non-biological materials before composting, these materials are recovered at the end of the process. This combined process is called Mechanical Biological Treatment (MBT). Figure 3.1 shows the mature composted MSW waste prior to screening and Figure 3.2 shows the final screened compost product. Currently the compost being produced will only be suitable for landfill applications, however it will count towards Dorset's recycling targets. This unfortunately would not be the case in Wales as only 'source segregated' compost can be included in the recycling targets. Project New Earth is however also looking to diversify into pure green waste composting using source segregated household waste and restaurant organic waste with a view to producing a higher quality product possibly for commercial use.

Despite the simplicity of a windrow composting system the research facility is highly technical and has a number of computer control systems to continually monitor the process over a range of quality specifications. One major advantage with continual monitoring is that each batch of compost can be traced back to the original feedstocks and in future production it may also be possible to match the produced material to market requirements.

The key aim of this research project is to "compare composting of mixed household waste and source separated organic materials to assist local authorities in deciding upon the most effective way of managing waste from households". However, in addition there is also research into producing compost of a high quality, to meet industry standards and to also investigate possible outlets for the material.

Figure 3.1 Composted materials to be screened

Figure 3.2 Final products after screening

3.2.2 Markets for Waste Derived Compost

The New Earth composting process has been designed to manage waste that has not been source segregated. The compost is produced using MBT and although the end product is in many ways similar to source-segregated compost it will inevitably contain a higher proportion of physical contaminants. There is also the added concern of animal contact, which cannot be eliminated from feedstocks that have not been segregated prior to composting. Taking these points into consideration the only viable market outlets suggested for the compost are as a landfill cover, thereby using the total amount of compost produced but with no value, or for use as a

growing material for non-food production on agricultural land. The latter of these suggestions has the benefit of a high demand coupled with the ability to collect a price for the product.

One particular sector that has been explored by the team is looking into the use of waste derived compost to produce an enriched soil in which to grow energy crops for bio-fuel. Using research conducted by Harper Adams University College concerning 'Investigation of nitrogen nutrition of wheat grown in soils containing green waste compost' (Keeling, 2003) the group have realised the potential benefits of using the compost to grow non-food crops and to sell these as a bio-fuel material. The research has highlighted that 'the combined addition of compost and fertilizer to the soil can increase crop yields and reduce nitrogen leaching. Yields can be maximised (increased by up to 20%) if 80% of the nitrogen requirement of the crop is derived from inorganic fertilizer and the remainder provided from well-established compost (equating to a compost addition of 35t per hectare)'.

The attraction of producing crops intended for bio-fuel has been spurred by global awareness concerning the increasing cost of using fossil fuels as an energy source, both in monetary terms but also more importantly the cost to the environment. One possible solution to the problem of depleting fossil fuels and their impact on the environment is bioethanol, a fuel produced by processing familiar and renewable crops such as cereals, sugar beet and maize using natural fermentation. Bioethanol can be used as a petrol extender and can be readily blended with conventional fuel. Blended with petrol at approximately 10% it can be used in vehicles without the need to change fuel or engine specifications.

The technology to produce and use bioethanol as a fuel has been available since before the Second World War and is already used commercially in the USA, Brazil and Canada as a blend for petrol. Compared to present oil prices bioethanol is more expensive to produce than petrol, however with increasing pressure on countries to reduce harmful emissions from fossil fuels the tax placed on biofuels may be reduced in order to encourage production of a cleaner fuel source.

The significance of potential growth in the biofuel market has enabled New Earth to identify a match between the resources available from the composting process and the growing demand within Europe for biofuel crops. The process, in theory seems to be compatible as the crops could be grown on set-aside land, which the farmer would not use for food crops in that year. The advantage for the farmer is that New Earth would guarantee purchase of all crops, thereby eliminating the risk of using a new growing medium, and also providing additional income to food crop production.

Dorset is a rural area, and approaches have been made to the local farming community to gauge the level of interest concerning the introduction of growing crops for bio-fuels. The initial response has been positive from this sector and could provide a localised solution to finding markets for municipal solid waste compost and ultimately working towards achieving the landfill reduction targets.

3.2.3 Barriers to Market

Despite the obvious economic and environmental advantages to developing crops for biofuel using municipal solid waste compost, there are a number of potential barriers to the success of such a project. Although the use of MSW compost in the production of non-food products to be used in the production of biofuels may appear to provide an ideal solution, farmers may be restricting the use of a field following an application of this compost. Procedures outlined in the Animal By-Products Regulations may affect the subsequent use of land for food crops. In addition, since the waste material is not source segregated, the MSW compost may contain higher levels of physical contaminants such as glass or plastics which may adversely affect the land.

The success of the project also largely depends on the success of biofuels as a suitable fuel replacement. Investors within Project New Earth will have no control over this and therefore the production of MSW compost could be considered a financial risk. Without the planned joint venture in the biofuel market there are serious limitations to alternative uses of MSW compost as it is unable to qualify for

the BSI PAS 100 quality standard or similar and its use as a landfill cover will not recover any value. Due to the expense of the in-vessel composting and monitoring process the Project New Earth scheme would need to generate income to be considered as a viable alternative to landfill and it is unclear that this will be achieved.

3.3 Case Study 2 – Capita Symonds

An example of a private consultancy firm pioneering sustainable development practices is Capita Symonds. a property and infrastructure consultancy. Capita is a professional consultancy group offering services in design, engineering, property and construction. The company also has a landscape design department, specialising in landscape planning, landscape design, project implementation and landscape management. The company undertakes a wide variety of landscaping projects with revenues ranging from £600 projects to large-scale £69million developments (Ford, 2003).

A number of extensive projects for the Home Office have been awarded to the company. The majority of these have involved works on the redevelopment of prisons, detention centres and hospitals. Capita work with a number of development bodies within Wales such as the Welsh Development Agency, Fforwm Tirlun, the Wales Landscape Industry Forum, and the company is also a member of the Landscape Institute for Wales.

The company has been shown to pioneer sustainable working practices within their contracts and on sites. An exemplar demonstrating the ethos of the company is the project which Capita carried out at the HM Prison Dovegate in Staffordshire. The initial plans to build the prison were met with strong opposition from local residents, who were concerned with both the impact on their homes and that of the surrounding environment during construction of the site (Ellis, 2003). Nigel Ford was the principle landscape architect on this site and very early he recognised the necessity of addressing the needs of the local community without compromising the surrounding environmental habitat and also providing a secure and functional prison

unit. To obtain a greater understanding of the problems facing the project Nigel organised a number of discussion groups with local interest groups and information was fed back so that social and environmental impacts were considered at all levels of the project design.

As a proportion of the site consisted of old brownfield sites previously occupied by the military, the first task for Nigel and the landscapers was to clear up the waste land and as far as possible re-use any removed aggregates, therefore employing a no-waste off site policy. Other policies adhered to throughout the construction of the prison landscape was the Staffordshire Biodiversity Action Plan and also the National Forest recommendations for planting (Ellis, 2003). Careful planning of each element of the project ensured that significant ecological achievements were made, with the site managing to attract new plant and bird species to the wetlands.

3.3.1 Bro Cerwyn - Withybush Hospital

One Capita project which is of particular interest to this study was the construction of an adult mental illness and psychiatry unit in Pembrokeshire in South West Wales. The site was opened in June 2003 and was funded by the Pembrokeshire and Derwen NHS Trust. The building comprises a 45-bed unit with the intention of re-locating patients previously residing within a large Victorian institution.

The landscape design of the centre was a crucial element of the project both in satisfying demands of the hospital and its patients and also existing local residents close to the hospital. Before any decisions were made concerning the design and implementation of plans for the new unit, a steering group was set up so that local residents, health care boards and health experts could voice any concerns and requests at the preliminary planning stages, 'Capita worked in close association with the client's grounds and gardens steering group' (Ford, 2004).

The Bro Cerwyn site was purpose built and there was an opportunity to incorporate a variety of specifications to cater specifically for the needs of the patients. Nigel Ford, as principle landscape architect focused on a number of designs to

accommodate the patients that included providing high quality external amenity facilities with a segregated male and female patient area, a mother and baby courtyard, outdoor recreation spaces and gazebos (see Figure 3.3). In addition, consideration for local residents was also a key requirement and Nigel tackled this issue by erecting a screen which acts as both a sound and visual barrier shown in Figure 3.4.

Figure 3.3 Gardens with gazebo shortly after planting

Figure 3.4 Screen for visual and sound barrier

The relevance of the project in conjunction with this study is to highlight the advances made in sustainable practices by both Capita and Mr Nigel Ford, with a particular reference to the use of green waste compost on site. Opting to use green waste compost illustrates just one of the sustainable practices encouraged by Nigel Ford and Capita and is unfortunately a practice employed by only a minority of firms at present. The case study of Bro Cerwyn at Withybush Hospital involved the researcher in a number of meetings and interviews with the landscape architect for

Capita (Ford, 2003) and the general manager of the contractor firm, Afan Landscapes (Stevens, 2003). The interviews highlighted several issues associated with the use of green waste within the landscape industry. Deciding to use an alternative type of growing media can create added expense in terms of costs of changes to procedure, despite the obvious sustainable advantages. Implementing sustainable purchasing can sometimes require changing suppliers and spending time and resources sourcing new ones. Switching to a new product can often create additional problems and will not always present itself as a more suitable alternative.

"A problem with using green waste compost is poor screening of wood pieces which when applied to the ground tends to filter to the surface after a period of rainfall and can be unappealing to the eye." (Stevens, 2003)

The majority of problems consist of minor inconveniences rather than any requirements for significant changes to working practices. As part of initiatives to become more sustainable landscape consultants and organisations that specify types of growing media need to encourage contractors to consider the effects of their products on all levels and not focus on price alone. In many situations the sustainable material will perform equally as well as the alternatives and this needs to be recognised and advertised.

"Just two weeks after planting, the foliage was luxuriant...The Bro Cerwyn scheme was a pleasure to be involved in, with an enlightened client who valued the benefit of high-quality landscape space..." (Ford, 2004)

In recognition of the innovative approach to the development of the unit, Bro Cerwyn was awarded the NHS "Building better healthcare" award for 'best designed mental health facility 2003'.

3.3.2 Caswell Clinic – Glanrhyd Hospital

The following year the same architect was also short-listed for the same award for another development, the Caswell Clinic Medium Secure Unit at Glanrhyd Hospital

in Bridgend, South Wales (see Figure 3.5) This particular development used a green waste compost material from a local producer in Caerphilly in association with the Wales Environment Trust: National Composting Network. Feedback regarding the use of the green waste compost was positive from both the landscape architect and the landscape contractor. The product performed equally as well as previously used peat free composts and was also competitively priced. One point raised however by the landscape contractor was the variance in quality available between green waste compost producers, despite the fact that they were deemed to have attained the same quality standard.

Figure 3.5 Landscaped gardens using green waste compost - Glanrhyd Hospital

These two Welsh projects highlight achievable good practices on behalf of collaboration between a public organisation, a private consultancy firm and a local contractor. It is necessary to promote successful partnerships between public and private organisations, particularly when they demonstrate how sustainable materials can be incorporated into design specifications whilst maintaining corporate objectives and without compromising on quality. The reason why this type of approach to development is not routinely repeated in public/private investments across Wales needs to be investigated.

3.4 Case Study 3 – Transport Research Laboratory

The Transport Research Laboratory (TRL) is part of the Transport Research Foundation with offices in the UK and overseas and is a recognised research body for all issues relating to land transport. The organisation is committed to the development of sustainable solutions and opportunities across a range of transport related areas. TRL works alongside both public and private sector organisations and has a sister company Viridis which is a waste materials research and development centre with the aim of creating value from waste.

This case study is based upon the results of an investigation conducted by TRL into possible applications for sandstone quarry sand in South Wales. The financial support for the study was provided through an environmental body, Viridis with a proportion of the funding coming from the Landfill Tax Credits Scheme and the remainder from the Welsh Assembly Government's Aggregates Levy Sustainability Fund.

Sandstone quarry sand (SQS) is produced during the process of excavating and producing crushed rock which is a valuable aggregate when applied to road surfaces for its skid resistant properties. During the production of the aggregate a large amount of filler or fines are produced and in South Wales this figure is approximately 0.9 million tonnes per annum. The aim of the study is to investigate current applications of the product and trial new potential uses for the product whilst also reducing the damage to the natural environment created by obtaining marine dredged sand and gravel. Using SQS as a substitute for this sand and gravel would be the more sustainable option. The range of applications for SQS include block paving bedding sand, to create cycle paths, as an ingredient in concrete mix, building blocks, cement extender, landfill liner and also as an ingredient in manufactured topsoil. The last application is where this case study will focus as the trials conducted to produce this product also contained quantities of green waste compost.

TRL's focus on using SQS for landscaping applications, more specifically as manufactured topsoil, was partly a continuation of previous studies carried out at

Harper Adams College (Keeling and Marchant, 2001). The study indicated the possibility of using sandstone quarry waste and green waste compost to produce manufactured topsoil. The benchmark for producing topsoil was based upon the British Standard Specification for Topsoil (British Standards Institution, 1994), which is split into three categories, premium grade, general purpose grade and economy grade. Keeling and Marchant's research indicated that, by using a 70:30 blend of filler and a suitable organic material such as green waste compost the textural classification and stone size requirements of the general purpose grade of topsoil could be achieved. The other requirements to achieve a graded topsoil product include chemical and nutrient requirements, which would need to be met by the organic fraction as SQS is essentially an inert material.

In order to test the suggestions of the Harper Adams study the researchers within TRL constructed a growing trial consisting of six test beds in the Geoenvironmental Research Park, near Port Talbot in South Wales shown in Figure 3.6 (Lamb, 2005). The green waste fraction of the study was sourced locally from the City and County of Swansea, who have been diverting waste from landfill by composting source segregated municipal green waste. TRL identified green waste compost as a suitable organic fraction as this material will continue to be readily available, since composting is set to increase in response to the EU Landfill Directive, and topsoil potentially provides a sustainable material outlet.

Figure 3.6 Growing trials using green waste compost and SQS in Port Talbot

The growing trial consisted of the construction of six beds, all with a variety of mixes of SQS, green waste compost, natural local topsoil, local manufactured soil and filler. Each of the beds was sown with a mix of grass and clover similar to that which would be planted on roadside verges. The progress of the trials was monitored on a weekly basis and prior to planting both the manufactured topsoil and the topsoil were analysed for comparison with the British Standard. The beds containing mixes of SQS, filler and green waste compost was also tested and found to achieve the majority of the requirements for the British Standard. In some cases the SQS, filler and compost mixes achieved a higher grade than the locally manufactured topsoil and the natural topsoil.

Throughout the trials the SQS, filler and compost mix performed equally as well as the other test beds and two of the mixes actually passed the requirements to qualify as Premium grade topsoil within the British Standard classification. Another advantage of the green waste compost mixes with SQS is that unlike natural topsoil, there is a lack of natural weed seedlings and although initial growth was slower the sand and compost mixes actually outperformed the topsoil products over time in growth.

The overall results show the mix of 2:1 sandstone and green waste compost is a suitable growing medium and meets almost all the requirements for the British Standard for topsoil. The main advantage of using this mix of products is that they are both widely available in the South Wales region, they are both sustainable products and could potentially provide an alternative disposal route for both compost and SQS. Conversely, the use of a sustainable mix rather than natural topsoil will help to retain natural soils, preventing damage to the landscape and provide an alternative product to natural topsoil which is becoming increasingly scarce and expensive. The production and sale of manufactured topsoil could also provide significant revenue which could cover the cost of production and save on potential landfill tax gate fees.

3.5 Summary

The case studies presented in this chapter are all examples of either innovative or pioneering practices within the composting industry. Not all of the projects undertaken have been entirely successful and often changes to legislation can sometimes invalidate certain methods of compost production; this is particularly relevant with the Project New Earth case study in the light of the recent Animal By-Products Regulations and restrictions on the composting of food waste.

The second case study, Capita Symonds, focused on the uses of green waste compost in the more traditional landscape gardening sector and is particularly interesting as it uses locally produced green waste compost for projects in Wales. The Capita Symonds case study is a good example of 'best practice' sustainable practices which can be successfully incorporated into both private and public projects.

The final case study looked at a trial conducted by the Transport Regions Laboratory (TRL). The research project involved investigating the potential use of sandstone quarry sand and compost as a potential mix for manufactured topsoil. The trial was conducted in Port Talbot in South Wales and used local materials, including green waste compost produced using City and County of Swansea green waste. The results of the trial were very positive and could potentially be developed to create a viable product which has green waste compost as one of its constituents.

CHAPTER 4

MARKETING A RECYCLED PRODUCT

4.1 Introduction

Chapter 2 highlighted key legislative drivers which will affect waste management practices in the UK in the coming years. In response to the EU Landfill Directive biodegradable waste will need to be diverted from landfill, and composting operations will become part of sustainable integrated waste management systems. In Wales the emphasis on composting source segregated biodegradable waste will be greater than in other parts of the UK, and significant quantities of compost will be produced from Welsh green waste. The National Waste Strategy for Wales (Welsh Assembly Government, 2002) has introduced targets which state that by 2009/10 and beyond Wales must achieve a 40% recycling/composting rate with a minimum of 15% composting and 15% recycling.

These strategic targets have essentially forced local governments to expedite their recycling and recovery policies, and there is more of an emphasis on local authorities to invest in long-term solutions for the disposal of waste by securing suitable markets for recycled materials. Composting initiatives have also been spurred on by a number of anti-peat pressure groups, concerned about natural eco-system habitats, who have suggested green waste compost as a natural and

sustainable alternative to peat based composts. An additional attraction of composting for waste managers is the potential to generate income from sales of the product within the growing media industry. However, trying to break into the growing media industry and establish a brand and a sound customer base will be a significant challenge for many green waste compost producers.

Since the introduction of the Wise about Waste Strategy in 2002 Wales has seen a significant increase in the amount of compost it produces as shown in Figure 2.4. However, in order to successfully divert green waste from landfill the compost will need to be dispersed as a product throughout the growing media market in Wales and possibly further afield in the UK.

Chapter 2 provides a list of possible applications suitable for green waste compost. This list is quite extensive, although many applications require the use of compost as a component of the product rather than the sole ingredient. In addition, Chapter 3 gives examples of projects which attempt to pioneer the use of waste-derived material within the composting industry. The solution to the problem of diverting green waste compost from landfill by introducing the product into such markets is however not entirely straightforward for a number of reasons:

1. Many of the green waste compost producers in Wales operate within waste management companies and therefore have minimal or no experience with product development within the growing media industry.
2. Despite an in-depth knowledge of compost production and processes, many of the compost producers will not have a similar level of knowledge and expertise in marketing the product or the necessary links to distribution channels and outlets.
3. Unfortunately there still remains a stigma surrounding materials created from waste and recycled products which can create an immediate barrier in product development.

The challenge for green waste compost producers in Wales is to take the compost, which is essentially a recycled material and market it as a product, with a market value within the growing media industry.

4.2 Elements of Basic Marketing Theory and their Relation to Marketing Green Waste Compost Products

Basic marketing theory often works on the basis that successful market development of a product requires producers to first identify the needs of the consumer within a target market sector prior to the development of a product (Kotler *et al,* 1998). A common misconception is that marketing can create needs which did not exist previously (Randall, 2001). In reference to the growing media industry there will be a maximum total demand for compost and the use of marketing strategies will only serve to aid and inform consumer choices. Randal (2001) argues that the challenge for the marketer is to demonstrate how the product can better meet the needs of the consumer, so it is first necessary to understand what those needs are and how to best match those needs to the product. Winer (2004) supports this theory by suggesting that the sole reason for a consumer to purchase is to obtain the benefits the product delivers and it is the job of the marketer to translate the characteristics of the product into the benefits the consumer seeks. In the case of marketing green waste compost it is important to identify the reasons for consumers' purchase choices and to highlight how the product can meet the needs of the consumer, whether that is the performance, the environmental credentials as an alternative to peat or perhaps purely the price.

The way in which organisations are guided to approach the marketing of their products or services has evolved. Initially, organisations may have produced a product and then used marketing strategies to create demand for the product, whereas now the focus is on developing a product to satisfy the demands of the consumer. The earlier approaches used were based around a 'production orientation' (Jobber and Fahy, 2003) method in which an organisation will manufacture a product and then adopt an aggressive sales effort to target consumers and create demand (see Figure 4.1). The preferred method now is to use a 'marketing orientation' method which will initially assess the needs of the consumer, identify the potential market opportunities and try to meet these needs with the product (see Figure 4.2).

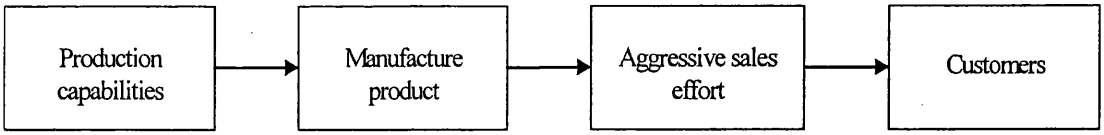


Figure 4.1 Production orientated approach

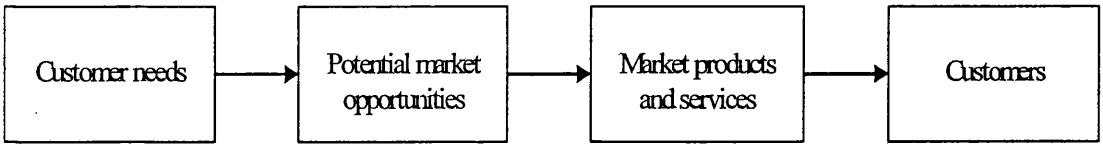


Figure 4.2 Marketing orientated approach

Unfortunately the concept of 'market orientation' is slightly more complicated in relation to green waste compost. As a result of the strategies implemented to achieve the national waste targets, producers in Wales will inevitably be faced with increasing levels of green waste compost to divert from landfill. As this problem has already been presented the most logical step would be to investigate the potential market for green waste compost based on previous research, and then to select the most appropriate marketing strategies to implement as a means to promote the product within the growing media market.

At the time when this research commenced there was limited research material available on the development of green waste composting. Three of the most prominent documents available included two research reports outlining the growing media market situation in the UK and one marketing guide prepared for green waste compost producers. The first document was a report commissioned by the Office of the Deputy Prime Minister (ODPM) and was titled '*Monitoring of Peat and Alternative Products for Growing Media and Soil Improvers in the UK 2001*' (Office of the Deputy Prime Minister, 2001). The report provides detailed information regarding trends within the growing media industry and gives specific quantities of peat and peat alternatives currently used within the respective growing media market sectors. However, there is only a brief mention of green waste compost use and there is no data to identify the level of use of the product, at the time, within the UK or any predicted levels of demand within the growing media sector. Although the report suggests green waste compost as a potential replacement for peat it is not clear from the report how this goal could be achieved

by the producers of the product. As some of the data used in this report was originally collected in the mid 1990s it is unreasonable to assume that the market situation in the growing media sector will have remained constant. Since the introduction of the waste targets in England and Wales the composting figures presented in the ODPM report will have altered significantly. Despite providing suggestions for outlets for green waste compost the document does not highlight any potential barriers to entry to each of the suggested market outlets nor how to develop entry into each sector.

Another report presented in conjunction between the Waste and Resources Action Programme (WRAP) and Paul Waller Consulting titled '*Composting and Growing Media Manufacturing in the UK, Opportunities for the use of Composted Materials*' (Waller, 2003). The report provides a detailed background to the growing media market situation in the UK, however, as much of the data used was sourced from the ODPM document the figures will only reflect the market situation prior to 2001. The report also provides lists of compost producers at the time in the UK and the feasibility of introducing compost into the growing media market. The research was conducted in 2002 and at this time it was probably too early to provide actual marketing strategies for green waste compost producers as many of the operations were in the early stages of development.

The '*Marketing Guide for Producers of Waste Derived Compost*' was a booklet produced by the DETR (Department of the Environment Transport and the Regions, 1999b) and provides producers of green waste compost with basic marketing advice and strategies to promote the product. Rather than report on market research conducted the publication was designed to inform green waste compost producers about how to implement their own marketing strategies. All the information provided is generic and does not focus upon a particular region or market sector and therefore could most likely only be used as brief introduction to marketing for many green waste (or waste derived) compost producers.

None of the aforementioned documents present any results which are specific to markets in Wales. One of the major barriers with selling compost is the cost of transport as highlighted in the WRAP report (Waller, 2003) and therefore it seems

sensible to identify local markets and solutions to the growing problem of green waste compost production in Wales. This research will attempt to identify which of the possible market sectors identified in previous research can be considered 'real' market sectors with a market value in Wales, since the cost of producing compost means that it is essential to recover value from the product. The research will also aim to highlight the potential barriers to these market sectors in Wales and suggest which marketing approaches would be preferable.

4.3 Green Marketing

Based on the fact that green waste compost is made from 100% recycled materials one option would be to promote the compost as a 'green product'. The idea of green consumerism and green marketing began to emerge in the late 1970s and 1980s to coincide with the rise of environmentalism. The pressures imposed upon industry to produce products and services with reduced environmental impact were particularly strong following media coverage of a number of environmental disasters, and the correlation between the reporting of such environmental disasters in the media and demands for environmentally friendly products was quite significant (Peattie, 1992; Coddington, 1993). The challenge for marketers, however, was to retain the interest of consumers following the subsidence of environment related stories from the news.

The identification of a potential green consumer segment was quickly realised by marketers who capitalised upon this by re-branding their products as green, or environmentally friendly. Green marketing at the time was viewed as a method to differentiate products when all other factors were equal (Ottman, 1993). It was considered possible to take advantage of the current climate and appeal to consumer demand for ecologically friendly products (Peattie, 1992; Ottman, 1993).

A particular focus in research over the past decade has been investigating the market potential for green products, specifically targeting consumers based on their commitment to buying products that will not have a negative impact upon the environment (Peattie, 1992; Coddington, 1993; Ottman, 1993; Charter and

Polonsky, 1999; Prakash, 2000). Utilising the 'green' component of a product such as green waste compost could potentially offer a unique selling point for the product and possibly a way to differentiate from the competition. In the earlier development of green marketing strategies, models were developed to show that within any consumer sector there exist varying levels of commitment from consumers to purchasing products that have a reduced impact upon the environment (Coddinton, 1993; Ottman, 1993). The basic theory was to build a profile of the most likely green consumer within any particular sector; however, this has not proved to be entirely successful as the next section will discuss.

4.4 Failures of Green Marketing

As the research for identifying 'green' consumers developed it became evident that this was not always an easy task and a number of problems with the initial models became apparent. In subsequent literature a number of studies highlight the problems associated with attempting to isolate green consumers within a particular market sector. This apparent turnaround in theory seems to question the validity of the entire notion of green marketing and its predicted success. A substantial proportion of 'green' market research conducted in recent years has tended to focus upon the failures and obstacles of green products rather than their successes and growth (Stoneman *et al*, 1995). The failure of companies to realise a growth in market share by offering environmentally friendly products has had a very negative effect on the entire industry, one particular opinion even goes so far as to describe green positioning as an 'anti-issue' (Neff and Halliday, 2000). This form of scepticism however is not entirely unfounded as rather than improve sales, many companies have reported at best a stalled growth or at worst a fall in demand for green products (Stoneman *et al,* 1995; Speer, 1997).

More recent research highlights a lack of focus on the needs and wants of the consumer, ignoring the basic lessons in marketing theory in favour of only presenting the environmental credentials of a product to attract demand. The reason for such a disastrous outcome to the 'green' phenomenon is not one particular flaw but a culmination of problems. The first problem could be attributed to a slightly

ambitious or misleading forecast in terms of demand for green products. Many people felt inclined to indicate in a survey, a purchase choice they would not necessarily choose in reality, in order to appear to be concerned for the environment (Speer, 1997). When making purchasing decisions, performance, value and reliability of a product will in reality feature ahead of environmental and social attributes (Holliday *et* al, 2002).

A second problem has been associated with the environmental claims made via eco-labelling. Eco-labelling is intended to educate consumers about the environmental impact of a product's manufacture, use, and disposal, thereby leading to a change in purchasing behaviour and ultimately, to a reduction in negative environmental impacts (Teisl *et al*, 2002). Eco-labels should make it easier for the consumer to identify those products which are less harmful to the environment and to highlight the more environmentally preferable alternatives (Case, 2004a). The theory behind the development of eco-labelling schemes was to encourage consumer preference for environmentally friendly products giving them a competitive advantage and allowing them to gradually push less environmentally friendly products out of the market. This competitive advantage could give other companies the incentive to develop new and more environmentally benign products (Grankvist *et al*, 2004; Thogersen, 2002b).

However, information about a product's environmental credentials will influence consumers' decision making only if the consumer values protecting the environment and desires environmentally-friendly products (Thogersen, 2002a). Teisl et al (2002) argue that in order for eco-labels to achieve policy objectives, consumers must hold preferences for certain environmental amenities and respond to the information presented on eco-labels by altering purchases toward eco-labelled goods. The success of eco-labels will rely heavily on the consumers' awareness and readiness to act to solve environmental problems in general (Thogersen, 2002b).

The usefulness of environmental labels from an environmental policy perspective will depend upon whether consumers use them in their decision making process (Thogersen, 2002a). Although the general level of environmental concern is relatively widespread in most developed countries, many consumers fail to perceive

or understand the connection between their buying decisions and various environmental problems (Thogersen, 1999). Studies suggest (Grankvist *et al*, 2004) that although consumers probably do pay attention to eco-labels when choosing between products, their attention is not strong enough to make them choose eco-labelled alternatives. Teisl et al (2002) also imply that a change in awareness does not necessarily translate to a change in behaviour and consumers do not necessarily follow their own purchasing assertions. Many studies have reported weak correlations between environmental concern and the choice of eco-labelled products (Grankvist *et al*, 2004) which could be attributed to the fact that respondents can often (knowingly or unknowingly) adjust their behaviour according to how they would like their behaviour to be, or be seen by others (Thogersen, 1999).

Studies have found (Grankvist *et al*, 2004) that consumers often have a hard time understanding what labels are intended to communicate and are uncertain about exactly what a label means. In the past, consumer trust in producers' private green claims has been undermined which has lead to widespread consumer uncertainty about who issues public and independent labels (Thogersen, 2002a). The challenge for purchasers is to be able to separate the more credible labels from the less credible ones (Case, 2004a).

Other reasons for declining sales have been the result of a number of products produced with false claims of being 'environmentally friendly' and confusing labels resulting in many genuine green consumers becoming sceptical towards companies professing to produce green products (Peattie, 2001). Polonsky (2001) refers to the bombardment of useless and incorrect green information as 'greenwash' adding that this type of cynicism now associated towards green claims has reduced the value of using green claims as a competitive advantage. Rather than encourage consumers to purchase as was once suggested (Ottman, 1993) it now can almost have the opposite effect and producers are increasingly disinclined to use green labelling on their products (De Boer, 2003). To label a product as 'green' does not really provide a strong enough argument and as suggested has often led to confusion for many consumers, often resulting in the opposite of the desired effect.

Finally, one point which must not be neglected is that few products are purchased with the sole purpose of protecting the environment and typically, consumers will buy goods for the private utility they provide (Thogersen, 2002a). Thogersen (2002b) also argues that if other self-relevant information competes for the consumer's attention, to a point where the consumer experiences information overload, they may easily fail to notice relevant eco-labels in the buying situation. There is also a fear that environmental claims may serve to legitimise a further growth in consumption and any gain from the reduction in harm to the environment will be offset by this increase in consumption.

4.5 Marketing Recycled Products

Closely associated with green marketing is the development and promotion of recycled products. When a product is made from a recycled material it should not be immediately assumed that this will compromise the quality, nor should the product be marketed solely upon its recycled content. A product should be marketed to highlight the features and potential benefits to the consumer and why they are favourable over the competition. Two examples can be used to illustrate this; the first is taken from the clothing industry and the second from the photographic industry.

Meyer (2001) presents a case study of a US based clothing manufacturer that specialises in outdoor clothing made using recycled plastic post-consumer waste. The company's target consumer segment require clothing lines suitable for high-intensity, usually outdoor, sports such as mountaineering. As their products are marketed on their functionality as outdoor garments rather than green products the company can be less concerned with green consumer demand and focus directly upon the needs and wants of the consumer. The environmental superiority of the products will be considered important by only a small percentage of their customers, however for the majority it will appeal to their 'self-esteem' criteria but only as a secondary consideration.

Recycling can also greatly reduce production costs if implemented correctly. One industry usually synonymous with the 'throwaway society' is that of the disposable camera. Once the film has been used on the single-use camera it is returned to a developer who will retain both the film and packaging. Although implemented as a reflexive reaction to an increasing waste problem Kodak recycles over 60 per cent of their disposable cameras worldwide (Heller and Mroczko, 2000). Despite the initial production alterations and infrastructure changes, the recycling of the disposable camera is far more efficient both environmentally and economically. Perversely, the company has chosen not to use this information as a selling point for the product, but rather, continues to allow many consumers to assume the product is discarded after each use. This study revealed that the *'recycled message doesn't warrant mention at the top of the list of priorities emphasised on the package'* (Heller and Mroczko, 2000).

These two examples illustrate cases of alternative approaches to marketing recycled products, both successful products but employing very different marketing strategies. Aside from particular case studies such as these there is limited research conducted on how best to market recycled products, however, those studies which do exist seem to focus on the issue of consumers' perception of quality, as the following study of recycled paper demonstrates.

4.5.1 The case of Recycled Paper

The concept of marketing green waste compost on a large scale has only recently been encouraged as a result of the legislative drivers to reduce green waste sent to landfill and hence there is little in the way of previous research on strategies implemented to market green waste compost. One industry which can be observed and compared with the green waste composting industry is the recycled paper industry. Recycled paper has been produced on a large scale for over twenty years and has gone through significant developments both in terms of production processes and market development. Due to limited information regarding the development of markets for green waste compost it seems sensible to observe the

changes in another recycling industry to identify any barriers to the market and how the industry has attempted to overcome these barriers.

When recycled paper was first introduced on to the market the product soon faced criticism surrounding the cost, availability and overall quality. The cost of recycled content paper was on average between 3% and 10% higher than virgin paper when first introduced and the costs of printing on recycled-content paper were also more expensive (Weinstein, 2005). These price considerations were often cited as one of the main reasons for magazine and catalogue producers not to proceed with the recycled product, plus the availability of recycled-content paper was also considered a major issue (Viveiros, 2003).

In addition to being more expensive than the virgin alternative, the quality of early recycled-content paper was also questionable, particularly in the 1980s when demand for recycled products was high. Some vendors were selling very low quality paper which was not designed for the modern printers (Case, 2005). The issue of paper quality was not just for end users at home and in the office, but also for industrial printers. Many mills found that they needed to make adjustments to their machinery. Although this was possible these alterations resulted in the slowing down of the printing process and ultimately an increase in production costs (Weinstein, 2005). Publishing and printing catalogues and magazines is such a large and established industry that many of the operators felt it would be too difficult to change the existing infrastructure to accommodate recycled-content paper (Viveiros, 2003).

The quality of recycled-content paper has however, dramatically improved over the last ten years (Viveiros, 2003). The price of recycled content paper has also fallen so that these products are now much more comparable (Weinstein, 2005) and in some cases are more favourable than the nearest virgin alternatives (Case, 2005). Case (2005) also reports on how paper manufacturing technology has dramatically improved and that the performance and availability of recycled-content paper in many industries is equal to virgin paper.

Despite these advances in the price and performance of recycled-content paper the studies suggest that there remains a problem of persistent myths concerning its quality, performance and cost (Viveiros, 2003). Indeed, many of the deficiencies of early recycled-content paper continue to influence potential paper consumers (Case, 2005). Viveiros, (2003) also reports that consumers in a number of business-to-business situations do not feel that it is important to their customers whether they use a recycled-content product and therefore it is not a priority. Another barrier to the market has also been observed in the way most governments continue to allow procurement officials to purchase non-recycled materials despite supposedly promoting the increased use of recycled (Case, 2005).

Following significant improvements to production processes, recycled-content paper is now becoming recognised in most industries as a suitable alternative to virgin paper, with many of the myths concerning price, quality and availability being tackled by producers. Recently, there has also been an increase in pressure from consumers and environmental pressure groups to alter production practices (Weinstein, 2005). Cataloguers are frequently being informed about how using a recycled-content paper can be used as a means to differentiate themselves in the market, but there is a need for increased support from more organisations within these industries (Viveiros, 2003). Finally, it is also necessary to place public bodies under pressure to make changes to procurement policies and to strengthen their commitment to buying recycled products (Case, 2005).

4.6 Summary

Marketing literature highlights a gap between consumers' perceived environmental attitudes and their purchasing behaviour (Wong *et al*, 1996). The green attributes of a product will rarely be a top priority for the consumer when making a decision to purchase. The only exception to this may be in the instance where legislation has been introduced to counter the effects of environmental pollution, such as the requirement for catalytic converters in all new cars and the switch to unleaded fuel. Without such consumer push factors many firms are finding it difficult to sustain

levels of demand for products being marketed using their environmental friendliness as a unique selling point.

The need for markets for green waste compost in Wales is of paramount importance to the success of the National Waste Strategy. The process of identifying a suitable marketing strategy for green waste compost is not straightforward however, and there are a number of basic marketing guidelines which need to be considered. The most basic of these guidelines stresses the importance of establishing the needs and wants of the consumer before developing a marketing strategy for the product. In reference to adopting green marketing strategies the same basic marketing rules should apply. As the literature suggests, it is not enough to promote a product purely on environmental credentials, the product must also be appropriate to the needs of the consumer and will need to be comparable in price and quality to the closest alternatives.

The example of the recycled paper industry highlights the barriers faced by the producers following initial problems with quality and price. Despite the drastic improvements made over the last ten years to the product it has been a struggle to allay these misconceptions regarding price and quality. Possibly one of the greatest hurdles to overcome for today's green marketers is the perception of poor quality. In the emerging stages of green consumerism it may have been possible to sell a product based purely on its 'green' claims, however this is no longer the case (Stoneman *et al,* 1995). Enhanced performance and quality have been continually reiterated as crucial when marketing all products, where as the emphasis upon being green, although important will always be a secondary consideration (Speer, 1997).

CHAPTER 5

DEVELOPING AN INSIGHT INTO THE OPINIONS OF STAKEHOLDER GROUPS

5.1 Introduction

The earlier chapters have established the need for green waste composting to be part of a sustainable waste management programme in Wales, and for viable outlets to be identified and appropriate strategies employed to market the compost product. The focus of the following chapters will be to describe the planning, design and results of an empirical study to investigate the issue of compost market development in Wales. This chapter will concentrate on the first part of the study, which used qualitative methods to gather a basic insight into each market sector within the growing media industry and to uncover any underlying themes.

Prior to conducting any form of empirical research a desk study was carried out to establish what research has previously been undertaken in the field of composting and compost marketing within the UK and more specifically within Wales (Welsh Assembly Government, 2002; Office of the Deputy Prime Minister, 2001; Department of the Environment, Transport and the Regions, 1999b). The research

identified a number of potential markets for biodegradable waste derived compost that include, horticulture, amateur gardening, agriculture, landscaping, grounds maintenance, land restoration and landfill engineering. Within this list it was possible to categorise these potential markets into seven sectors which were used as the basis for the qualitative research. The potential consumers were placed into the following sectors; government bodies, landscape consultants, landscape contractors, growing media suppliers, independent domestic retailers, horticulturalists and agriculture.

5.2 Methodology for Qualitative Research

The choice to carry out qualitative research was based on a number of factors. Firstly, qualitative data can often identify variables which can be suitably applied in a quantitative study and provide guidance when constructing survey questions. Qualitative research, in the initial stages, can also help to define the exact nature of the research question and can be useful to obtain detailed information about a process or industry which is not always accessible from quantitative research. For the purposes of this research it was essential to build an accurate profile of the growing media industry in Wales and all the major types of organisations which interact with the industry. Conducting qualitative research provided an opportunity to confirm and build on the secondary research previously collated. In order to compile a comprehensive profile of the growing media industry in Wales it was necessary to obtain a clear understanding of the relationship between all of the market sectors highlighted and this would be best accomplished by speaking directly to representatives from each of these sectors.

When analysing the validity of qualitative research as a market research tool, Malhotra and Birks (2003) present a number of arguments in favour of selecting qualitative research as means of collecting data. Qualitative research provides the researcher with the opportunity to build a rapport with the respondent in a way not possible when administering a quantitative survey. The condition under which the research is conducted is often more relaxed and more conducive to obtaining more

in-depth and possibly sensitive information. If there is sensitive data to be obtained, such as opinions on working practices or attitudes towards other sectors, this may be more difficult to achieve with quantitative research methods.

Quite often the information required from respondents might only be present in a subconscious form and therefore it is the task of the interviewer to uncover these subconscious feelings by analysing attitudes and emotions expressed when discussing a particular topic. In the case of this research it was important to understand the relationships between sectors, for example, the relationship between the growing media specifiers and the contractors, as this could have direct influence on producer and consumer product satisfaction.

Probably the most important and relevant reason for opting to undertake a qualitative form of research during this study was that it presented an opportunity to gain a comprehensive and relatively complete understanding of the growing media industry in Wales. Conducting depth interviews with representatives from each of the sectors made it possible to map the relationship between government bodies, consultants, contractors, suppliers and retailers in the growing media industry in Wales and how these sectors interact with each other (see Figure 1.1).

Malhotra and Brinks (2003) also present two types of qualitative interview paradigms, positivist and interpretivist. A positivist approach to qualitative research seeks to establish causality (where the occurrence of X increases the probability of Y) to explain a phenomena, whereas an interpretivist will learn from each step of the research process. The research reported here is based on the latter style as the interviewer was able to develop an understanding of each sector during the process of the research and based on this could make decisions regarding the direction subsequent quantitative research would take. The results from the qualitative data would determine which sectors would be selected for further quantitative research.

The reason for choosing depth interviews was based on the assumption that they would increase the level of depth and understanding during a one to one situation rather than in a focus group situation, plus there were also a number of practical

reasons. In order to attain a more comprehensive understanding of each sector and the position each organisation held within the hierarchy of the industry it was imperative to interview respondents holding senior positions within each company. In most organisations the people who hold these positions are rarely available for interviews other than at their place of work and are often unlikely to commit to attending a focus group style interview. For this reason it was deemed far more practical to conduct depth interviews at each respondent's place of business, and this ultimately increased the success rate of obtaining the required number of interviews. In addition, as the research encompasses the whole of Wales it would be almost impossible to arrange focus groups with respondents having to travel from North to South Wales purely to participate in a focus group.

Depth interviews are also more suitable in this instance, as within each sector respondents are quite likely to be in competition with each other and therefore a focus group type situation may inhibit levels of response and depth of information provided. When discussing working practices or experiences with other organisations respondents will often feel more relaxed with a one on one situation.

When conducting the interviews there are a certain number of general guidelines which are suggested (e.g. Malhotra and Birks, 2003, McDaniel and Gates, 2002). These are only general guides and it is up to the interviewer to adapt a style of questioning and method of execution suitable to the subject topic and nature of the interview. Although depth interviews are generally considered to be unstructured it is important that the researcher has prepared a list of topics or areas they wish to cover and that they try to direct the flow of conversation to these subject areas. Conversely, it is also important to allow the respondent freedom to elaborate if they wish and if any interesting or valid comments are made the interviewer might choose to probe more to obtain a more complete response.

5.3 Design of Qualitative Study of Composting Industry in Wales

The initial qualitative element of the research involved 28 depth interviews across the seven market sectors: government bodies, landscape consultants, landscape contractors, independent domestic retailers, compost suppliers, horticulturalists and agriculture. The interviews were conducted over a seven-month period from March 2003 to September 2003 and encompassed businesses and organisations throughout Wales. The intention was to obtain responses from companies within similar sectors, and also to determine whether geographic location was a significant factor. Interviews with representatives from central government and consultancies, however, were restricted to South Wales for the simple reason that they were largely only represented in this region. The relevant sectors were identified according to a hierarchy of influence within the industry and in order to follow and better understand the procurement process, the interviews were conducted in a hierarchical sequence. This involved speaking to representatives from the Welsh Assembly Government and the Welsh Development Agency (WDA), followed by a number of landscape consultants, landscape contractors, growing media suppliers and the independent retailers.

It should be noted that, at the time of the interviews, the BSI PAS 100 quality standard for green waste compost had only very recently been introduced, and was not widely known. The opinions of the interviewees regarding the need for some measurement of quality should be considered in the light of this information.

A small number of interviews were also carried out with representatives from the agriculture and the horticulture sectors. However, these do not appear in the reports and analysis which follows. Reasons for not concentrating on these particular sectors were because, at the time of the interviews, the quality of green waste compost produced in Wales was not sufficiently high enough to satisfy the demands of the horticulture market. The agriculture market presents little opportunity for return on investment, particularly when placed in competition with other waste derived products such as sewage sludge which is given and applied free of charge.

Following each of the interviews it was important to write up a transcript of the conversation so that firstly it was easier to retain all of the information obtained during the interview which would be used during the analysis stage and secondly, so that a copy could be shown to the respondent to ensure the information conveyed was accurate. Included with each copy of the transcript sent to respondents was a covering letter explaining the nature of the research and informing them that details from the interview could be used as part of the final research project.

5.4 Interviews with Government Bodies and Landscape Consultants

The objective of interviewing these two sectors was to establish the role of engineering and environmental consultants and the relevant government bodies in Wales in relation to their involvement with the landscaping industry and how this may affect the development of green waste compost markets.

5.4.1 Role of Welsh Assembly Government

The Welsh Assembly Government, formerly the National Assembly for Wales was officially opened in 1999 following devolution proposals put forward in September 1997. The main driver for change was to allow the Assembly to develop and implement Acts of Parliament passed in the UK to reflect the particular needs of the people in Wales.

The Assembly has considerable power to develop and implement policy within a range of areas, of which the most significant to this project would be largely concentrated within the Environmental Planning and Transport Committee. The sub-sectors of the committee include Sustainable Development, Environmental Protection, Countryside Coast and Conservation, Planning, Transport and Heritage.

Sustainable development encompasses not just the Environment and Planning sector but all policy documents and therefore takes on a wide and varied role within

the Assembly Government. One specific document relating closely to the development of green waste and other recycled materials is the 'Wise About Waste' document which aims to incorporate sustainable development into policy development according to the National Waste Strategy for Wales (Welsh Assembly Government, 2002).

The Transport Directorate has been identified as one possible sector within which sustainable development can be integrated into the policy documents. One of the principle roles of the Transport Directorate is the maintenance and improvement of major road networks within Wales, which comprise over 1000 miles of trunk roads and approximately 75 miles of motorway. For each mile of road accountable to the Assembly also comes responsibility for the surrounding landscape, amounting to quite an extensive area of landscape development for the government to undertake; this highlights one possible avenue in which a proactive policy towards the increased use of sustainable products may be introduced.

The soft landscape requirements adjacent to the road networks will typically involve planting trees, shrubs and general maintenance of the surrounding soft landscape area. In an effort to encourage sustainability and to reduce costs the contract will generally require that contractors endeavour to reuse all materials on site resulting in a minimum amount of waste being taken off site. Inevitably however, there will an excess requirement for topsoil and possibly a soil ameliorant to restore the surrounding landscape and to encourage growth of new plants and shrubs.

All funding for major trunk road networks will originate from the Welsh Assembly Government but may often be directed through another government organisation such as the Welsh Development Agency or local authorities. The majority of the contracts awarded by the Assembly for network construction or improvement come under the title of 'design and build' regulations where the contractor is responsible for both the design and maintenance of the project for a set number of years, usually 5. A small number of projects may be categorised as 'design and operate' contracts where the maintenance terms may extend to a period of 30 years. With such

schemes the contractor will usually be involved in the planning process right from the onset and may also be required to obtain planning permission for the project.

Areas of development for the road networks can span the entire length and breadth of the country and so the contractors awarded the contracts will often try to source materials locally to reduce haulage costs and to reduce delivery time. The Assembly does not usually specify suppliers and particular products but rather the landscape architect or contractor would be required to provide a sample of the materials to be used to ensure they meet minimum national standards.

Development of the major road networks can often remain in the planning stages for an extended period of anything from 8 to 12 years making it difficult to quantify on an annual basis the volume of work undertaken by the Transport Directorate. Construction involving the bulk of major routes in Wales however has been completed or is in the process of completion and the majority of new contracts will focus primarily upon maintenance and improvement of the existing network.

The current spending on soft landscaping for road network construction and restoration projects would usually amount to a figure of 2% of the contract value which is approximately £15-20 million spent by the Transport Directorate cumulatively for one year (Dorken, 2003). This figure however will fluctuate depending on the number of active projects within each year. Maintenance costs of existing routes will usually be in the region of £1-2 million annually.

5.4.2 Role of Welsh Development Agency (WDA)

The Welsh Development Agency was established by the UK Government in 1976 with the intention to 'stimulate and support economic prosperity in Wales' and is now accountable to the Welsh Assembly Government. The rationale behind the start up of the organisation was to encourage economic development in Wales, to attract investment and develop industries whilst working in conjunction with local

communities. The aim is to integrate competitive business, promote vibrant communities and create opportunities for people in Wales.

The development programme investigates those areas in Wales where there is an identified failure or gap in the market and tries to encourage growth in these areas by partly funding local schemes and enterprises. The WDA have identified ten key areas in which to focus their work and these have been implemented in projects throughout the country:

- Innovation
- Entrepreneurship
- A Learning Country (joint corporate planning between WDA and Education and Learning Wales)
- ICT (Information and Communication Technology)
- Supporting Business (Advice and support to established businesses)
- Fresh Direction (Environmental Support)
- Wales in the World (Inward Investment and Overseas Marketing)
- Transport
- Communities
- Rural Wales (Rural Development Plans and Farming for the Future)

With particular reference to landscape development the WDA have two departments, the Land Development and Legal Services Department and Capital Projects. Both departments involve the management of land development projects ranging from single plots of land to major complexes. The WDA hold a rolling land bank of more than 1,000 hectares and continue to buy up land for further development. A substantial part of the development programme involves the restoration of old quarry and colliery sites within the land reclamation sector, and the renovation of old industrial brown field sites with an aim to developing innovative business and retail parks to attract future investment.

Despite a reduction in the number of new land reclamation projects there still remain approximately 4/5 schemes either under consideration or at various stages of the planning process. Restoration of colliery and landfill sites had previously accounted for a large percentage of the land reclamation work for the WDA, but as these projects reached the completion stages in the mid 1990s the majority of new development schemes have shifted towards the brown field sector. The initial planning for a land reclamation scheme can undergo numerous changes before any work is commissioned, with the majority of changes reflecting amendments and alterations to government policy.

The landscape development sector managed by the WDA covers a broad spectrum of activities ranging from roadside improvements to tourist displays and public park areas. These activities are predominantly concentrated in the South Wales region owing to government efforts to create an influx of investment to the area, but there are however, other divisions of the WDA throughout Wales that oversee local development activity. The WDA also collaborates with the forestry commission on a number of developments throughout the country.

As with the majority of government-funded organisations the WDA has a procurement policy aimed at achieving 'best value for money and fairness in decision-making'. For purchases over £750 a minimum of two quotations will be required and anything over £50,000 will involve a formal tendering procedure (Spode, 2003). The funding available to land development projects is in the region of £8-9million per year of which approximately £2million is allocated for soft landscaping.

5.4.3 Role of Environmental and Engineering Landscape Consultants

Firms operating under the title of environmental and engineering consultants cover a broad range of disciplines and levels of expertise making it difficult to quantify without further investigation the exact number of soft landscape consultants in Wales. The three landscape consultants approached in this instance for interview

form part of multi-disciplinary firms primarily involved with engineering and hard landscaping (e.g. paving construction, fencing etc) but are also regarded as highly competent within the soft landscaping sector (e.g. planting, tree surgery, landscape design etc). Tenders applied for by these firms will, on the whole be for public sector and commercial business rather than small private contracts as often the tender will require a number of disciplines in addition to landscape development. This is not to say that only firms with civil engineering specialties can be considered as often a number of firms will be selected to cooperate on a single development scheme, but the majority of firms selected will benefit from shared expertise within a company.

As a general rule, any institution wishing to appoint a consultancy firm to manage a development project will invite a selected number of firms to bid for the contract. Usually there will be set criteria, which each consultant is obliged to fulfil in order to be successful and this criteria is often a result of a culminating number of facts rather than on price alone, although this will be one of the main determining factors. Experience in the industry and a reputable working practice can have a strong impact on the client's final decision. Following a successful bid the consultant will then put out a tender on behalf of the client to contractors for the various works required and generally it will be the responsibility of the contractor to find suppliers of the materials specified within the contract.

Publicly funded projects will tend to have a specific type of contract to be adhered to by the consultant. The Highways Agency would typically incorporate a 'design and build' or 'design and operate' contract where the specifications are required to comply with those set out in the manual of contract documents for highway works. The manual would include the minimum standards and quantities required for each material used depending on the nature of the work to be completed.

Commercial projects will generally allow for greater freedom with the specification of materials, as there is no standard document with which to comply other than the requirements of the initial development plan issued by the client. Depending on the nature of the company and their commitment to issues of sustainability this may

have an effect on the materials used by the contractor, but on the whole, sourcing of the supplies will be left to the contractor to find the best value for money.

In recent years there has been a shift in the procurement method of development schemes and a number of projects are funded through PFI (Private Finance and Investment) and PPP (Public/Private Partnerships) with the majority centred in the healthcare, educational and custodial sectors. Despite the element of private funding for such schemes the government remains involved in all areas of design and there will often be set guidelines on procurement and for work on land and buildings which are included in the contract and must be adhered to by the contractor awarded the job.

The consultancy firms approached manage projects throughout Wales and England, more specifically the South East and often the different branches of the company will collaborate on a single project if the expertise required is stronger in another branch.

5.4.4 Influence of Sustainability

The issue of sustainability has in recent years come to the forefront of many development projects in Wales and the rest of the UK, particularly with the advent of the EU Landfill Directive which aims to introduce substantial reductions in the amount of biodegradable municipal waste sent to landfill.

All of the institutions interviewed, particularly government organisations have been keen to introduce new policies encouraging sustainability. The WDA has a sustainable development policy titled 'Learning to Work Differently' listing key issues and objectives to promote development whilst sustaining natural resources for the needs of future generations.

'In line with the WDA's commitment to sustainability, where possible the material currently on the site will be re-used and if necessary a nutrient will be

added to encourage re-growth of vegetation and improve pore structure within the soil. At present much of the added nutrient will be supplied in the form of spent mushroom compost' (Spode, 2003).

All of the institutions approached for interview expressed a desire to use peat-free products in any landscape development scheme, unless peat was specifically required for a particular plant, and would welcome any new product which could perform to a similar standard to the closest competitor, mushroom compost, at a competitive price. As a priority for both the WDA and the Welsh Assembly Government all projects must be approved before funding is awarded and specifications for any new developments must allow for projects to be completed at a competitive cost without having a negative environmental impact.

'The Welsh Assembly Government encourages practices of sustainability from all contractors hired and requires proof that they are working towards the ISO 14001 and have some type of EMS (Environmental Management System) in place. The contractors may be required to identify current methods of sustainable practices on development sites' (Dorken, 2003).

The active role in sustainable practices varies among the consultancy firms interviewed and although sustainable development is ranked to be of significant importance ultimately the decisions will be largely cost related in terms of best value for money (McComiskey, 2003). One particular firm however claims to have pioneered sustainable working practices (Ford, 2003) with a number of projects having a 'no waste off-site policy' meaning that all materials were recycled and used on site. An example of such a development was at HM Prison Dovegate in Staffordshire in which Capita Consultancy's principal landscape architect Nigel Ford took on the challenge to create a suitable prison landscape in accordance to the demands of the local community. The entire project produced no off-site waste and operated restrictions on the volume of vehicle flow through the site and all movement of materials was completed using a conveyor belt system. This system was designed in response to concerns from local residents over the impact on the rural environment of increased traffic flow caused by the construction work.

Another firm also highlighted a noticeable trend of client preference for increased sustainable working practices (Hopkins, 2003) which has led to increased awareness by the company of the value created by encouraging sustainable development, and highlights the benefits of using renewable resources. Often the effects of encouraging the use of renewable resources will have a positive impact on a company's commitment to sustainability.

The levels of sustainability achievable within each project will most likely be affected by a number of external influences, often budget and time constraints will limit the number of sustainable alternatives available, particularly for smaller commercial organisations in which the size of the project cannot always justify investment into the use of renewable resources.

5.4.5 Forecast for Possible Demand of 'Green' Compost

In terms of commitment from government bodies towards the use of green waste compost the initial reaction seems to be positive with the most significant barrier presenting itself with the need to have the product certified to assure consultants and contractors of the reliability of the product. The WDA at present have no in-house set specifications regarding green waste compost and have implied that if the green compost were to meet a recognised standard e.g. BSI PAS 100 then it could be considered as a viable alternative to spent mushroom compost (Spode, 2003). In a similar vein, the Transport Directorate have highlighted that despite the generic specifications set out in the form of standard model contracts for all highway projects under EC Procurement Directives (European Commission, 2003) the Welsh Assembly Government have the ability to include additional specifications in an annex specific to each individual project. Such specifications could include the use of green waste compost or peat-free substitute providing these products conform to a standard, which is recognised industry wide. A specific distributor or brand would not be placed within such specifications, however contractors would be encouraged to source locally.

Of the consultants interviewed only one firm, Capita Property Consultants have specified green waste compost for use on developments. The compost currently used is sourced from a company based in Dorset. It was reported that the initial reaction from contractors is not always positive as the aesthetics of the material is not quite the same as a peat-based product, however feedback on the whole has been positive and the company will continue to encourage the development of green waste composts (Ford, 2003). The other firms interviewed despite having never used green waste compost have expressed interest in using the product as a peat-alternative provided that the price is competitive and the compost meets an industry recognised standard.

Although there is an increasing interest in reducing waste on site and increasing sustainability there still remain one or two concerns with using 'green' waste products. In addition to apprehension over consistency within the quality of material provided one firm voiced concern over the levels of physical contaminants within the compost. Particles of plastic and glass must not exceed the stated ≤0.5 (of which ≤0.25 is plastic) per cent of total air-dried sample to conform to the BSI PAS 100 standard. The main reason for wanting to reduce such particles of plastic would be to improve the aesthetics of the product rather than any chemical imbalance. There may however be certain circumstances such as with use in prison and hospital grounds where it may be specified that all materials used must have zero trace of glass and other physical contaminants for safety reasons. Issues of this nature can hopefully be overcome with the introduction of a more thorough screening process to eliminate all physical contaminants.

Despite the concerns raised during the interviews the overall response towards green waste compost has been positive from this particular sector. Further development of an industry wide standard combined with an increase in awareness should provide an opportunity to create adequate demand for the product.

5.5 Interviews with Landscape Contractors

The purpose of interviewing the landscape contractors was to accurately define their roles and to outline the various responsibilities they hold as part of a service to the consultant, client and the local authority. The interviews also investigated the degree of purchasing power held by each contractor when sourcing suppliers and to what extent the contractor has an influence on the types of materials specified within a contract.

5.5.1 Role of Landscape Contractors

According to the Welsh Development Agency Landscape Directory (Welsh Development Agency, 2001) in Wales there are just over 100 (103) registered companies trading under the title of landscape contractor, either solely or within the capacity of consultant and/or supplier. The definition of a landscape contractor can at best be loosely defined owing to the vast range of services offered within this classification. The range of disciplines each contractor is capable of providing can vary significantly between companies, particularly when expertise is sought within hard landscaping and civil engineering domains. The majority of landscape contractors will offer a range of design services: soft landscaping, tree surgery, fencing, grounds maintenance and varying degrees of hard landscaping.

Some contractors will also offer a more specialised service in addition to those mentioned; for example, RMB Craftscapes (Melville-Brown, 2003) specialises in 'hydroseeding', a method of replacing grass and soil in a more efficient and economical way than conventional sodding. The process involves the mixing of mulch, seed, fertiliser and water in a tank within a hydro-mulching machine. The mixed material is then pumped from the tank and sprayed onto the ground. Hydroseeding is often used on brownfield sites, railway embankments and various other land reclamation projects.

The scale of project undertaken by each contractor can vary considerably depending on the size and capability of the company. Many contractors operate as a sole trader or small limited company with between one and three employees and the majority of work will be restricted to private landscaping and small business. For the purpose of this study contractors selected for interview employed a workforce of ten or more and had an annual turnover of between £250,000 and £1 million with the exception of one firm whose annual turnover in 2002 was reported to be approximately £5 million and this firm employed a workforce of approximately sixty people (Hughes, 2003).

Three of the five contractors interviewed for the purpose of this study mentioned that they would be inclined to restrict projects to the South and Mid-Wales regions on the basis that they would save money by reducing both time and logistic constraints. The remaining two contractors were slightly larger companies, and they have the capacity to undertake contracts throughout the UK. They do tend however, to focus within Wales and the South of England, in particular the South East where the value of a contract can be significantly higher than in Wales and the rest of England and will more than compensate for the added cost of travel expenses.

Medium and large firms were selected for interview due to their tendencies to order materials in bulk quantities from a supplier e.g. by the cubic metre or tonne as opposed to smaller landscapers who in many instances would purchase materials in bags from a local outlet rather than wholesale. Although the smaller operations were not selected for qualitative interviews they will be included in the quantitative element of the research, as they still comprise a percentage of the landscape market. Furthermore the sale of bagged 'green' compost constitutes the highest market value for the product.

5.5.2 Contractor Client Base

The majority of the firms contacted for interview explained that the bulk of their contracts involved work for local authorities within a wide variety of disciplines such as roadside maintenance, parks, leisure facilities, schools and housing developments. Local authority contracts can, for many of the contractors, account for up to 50% of their business and can also represent a regular income, particularly with reference to the after-care contracts for work in terms of a maintenance period, anything from 12 months to twenty-five years. A typical job would require a guarantee for plants and shrubs for a twelve-month period and often maintenance of the site would be for three years, although each contract may vary depending on the nature of the job (Lloyd, 2003).

Other government landscape developments typically include land reclamation schemes, small starter units for business, and public displays. These initiatives within Wales will largely be overseen by the Welsh Development Agency or an affiliate organisation.

Commercial contracts also constitute a large proportion of projects for contractors. By and large these will include new business retail parks, private housing development e.g. Wimpey or Lovells and various leisure or sporting grounds, namely golf courses, rugby and football grounds. The commercial development of golf courses in Wales was prominent a few years ago and represented a lucrative landscape sector, unfortunately this sector reached saturation rather quickly and has suffered decline in recent years.

Only one of the contractors interviewed, Spencer Environmental Care (Spencer, 2003), will regularly undertake work on private gardens as often these types of contracts will be too small and are left to the smaller landscapers. Exceptions will be made, however, if the private landowner has a substantial area of land to be developed or the grounds constitute part of a stately home.

5.5.3 Procurement

In response to enquiries concerning the procurement of materials, the findings were variable depending on the size of the firm and location of a project. On a general note, the majority of contractors will work from a cost benefit point of view and where the material is sourced will largely depend on the price of goods. The transport costs of non-specialist materials can be more than the cost of the product itself and for that reason most suppliers will include the cost of haulage within a specified radius.

Medium contractors will generally source material from a local supplier with the motive being for no reason other than for convenience and to save time. One contractor however, operates a 'Green Code' policy which specifies that where possible

'*All material is produced and sourced in the local area or within a 50 mile radius. The company aims only to deal with suppliers within the Principality*' (Spencer, 2003).

This preference to support regional business is not overly common within the landscaping business and although many contractors support growth of local business there must also be a cost advantage.

The criteria for the larger contractors is slightly more complicated as in addition to seeking a good value product the company will also require the supplier to be able to deliver large quantities of materials on a regular basis. One of the larger contractors in South Wales will typically place an order for $80m^3$ of compost, $160m^3$ of bark mulch, 400 tonnes of topsoil and 500/600m turf per week (Stevens, 2003). These requirements can often limit the number of suppliers capable of delivering such considerable consignments on a regular basis.

The majority of suppliers used by the contractors will deliver materials either directly to the site or to the contractor's yard. The cost of haulage will almost

always be included within the price assuming delivery is within a specified radius, and for any additional mileage the price can be readjusted according to the location of the site. For the larger firms ordering substantial quantities of product, suppliers will sometimes offer a set delivery price for anywhere within Wales, this can prove to be cost-effective for the contractor especially if a project is located in North Wales.

The methods of locating a supplier for materials will vary from company to company. For the majority of the contractors, their length of time and experience in the industry has allowed them to build a comprehensive list of suppliers in the local areas, which can fulfil general product requirements. On rare occasions when either a specialist product is required or the project site is situated in an area unfamiliar to the contractor then it may be necessary to locate an alternative supplier. In these instances the most common method of finding a supplier will be to use local advertising media or a specialist directory, one of the most popular is the ENDAT External Works Standard Index (ENDAT, 2003) which yields a comprehensive list of suppliers for all outdoor specialists in the UK. Other publications advertising services for landscapers include monthly journals such as The Landscaper, landscape associations e.g. British Association of Landscape Industries (BALI) and a variety of trade shows.

To a certain extent the contractors will be restricted in their choice of materials, as they are obliged to adhere to the specifications set out by the landscape consultant, or in the case of roadside development, the Highways Agency. A growing number of tenders will involve contractors having to adhere to a bill of quantities. These specifications largely concentrate on hard landscaping such as tarmac and fencing and the type and size of plants required (Ashton, 2003).

The specification procedure in the majority of cases for soft landscaping is slightly more relaxed with the exception that a specific requirement be that the contractor opts for a peat-free alternative when sourcing materials. With reference to specifying particular brands of product the architect will usually suggest a known

brand "or equivalent" so as not to reduce the element of competition and consequently drive up the cost of supplies.

'The architect will not usually require samples of materials used, with the exception of bark mulch, as this can often vary somewhat in quality depending on the supplier' (Ashton, 2003).

The degree of purchasing power held by the contractor will largely depend on the nature of the contract and the existing relationship between the landscape architect and the contractor. The landscape architect will generally leave sourcing of supplies to the discretion of the contractor, particularly if the two companies have a previous working history.

5.5.4 Sustainable Practices

One of the most significant advances towards adopting sustainable practices within the landscaping industry has been the move away from the use of peat and replacement by a peat-free substitute to be used as a soil conditioner or ameliorant. The most common peat substitute applied is spent mushroom compost which will generally comprise of 'chopped straw, horse, pig or poultry manure, gypsum and added nutrients. The compost is topped with a casing of peat, mixed with chalk or sugar beet waste lime' (Office of the Deputy Prime Minister, 2001).

In terms of adhering to a general sustainable working practice all of the contractors interviewed were either able to produce an environmental policy or were members of a reputable landscaping institute e.g. BALI and must therefore comply with all environmental policy adhered to by the organisation. The extent of an environmental policy's effectiveness varies considerably between the contractor firms, however the majority of policies will typically consist of a company's mission to uphold and exceed where possible all current environmental legislation, rather than specify in any detail the sustainable working practices of the company.

Many of the sustainable measures introduced by the contractors such as the composting of green waste on site, recycling wood and having a 'no waste off site' policy can be attributed as a direct measure to try to reduce the ever-increasing charges of sending waste to landfill. One firm interviewed (Lloyd, 2003) have gone a step further and are actively investigating an environmentally sustainable replacement for plastic covering used on plants and shrubs on motorway roadsides. These sheets of plastic are difficult to recycle and can cost a substantial amount of money to dispose of using conventional landfill methods. In response to this problem the company are experimenting using a biodegradable material to replace the plastic. Due to the composition of the organic material the product can also be used as a mulch mat and this removes the need for disposal, as it will break down naturally into the soil.

5.5.5 Response to Sustainability

The move to replace peat with more environmentally sound alternatives has provided the contractors with cheaper alternatives, for example, mushroom compost, green compost and *Biogran* have all been used successfully (Stevens, 2003).

The interviews also served as an opportunity for the contractors to voice any concerns and hesitations pertaining to the implementation of sustainable development practices. A number of contractors suggested that in order for sustainable development to become a priority in landscape development it is necessary for the government to offer companies incentives for reducing waste and encourage all contractors to meet the minimum level of requirements. Despite increasing legislation concerning sustainable development there have been no allowances within the industry to encourage sustainability and the worry is that the majority of tenders, even from local government will continue to be awarded to the lowest bid.

'For the majority of firms, implementing policies of sustainability will result in an initial increase in cost and these must be accounted for within the price for a job' (Lloyd, 2003).

Although the purchase of peat-free products offers a cost advantage to contractors, the investment required to create more sustainable working practices on site would initially increase costs and these may have to be passed on to the client. Such investments may include specific training courses for members of staff, new machinery to segregate waste materials and a large number of energy saving devices. Despite the long-term benefits for the company of reverting to a more sustainable working practice the initial costs of implementation my leave them at a specific cost disadvantage.

5.5.6 Forecast for Possible Demand of 'Green Compost'

The results from the interviews regarding the sectors of work which are expanding and declining varied greatly from company to company and therefore any suggestions should only be considered as a guide to possible developments in the landscape industry.

In the soft landscape market, mushroom compost appears to be the closest competitor to green waste compost as it has similar properties and can be applied to the land in much the same manner as green waste compost. Other applications for green waste compost have been suggested by the producers however, the high nutrient levels may make it unsuitable as a mulch or topsoil.

'Landscape architects have in the past specified green compost for use as a mulch, although this was not particularly successful, as compost should ideally be incorporated into the soil and not left on the surface as weeds can thrive' (Stevens, 2003).

Initial figures for use of mushroom compost vary significantly from only 100m³ per annum, considered as light use, to 80m³ per week, which is a fairly substantial quantity. The quantities given take in a fairly large range and the majority of small to medium firms would probably be somewhere in the middle. It is quite difficult to quantify exact figures of demand for compost using only qualitative research therefore quantitative measures will be administered in order to collate more reliable figures to predict future demand.

Two of the contractors interviewed have on occasion used green waste compost and the reaction to the product in comparison with the traditional spent mushroom compost has not been overly positive. Although green waste compost works much in the same way as mushroom compost there have been a number of criticisms highlighted. The main concern with the product seems to focus more upon the aesthetics of the product rather than how it functions as a soil conditioner. The major problem cited with using green waste compost is poor screening of wood pieces.

'*When applied to the ground the small pieces of wood tend to filter to the surface after a period of rainfall and can be unappealing to the eye*' (Stevens, 2003).

The potential success of introducing green waste compost as a suitable alternative to peat-free products seems to rest upon its price being competitive, sufficient availability and its conforming to specification documents provided by the landscape consultants. However, quality of the product will also be a major consideration as contractors can be liable for work completed for anything up to one year following completion of a job and therefore will need to be able to guarantee the quality of products used. The development of an industry wide recognised standard could go a long way to ensuring a minimum quality of product which both specifiers and contractors can rely upon.

5.6 Interviews with Independent Domestic Retailers and Suppliers

The intention of these interviews was to investigate the current and possible future of green compost in the retail market. This part of the report combines interviews with two market sectors, the supplier stream and also independent garden centres to compare and contrast the levels of demand for growing material and the anticipated reception of peat-free compost in these markets. Previous literature has highlighted the horticultural and domestic market as the most difficult to convince and persuade, particularly nurseries whose livelihood will depend on the success of plant production each year. It is necessary to ascertain the views and experiences of the people having front line contact with the consumer whether they are contractors, horticulturalists or domestic householders.

5.6.1 Role of Suppliers

Suppliers of horticultural and domestic growing media are defined within a wide scope and to pinpoint a definite category of suppliers is quite difficult. For the purpose of the qualitative research element four suppliers were approached, all of whom can be placed within the supplier category, however, each establishment has distinct differences in terms of materials supplied and production methods. As the availability of commercial suppliers is very limited in Wales the suppliers approached are all based in England but were all recommended by Welsh contractors. The suppliers are all of similar size (SME) and have an average turnover of between £2 – 3 ½ million.

The first of the suppliers approached was Melcourt, a producer of composted bark mulch based in the Gloucester region. Composted bark mulch is the company's primary product and sales of this product would account for in excess of 98% of the business (Adams, 2003). The primary feedstocks used are usually bark, wood and tree roots and can be sourced from a variety of countries including the UK, Latvia, Estonia, Spain, Portugal and the South of France. The company does not produce

any green waste compost but will source the product from a company called Eco-Composting, based in Dorset, if a client specifically requests a green waste material.

The second supplier interviewed was Roffey Ltd in Dorset. Roffey is a manufacturer of growing media for commercial horticulture and landscaping. The company also provides dressings and turf for sports pitches (Short, 2003). Rather than compost on site the company will buy in composted materials and make up a mix specific to the customer's needs. A small percentage of recipes will specify green waste compost and this is sourced locally.

'When green compost is required the company will source the product from Onyx, the waste management company for the Hampshire region' (Short, 2003).

White Moss is a growing media producer based in Merseyside. The company's primary business is peat extraction from their 450-acre site, which has a full modern planning consent to extract peat, and is not classed as a SSSI (Site of Special Scientific Interest). In response to external pressures the company has also diversified into composting bark and wood materials to mix with peat and, more recently the use of composted green waste. The green waste used is sourced from Mersey Waste Recycling and is sent in a composted form, which will then be mixed with peat or other composted materials. The company also bags the green waste compost in its pure form to be sent back to Mersey Waste who operate a voucher system through civic amenity sites.

White Moss supplies peat and peat-free materials in bulk to other compost manufacturers throughout the UK, specifically East Anglia, Kent, Somerset and the Midlands. Often these companies will blend the peat or compost with their own products to sell under their own brand. Retail sales are generally restricted to regions in the immediate vicinity of the site.

The final supplier interviewed is of particular interest to this research. Eco-Composting, a compost producer based in Christchurch, Dorset uses 100% recycled materials in the production of all products. Eco-Composting sells a variety of peat-

free composts, mulches, chipped bark and topsoil. A recent venture has involved using the compost to grow turf on land adjacent to the site to add to the company's product range. The feedstock used by Eco for compost production is predominantly domestic green waste, the majority of which is sourced from waste companies collecting from within Dorset County Council. The waste management company in Dorset is SITA, who will sub-contract Eco to take the green waste. A smaller percentage of green waste is also taken in from local contractors and commercial landscapers.

The distribution network of each supplier is tailored to enable the company to distribute the maximum quantity of material without paying excess charges in haulage. Melcourt will deliver anywhere in the UK and in the majority of cases can guarantee either next day delivery or within 48 hours. This efficient service is vital to customers who will often have to leave purchase decisions to the last minute (Adams, 2003). As Melcourt is owned by a parent company it has the advantage of a large fleet of delivery vehicles at its disposal that allows it to transport large quantities of material at relatively short notice. White Moss will also deliver peat to various locations throughout the UK however these will tend to be regular bulk deliveries to other compost producers. Retail sales are generally restricted to regions in immediate vicinity of the site. The company will use local independent garden centres in the Merseyside and Greater Manchester area to sell the composts under the Cromwell brand name and through the company's own garden centre (Eardley, 2003).

Both Roffey Ltd and Eco-Compost focus sales in the southerly regions of the UK.

'The distribution network for Roffey is generally focused on areas south of the M4, the South East regions. The main reason for this is that transport costs are significant as they will often match or be in excess of the price of the material being transported. As the distance to travel increases so will the cost and the further away the client the less competitive the prices of materials will become' (Short, 2003).

Eco-Compost have a similar view on their distribution network however both companies would not adversely affect sales and will always confirm an order irrespective of the distance.

'The priority however will be to optimise the local domestic market as the product will fetch a premium price locally and there is a sufficient demand base' (Ewbank, 2003).

Volume of sales differs between each supplier and this figure will often reflect market demands for the primary feedstock. Melcourt will average deliveries of 15,000m³ per annum and this figure can generally be separated into three distinct categories, 50% of sales are bark mulch products, 30% wood chip for play areas and 20% composted bark mulch (Adams, 2003). Although Melcourt do not carry green waste compost, all products are classed as a peat-free additive and have therefore seen an increase in overall demand in response to pressures to reduce the use of peat. Roffey Ltd have given an approximate sales figure of between 3,000 and 4,000m³, however as with all growing media products, sales will be heavily influenced by seasonal fluctuations which have been smoothed to get an average annual or monthly figure.

White Moss indicated uses of 150,000m³ per annum of material, the majority of which will be peat as the business was founded as a peat supplier. The changing attitude towards the use of peat has had a direct influence on the company and recent figures indicate that 25,000m³ of the figure quoted was a non-peat material and this is expected to rise steadily.

Due to the nature of Eco-Compost productions, composting green wastes, the entire product range is peat free. The company will take in approximately 35,000 tonnes from which it will produce 50,000m³ of compost and mulch (Ewbank, 2003), however not all income is derived from sales of pure green waste compost. In actual fact the best selling product for the company is 'Super Soil' which accounts for approximately 58% of sales, however there will be a slight overlap as the soil will have been blended with 30% Eco-Mix (the brand name for the company's

multi-purpose compost). Compost sales will account for between 30 – 35% of total sales and the remaining sales would comprise of mulch and wood chippings (Ewbank, 2003).

The target markets of the suppliers interviewed can be separated into two distinct sectors based on the primary feedstock used in production of the materials. Both Melcourt and Eco-Compost use 100% peat-free ingredients for composts and mulches and therefore landscape contractors comprise a high proportion of the customer base. The soils market also has a substantial impact on sales for Eco-Composting

'Due to the success of the soils market this can often act as a disposal route for the compost as the soil is blended with 30% Eco-Mix' (Ewbank, 2003)

In the case of both Melcourt and Eco approximately 90% of sales would be in bulk to contractors and the remaining 10% sold as a bagged product via independent outlets.

Roffey Ltd and White Moss have slightly varied customer bases to the previous companies, as the large majority of the materials sold are peat based and would therefore attract growers in the horticultural market.

'Although there is increasing pressure for growers to use peat free materials the risk of plant failure is heightened with the use of green compost or similar as the nutrient and pH levels cannot be of a guaranteed consistency' (Short, 2003).

Despite the variances in the main target markets for each type of supplier, whether it is peat based or peat-free it is also interesting to note the small percentage of growing media in bags. With the exception of White Moss whose retail sales are in the region of 30-35%, the remaining suppliers will only manage to sell 10% of materials through an independent outlet as a bagged product.

5.6.2 Role of Independent Domestic Retailers

Rather than approaching the large commercial garden sheds such as B&Q, Focus, and Homebase the decision was made to interview only independent retailers based in Wales. The choice to restrict the interviews to independent garden centres was based on the typical supply requirements of a large chain compared to the compost production figures predicted by the Welsh Assembly. It has been suggested that the green waste compost produced in the next five to ten years in Wales would not be sufficient to satisfy current demands of retail chains. The potential market size for green waste compost as provided by the National Waste Strategy for Wales (Welsh Assembly Government, 2002) indicates that within Wales there is scope to retail 40,000 tonnes at between £15 – 50 per tonne. These figures are only given as a very rough estimate and more accurate information will hopefully become available with the development of proposed composting facilities in Wales.

In an attempt to gauge current market trends within the independent garden retail market, six garden centres at various locations throughout Wales were approached. The establishments ranged in size from a small, solely managed garden nursery with an annual turnover of £48,000 (Edmondson, 2003) to a larger SME with a turnover of approximately £3 ½ million and a workforce in excess of 70 employees (Buckler, 2003). The remaining four garden centres interviewed fell between these brackets, and were all relatively similar in size and turnover. Despite interviewing in a number of different regions of the country the general organisation and management of each business was relatively similar. Product ranges will typically consist of plants, many of which would be grown on the premises, growing media and a range of garden accessories to varying degrees.

Sales of composts and other soil improvers will generally account for a substantial percentage of total sales, usually between 25 – 35%. The most popular brands carried are Levingtons, J Arthur Bower, Sinclair, Scotts and Gem. Each garden centre has at least two of these brands within their product range and a popular regional brand is Clover which is prevalent with most garden centres in North Wales.

Only two of the garden centres carried an independent composted product. Pontarddulais garden centre sells composted manure; the company has traditionally been an outlet for Cowbridge Compost, a large farm in the Cowbridge area in South Wales, which has supplied composted cattle manure for many years (Pontarddulais, 2003). The only other garden centre to supply an independent product was Moreton garden centre, the largest of all the businesses interviewed. The garden centre carried a range of products from an independent producer, Pennine Organics who supply pelleted cattle and chicken manure (Buckler, 2003). A farm-based company in Shrewsbury wanting to supply the garden centre with composted and dried farmyard manure, 'Moo Poo', also recently approached the company. However, the pricing structure was not competitive enough to match the current composted manure provided by Sinclair. Green Fingers garden centre previously stocked independently produced organic compost '*however the quality was not satisfactory and the line was discontinued*' (Pickles, 2003). Although the number of independent brands being sold through garden centres is small, the proprietors do seem to be receptive to local produce assuming the price and quality can be competitively matched.

Local domestic householders comprise the vast majority of custom for garden centres and are responsible for over 95% of total sales, with the remainder possibly going to a local contractor or commercial business requiring a small delivery. Garden centres will concentrate on sales of bagged products alone, which are priced at the top end of the scale and therefore would create greater revenue than the same material sold as a bulk purchase.

As a method to measure volume of sales of growing material the garden centres have indicated total volumes in pallet units. Each pallet would hold between 35 and 50 bags of material depending on the nature of the growing media and the litre capacity of the bag. The number of pallets delivered in one year varies considerably, from 25 pallets per year (Edmondson, 2003) to approximately 600 pallets per year (Buckler, 2003). Again, these two examples represent the two ends of the independent garden centre range and an average store may require between 30 and 60 pallets per year. Naturally, these figures will fluctuate from year to year,

as will sales of individual brands and products, but are useful as a guide to the volumes of material generally required for the domestic market. In addition, all garden centres could report an overall increase in demand for growing media, which may be in response to more indoor gardening and possibly the influence of gardening television programmes.

One question in which the reply was undisputed concerned the best selling growing media. Multi-purpose compost was consistently reported to be the best seller, with sales usually between 60 - 70% higher than the other products in the range.

'High sales can be attributed to special offers with a multiple purchase, also many people feel comfortable using a multi-purpose and will choose it for this exact reason' (Pickles, 2003).

'Multi-purpose also has the advantage of 'being versatile and is suitable for a wide range of potting and planting requirements' (Edmondson, 2003).

The general domestic gardener will not have an in-depth understanding of horticulture and will prefer to use a reliable product that can be used in a wide range of applications and is relatively inexpensive. The versatility, consistency and value of the multi-purpose compost provides an insight and understanding as to why peat-free and alternative composts are only achieving sales volumes of less than 10% on average.

'The multi-purpose will often be linked to a multi-buy promotion of three bags for £10. In comparison the peat-free compost is £4.75 for the same volume and may indicate why sales will generally be lower' (Edmondson, 2003).

5.6.3 Response to Sustainability

The report thus far has briefly analysed the processes of the two retail streams and has highlighted the differences between the organisations. The suppliers will either

produce the materials on site or take in raw materials and blend them to a specification or recipe specially formulated for the client. Accounting for the obvious difference concerning levels of supply, one of the most recognisable differences between the two types of retailers is the suppliers' ability to customise the product to the clients' own particular specification. This service will often however require a minimum order quantity and it is here where the garden centre retailers can gain an advantage and cater for those consumers only wishing to purchase a small quantity of material. The advantage of selling growing media by the bag is that this comprises the top end of the market and retailers can command the highest price per unit.

The other purpose of this report was to investigate the reactions of growing media retailers to recent calls for a reduction or complete ban on the use of peat in horticulture and to the use of a peat-free alternative. The response to peat-free alternatives has varied considerably and each market sector has not necessarily taken a similar reaction to the moves.

Two success stories that can be presented as advocating the use and production of peat-free composts and mulches have been presented in the form of Melcourt and Eco-Compost.

'The product range offered by Melcourt is by the nature of the feedstock produced from a sustainable material. All feedstock consists of remaining bark and roots from timber mills where wood is prepared' (Adams, 2003).

Similarly, Eco-Compost has been very successful in taking a waste material and using it within a profitable capacity.

'Eco would like to think of their operations as a resource management enterprise offering a high quality diverse range of products and services with the additional benefit of implementing a sustainable process' (Ewbank, 2003).

Eco-Compost also seems to have benefited immensely from a carefully constructed and immensely effective marketing and promotional campaign. Eco-Compost have not failed to recognise that the bottom line will always be a high quality product at a high price.

'For the majority of consumers sustainability will not feature particularly high within their decision criteria, however it is always beneficial for local authorities and consultants to show environmental awareness by using products that are produced without compromising sustainability' (Ewbank, 2003).

Another company to recognise the opportunities of using a sustainable material in the growing media trade is White Moss. Despite their initial concerns over the threat to peat production following campaigns by a number of environmental groups, White Moss realised that rather than ignore the recent moves towards peat-reduction they would try and incorporate it into their business.

'Peat is a finite, reducing resource in the UK and therefore will not last indefinitely and despite concerns over the initial peat-free campaigns the company has used the situation to its advantage and have explored new avenues into peat alternatives' (Eardley, 2003).

Rather than restricting sales, the new initiatives have enabled the firm to diversify their range of products. In comparison, the reaction from the garden centre retailers has not been overwhelmingly positive, however it can be noted that despite some concerns regarding the viability of peat-free compost as a suitable alternative to peat, all garden centres interviewed carried at least one type of peat-free compost. This can be interpreted by the composting industry as encouraging as it highlights that there must be a certain level of demand, albeit quite small. Feedback from consumers who have used peat-free compost has in general been positive.

'The peat-free product on sale, Horizon has been received particularly well by those who have tried the product. Although the number of consumers

purchasing the product is low those who have used the product liked it and will be inclined to repeat purchase' (Ferndale, 2003).

Different brands of peat-free seem to be received better than others and the J Arthur Bower New Horizon brand seems to be particularly popular. The main hurdle for peat-free compost in the garden centre retail market is the price rather than concerns with quality (Forsyth, 2003). In almost all the garden centres visited the peat-free compost is consistently priced higher, usually over £1 more which will be enough to deter all but the most ecologically aware consumers. Possibly, one other deterrent would be the consistency and versatility of the compost, as a peat-based multi-purpose is very manageable to all consumers and a peat-free product may be more difficult to apply. These issues need to be addressed before domestic consumers would be willing to switch products in favour of peat-free.

With promotion and a reduction in price it may be possible to increase peat-free compost sales through garden centre retailers. The commercial growers and horticulture market however will be far harder to persuade.

'At present there is a definite lack of interest from professional growers towards green waste compost with the exception of one or two. The reputation of peat-free materials is still very fragile and can often deter commercial interest completely' (Eardley, 2003).

5.6.4 The Future of 'Green' Compost

The retailers and suppliers have put forward a number of suggestions as to how peat-free compost producers might increase demand for their products. In order to increase sales through the garden centre retailers it is necessary to reduce the price to ensure the product is competitive and encourages consumers to try the product. Price is the greatest barrier to increasing sales, although the quality would need to be of a comparative standard if the producer is to ensure a repeat purchase.

Suppliers who have had experience with the product have also put forward a number of suggestions to enable a smoother transition from the use of peat to a more sustainable alternative. Many of the suppliers in the industry feel that the issue of peat has been chronically misrepresented, although it is necessary to reduce the amount of peat use it would be more sensible to mix with green compost or a similar alternative rather than taking the extreme choice of a total ban. These views are shared by the majority of producers approached who feel that although there is a place for green waste compost in the future it is necessary to introduce the product slowly and only after it is certain what effects it will have long term on horticulture.

5.7 Summary of interview findings

The intention of the interviews was to obtain a basic understanding across all the main target market sectors of the growing media industry, so that it would be possible to compare the views of each about the role of sustainability within each industry, with particular reference to the introduction of green waste compost. The results of the interviews confirmed that there was a definite interest from all sectors to appear to be encouraging sustainability by implementing proactive measures to reduce the environmental impact of all products and processes used.

Throughout the interviews representatives from both the WDA and the Welsh Assembly Government were keen to refer to procurement policies put in place to encourage sustainable development in all areas of the organisation. Similarly, almost all of the consultants and contractors interviewed confirmed that they had an environmental policy in place. These policies vary from a basic mission statement citing that the company conforms to minimum legal requirements to others detailing a policy of total sustainable working practices. It is evident that the move towards more sustainable working practices has been mainly for legislative reasons on the part of the contractors and consultants. However, for the growing media retailers and suppliers any move towards sustainability would need to be a demand led incentive. This difference in the major driving force for environmental concern is

important when considering effective measures for marketing and distributing green compost throughout the growing media markets.

One of the barriers to successfully marketing green compost has been reported in the form of criticism towards government bodies for a failure to fully implement sustainable working practices into tender documents. The interviews highlight that for many of the contractors a vast majority of their work is contracted out by local or central government, or indirectly via funding from the WDA. If the specifications for contractors concerning work that was centrally funded insisted upon the use of green waste compost as a soil conditioner, and possibly as a mix for topsoil, then this would be a driving force which would create substantial demand. The present specification documents only request the use of peat-free compost for all compost applications, unless peat is specifically required for a particular purpose. Although there is a wide range of peat alternatives available the most popular with the contractors is mushroom compost as it is cheap, widely available and very consistent in quality. In response to enquiries about using green waste compost the contractors pointed out that unless it is specified directly by the specification documents then it is unlikely that it will be demanded.

Another barrier, and possibly the most important reason for such a low demand for green waste compost is price. Due to the processes involved in composting and screening green waste the final product is often more expensive than the nearest alternative. Contractors argue that unless there is a uniform specification for green waste compost to be used as a peat-alternative then contractors who do decide to use the product can be left at a price disadvantage, possibly resulting in loss of a bid for a contract. Reaction from both the consultants and the contractors points to a demand for more stringent enforcement of sustainable practices throughout to ensure the more proactive companies are not left at a disadvantage by other less environmentally aware companies. This type of behaviour is known as 'environmental free-riding' and is associated with companies choosing not to enforce sustainable practices in favour of offering a reduced bid for a contract. Such actions are both frustrating and damaging as there is no legal requirement for companies to employ the same sustainable practices and therefore rather than

increasing sustainability and green procurement the effects of 'free-riding' may result in the opposite.

For commercial retailers the price of green waste compost is also acting as a barrier to the market. Using the retail garden centres interviewed as a guide it was possible to make a comparison between the peat, peat-free alternative and green waste composts available in each outlet. In each case the green waste compost was almost £1 per bag more expensive than the nearest peat-free alternative. Other leading multi-purpose composts were also commonly found to be advertising promotions for bulk buying. Although these observations are based upon qualitative rather than quantitative data analysis it was interesting to note that this pricing trend was commented upon in each of the interviews and that the interviews were conducted in a number of different regions across Wales.

Probably the most important reservation touched upon by all those interviewed when discussing the development of green waste compost was quality. The introduction of the new Landfill Directive has pushed the issue of compost development to the forefront of many waste and recycling initiatives. In terms of finding an alternative and viable route for green waste, composting is presented as an ideal solution, which in theory could generate income as a product in addition to providing a suitable disposal route for green waste. This idea however has not been lost on many compost producers but unfortunately green waste compost production has been far from consistent in previous years. As a result many consumers have been reluctant to trial green waste compost either due to a previous unsatisfactory experience, to poor publicity or they are simply dubious of using a recycled product. These issues present compost producers with two distinct challenges, first they must ensure that the quality of the compost or growing media produced is to the highest possible standard suitable for the target market. Once a standard has been achieved it is then necessary to exploit the best qualities of the product and use these to differentiate the product from the competition.

CHAPTER 6

CONSUMER PREFERENCES WITHIN THE CONTRACTOR AND RETAIL SECTORS

6.1 Introduction

A significant aspect of this research has focused upon the identification of suitable outlets for green waste compost. A number of sectors were highlighted as potential consumers, and representatives from each sector were subsequently approached for the purpose of the qualitative study. The in-depth interviews were designed with a view to establishing a basic understanding of each sector in order to uncover any underlying themes or trends within the growing media industry and to use as a basis for the quantitative element of the study. The qualitative interviews were conducted across five sectors, all of which have been suggested in previous research as possible viable outlets for green waste compost. These sectors include government bodies, landscape consultants, landscape contractors, growing media suppliers and independent retailers.

The qualitative research provided an overall representation of the growing media industry, identified the key players and gave an indication as to the level of

purchasing power held by the different groups. The interviews highlighted the contractors and independent retailers as having most influence over purchasing decisions. Although the government agencies and consultants are responsible for the specification documents they will generally leave sourcing material to the contractor awarded the job, and independent retailers are directly responsible for the range of growing media sold through their businesses. Consequently a larger scale survey was designed, focusing on landscape contractors and independent retailers throughout Wales.

6.2 The Empirical Study

The exercise involved designing a questionnaire, distributing it to landscape contractors and independent retailers throughout Wales and analysing their responses. The aim of the study was to understand and calculate which types of growing media were currently used by each market segment, how much they used, where the material was sourced and who were their main consumer groups. In addition, the survey was intended to determine both contractors' and retailers' knowledge of composting standards, any possible experience using green waste compost, and the level of importance placed on various characteristics of compost products.

In preparation for sending out the survey to the respective sectors it was necessary to compile a list of landscape contractors and retailers in Wales. Despite having access to a number of independent directories it was difficult to compile an updated list. The Welsh Development Agency (WDA) was preparing an updated list, however the date for publication of the document had been postponed on a number of occasions. Consequently the first stage of this research was to consult of number of independent directories and other sources (ENDAT, 2003; Welsh Development Agency, 2001) in order to produce a database of contractors and retailers. In order to raise the response rate, each contractor was called individually, and asked to participate in the survey. This exercise also made it possible to update the database with current information on contact details.

When considering the retail sector it was decided that, due to the unlikelihood of being able to produce, in the near future, sufficient quantities of quality green waste compost to supply a large retail chain such as B&Q or Wyevale, it would be more beneficial to investigate potential demand for green compost amongst the smaller independent retail outlets. Consequently, a large number of garden centre retailers were contacted individually to see whether they would be prepared to answer a short questionnaire. As with the contractors, it was hoped that this technique would also encourage a higher response rate from respondents if they had committed over the telephone.

6.2.1 Questionnaire Design

The role of a questionnaire is to standardise a set of questions for all respondents that will hopefully provide answers to enable the researcher to satisfy the research objectives. The questionnaire design process is a particularly lengthy process as it is important to fulfil all the objectives of the research in a practical and simple manner (Mc Daniel and Gates, 2002). The final questionnaire needs to be understood by all potential respondents, however, the data must also be easily transferable so it can be analysed and displayed in a manner that will answer the original research objectives.

Two separate questionnaires were required, one for the landscape consultants and another for the retail sector. Full copies of the questionnaires are shown in Appendix A and B. Some individual questions are also shown in the text which follows at appropriate points in the discussion. Although many of the questions featured in both questionnaires were similar it was necessary to produce two separate surveys as the two sectors operate in significantly different manners. The landscape contractor questionnaire was designed with twenty-three questions, which were then sub-divided into seven sections. The title of each section was designed to aid the respondent with an understanding of the direction of the questions and later for the researcher to use as a tool when analysing and presenting

the data. The sections included in the final draft of the questionnaire were: market segmentation, service coverage, product range, experience with green waste compost, composting standards, and environmental awareness. A final section was included to classify each of the respondents to gauge the size of their business, as this may be a relevant factor when analysing the responses. The retailer questionnaire contained only five sections: market segmentation, target market, sustainable awareness, composting standards and classification questions. Despite the variation in the title of the sub-sections of each questionnaire the general lines of enquiry were very similar. The aim of each questionnaire was to understand and calculate what types of growing media were currently used by each sector, how much they used, where the material was sourced and who were their main consumer groups. In addition both sectors were asked to comment on their knowledge of composting standards and any possible experience using green waste compost. Included at the end of both questionnaires was a set of questions designed slightly different to those in the main body of the survey using a statistical technique called conjoint analysis. The basic design of the technique and the results are explained later on in the chapter.

The questionnaires were designed with predominantly closed-ended questions, as without an interviewer present many respondents may be reluctant to fully answer questions requiring more than simply selecting an available option. Another concern with open-ended questions would have been the time taken for the respondent to complete the survey, and it was important to reduce the likelihood of incomplete questionnaires. The purpose of the quantitative analysis was largely for data collection as opposed to the qualitative interviews, which were designed in such a manner as to extract underlying themes and opinions. The questionnaire did however leave a small section for additional comments allowing the respondent to voice any views or concerns on the subjects discussed throughout the survey.

The final preparation before the questionnaires were distributed was to pre-test each one with the relevant sectors, and with Tirlun, the Wales Landscape Industry Forum, to identify any potential difficulties or ambiguous questions (Skidmore, 2003). In order to approach the contractors at a time when workloads are generally

reduced it was important to send out the questionnaires during the winter season to encourage the greatest response rate. The questionnaires were distributed during January 2004, and responses were received during February and March 2004.

6.2.2 Survey Response and Analysis

The survey response rates are shown in Table 6.1, which highlights a greater response from the retail sector. This may be explained in part by the nature of each business, as contractors would be expected to spend less time in an office environment and have more regular commitments. However, the number distributed will not necessarily reflect the number of businesses contacted, but rather those who agreed to take part in the survey. A number of the businesses contacted requested that they not be included in the study as they were unwilling to commit to completing the questionnaire, these have not been included in the calculation of the response rates.

Table 6.1 Response rates for questionnaires

	Number distributed	Number of responses	Response Rate as %
Contractors	171	42	25
Retailers	92	35	38

Upon receipt of the completed questionnaires a spreadsheet was set up to collate all the responses from each survey. Responses from the survey were analysed with SPSS version 11.5, using a variety of techniques (Howitt and Cramer, 2003). The initial analysis of the data collected from the survey involved creating frequency tables for each question. A frequency table shows the responses given to a question and the relative frequency of those responses. These tables are most appropriate for nominal or ordinal data with restricted number of different responses. Frequency tables were produced for each question and were then analysed to try and identify possible links or trends in the data based on previous knowledge or concepts touched upon during the qualitative interviews. The intention was to support or discredit assumptions made previously based on the purely qualitative research.

Using cross tabulation analysis it was then possible to compare two sets of results with each other to see if there was any link.

Cross tabulation is used as an alternative way of displaying data that is not simply homogeneous as a means to identify possible differences in the pattern of responses. If frequency tables are ways of summarising the responses of the samples as a whole then cross tabs are ways of comparing the responses of one sub group to another. If the cross tab table suggests a possible difference in responses from one sub group to another then there are a number of different statistical tests to determine whether a significant relationship exists. The chi-square test is the one used most frequently to test the statistical significance of results reported in this kind of bi-variate table.

The chi-square test measures the confidence we have that the patterns observed in the data are due to more than mere chance. The key advantages of using the test include its simplicity and its non-parametric nature, which makes it more forgiving in terms of the data it will accept. The data that have been collected for this survey are primarily ordinal and nominal, with only a small number of options to each question. These attributes make the chi-square test suitable for this type of survey, and a significance threshold of 90% has been used for the tests.

One point to consider with the chi-square test however is that the results can be distorted by low cell counts. Where ever possible this has been avoided when analysing the questionnaire or its implications considered. If all the requirements were not met the test was still used but less reliance was based on the conclusions.

6.3 Contractor Findings

6.3.1 Market Segmentation

Although the landscape contractor sector within Wales is not extensive there is some disparity between the very large and the small to medium businesses in

operation. The first section of the questionnaire concerned market segmentation. This section was designed to identify the differences within this sector. Average turnover, the services the contractors offer and their main consumer segments were all considered to be effective indicators of size. It was thought that there would be a link between these attributes, which would need to be established during the analysis.

Q: What range of services does the company provide?

Options available:

Hard Landscaping
Soft Landscaping
Grounds Maintenance
Construction/Engineering
Tree Surgery
Land Reclamation
Other

As a starting point of the survey, contractors were asked to specify the range of services they provided. As they were allowed to give multiple responses, it was impossible to obtain individual values for each service but rather an indication of which are most popular.

Table 6.2 Range of services offered by contractors

Type of Service	Number of responses	Percent of responses	Percent of cases
Hard Landscaping	32	23.5	78.0
Soft Landscaping	37	27.2	90.2
Grounds Maintenance	32	23.5	78.0
Construction/Engineering	7	5.1	17.1
Tree Surgery	17	12.5	41.5
Land Reclamation	7	5.1	17.1
Other	4	2.9	9.8
Total Responses	136	100.0	331.7

The percent of responses in a multi response table indicates the proportion of answers given for that particular answer out of the total number of responses made. The percent of cases highlights the proportion of respondents who mentioned that service as one they provide. In this case Table 6.2 suggests that soft landscaping was the service most commonly selected. The total percent of cases is 331.7 per cent indicating that on average each contractor provided at least three services. Both construction/engineering and land reclamation had fewer responses as a service offered and there may be a link between the firms offering these particular services and the size of the company. The frequency table however does not provide a weighting for each service to show exactly what proportion of total jobs each sector contributes.

Q: Please indicate your main consumer segments and what percentage can be attributed to each?

Options available:

Local Authority
Commercial and Industrial
Government Agency e.g. WDA
Domestic
Other

Table 6.3 Distribution of the contractors' main consumer segments

Consumer Segments	Number of responses	Percent of responses	Percent of cases
Local Authority	19	18.1	47.5
Commercial and Industrial	31	29.5	77.5
Government Agency e.g. WDA	18	17.1	45.0
Domestic	30	28.6	75.0
Other	7	6.7	17.5
Total Responses	105	100.0	262.5

Table 6.3 illustrates the distribution of the contractors' main consumer segments. The commercial and industrial sector was the most commonly selected sector, followed by the domestic. The suggestion from the qualitative interviews was that the larger firms mainly worked for either commercial business or local/central

government. The smaller contractors would in general restrict themselves to domestic households, as the majority would not have the capacity to undertake local/central government jobs. This was confirmed by the results of the quantitative survey.

The landscape contractor industry as a whole in Wales is largely split into two or possibly three categories. At the top end of the scale there are a small number of large contractors offering an extensive range of services, including the more specialised elements of construction and engineering. Approximately 16% of the respondents represented the larger category of landscape contractor, category 3, based on an average annual turnover greater than £750,000. The remaining contractors comprise of small to medium firms with turnovers of under £100,000 (category 1) or between £100,000 and £750,000 (category 2) respectively. Approximately 42% of the survey respondents were firms from category 1, and 42% were from category 2. Using these categories, the profile of members of the British Landscape Institute (BALI) throughout the UK is approximately 24% (category 1), 43% (category 2) and 33% (category 3). BALI considers that its membership is less representative of the smaller companies, of which there are many in the UK (WRAP, 2004); there is a better representation of these companies in the survey dataset. The initial analysis of the data collected from the questionnaires shows a definite split in response patterns and further investigation using cross tab analysis and chi-square tests have confirmed relationships between the size of contractors and response patterns.

A cross tabulation table was used to compare the average annual turnover with the main consumer segments for the landscape contractors. In general those contractors with a larger turnover, in the second or third category, tend to have a high percentage of contracts with local authority, government agencies or commercial and industrial. On the other hand the domestic sector has the lowest incidence of annual turnover of over £750,000 and the highest incidence in the smallest category, under £100,000.

The services offered, and the consumer segments serviced, are significantly different depending on the size of the contractor, and are a factor to be considered when trying to determine levels of demand for compost and other related growing media products. As a means of trying to prove this relationship a contingency table analysis based on a chi-square approach was used between the type of contractor and the services they offer. This analysis compares the two streams of data and presents the results in terms of what would be the expected outcome and the actual outcome.

Table 6.4 Test for relationship between services provided and turnover

Services v Turnover	Significance Level
Construction/Engineering	95%
Land Reclamation	89.5%

The test highlighted that there was a significant relationship between the size of turnover and the services provided by the contractors. As a general guide the significance threshold for these tests has been placed at 90%; levels over that figure indicating that there is a significant relationship between the two variables. In the case of the construction/engineering test Table 6.4 shows a 95% significance level, which is a strong indication of a relationship between the larger contractors and this discipline. In the case of land reclamation the significance was just outside the 90% level, however the test does provide strong evidence to support the hypothesis that there is a relationship between this service and contractors in the top annual turnover bracket.

The other major distinction between the larger and small to medium contractors is the main consumer segment each type of contractor will generally be employed by. Based on information gathered in the qualitative interviews there was an assumption that the larger contractors would tend to bid for the larger contracts with industry, local authority and government agencies, but generally not the domestic sector. This hypothesis was also tested using the chi-square approach, in a similar manner to the one already described.

Table 6.5 Test for relationship between consumer sector and turnover

Consumer Sector v Turnover	Significance Level
Local authority	89.1%
Government Agency	95.7%
Domestic	98.4%

The test for a relationship between turnover and local authority contractors was the weakest of the three represented here. Although it is just outside the 90% significance level there is however, evidence of a relationship here and this should be taken into consideration when interpreting the rest of the data and in the conclusions and recommendations. The government agency statistic shows a definite relationship between this sector and the larger contractors, which supports earlier indications that it will almost always be the larger contractors to take on work for the government organisations. The final test is again confirmation of a split between the main consumer segments of the larger and smaller contractors. The comparison of domestic market and average annual turnover is particularly significant. It showed an inverse relationship highlighting that a high proportion of small contractors service the domestic sector and a relatively small number of large contractors cite the domestic as a main consumer segment.

In summary, the conclusions drawn from these tests allow certain assumptions to be made concerning the differences within the landscape contractor sector when interpreting the remainder of the data collected from the questionnaire. The primary assumption to be made using the data reported in Table 6.5 is that there is a link between the size of turnover of a company and their main consumer segments. Therefore we will assume that when discussing the larger contractors that their answers will largely represent the local authority and government agency groups rather than the domestic sector.

Q: Which three months would be your peak buying season for compost?

Another way of segmenting the market is to identify when the primary users of the product will want to purchase the product. In both the contractor and retailer questionnaire respondents were asked to indicate the top three months for purchasing compost. The buying patterns of each sector are necessary to ensure that any marketing of the products is designed to reach the target sectors in preparation for their peak buying months. It is also useful for producers to be aware of whether demand is steady throughout the year or in peaks and troughs, as this will determine minimum quantities required in stock.

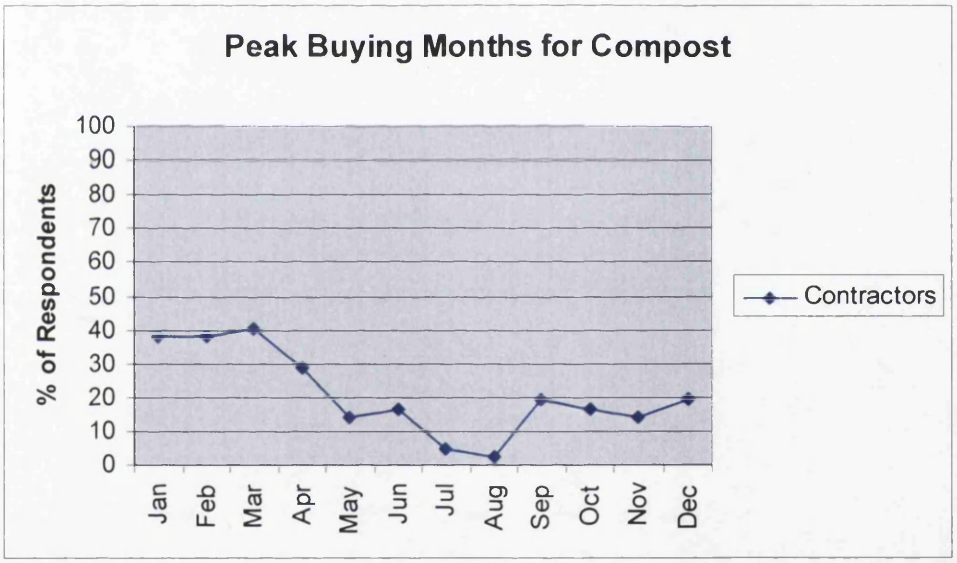


Figure 6.1 The landscape contractors' peak buying months for compost

Figure 6.1 depicts the typical buying pattern of landscape contractors in Wales. January, February and March are the top three months for purchasing compost with July and August representing the lowest period. The results comply with the usual planting season, as the compost would generally be purchased a relatively short time before being required on site. A comparison with the retail sector will indicate any similarities or differences.

6.3.2 Product Range

A key objective of the questionnaire was to determine an approximate level of demand for compost and other types of growing media. The second section of the questionnaire therefore focused on the product range used by the contractors, and whether these particular products were used because of contract specifications.

Q: What percentage of the services provided requires the use of compost?

Options available:

0 – 10%
11 – 25%
26 – 50%
51 – 75%
76 – 100%

Soft landscaping was a service that over 90% of respondents said they offered, which may be an indication of high growing media usage. As it would be unreliable to make this assumption without further justification the data was compared by cross tabulation with the percentage of services provided requiring the use of compost. The results showed that for 77% of contractors less than 25% of their jobs will require the use of compost. One possible explanation could be that despite the large number of contractors offering a soft landscape service it is not the primary service for the company.

The section of the questionnaire entitled 'Product Range' was designed with the intention of measuring the amount of different types of growing media required on average by contractors and unit prices for each, with particular reference to compost. Unfortunately, following a brief analysis of these questions, it was clear that asking respondents to list specific volumes and unit prices was either too time consuming or too commercially sensitive and therefore a significant number were left incomplete. One question however did ask respondents to indicate their average compost usage by selecting one of a number of categories.

Q: On average how much compost will you typically require per year?

Options available:

0 – 500m³
501 – 1000m³
1001 – 1500m³
1500m³

Although the results are not precise they provide an indication as to approximate demands for compost in Wales as all respondents answered this question. The first category 0 – 500m³ was most common, with 82% of the total, highlighting that although compost is a requirement for the majority of contractors it is not used in large quantities (Table 6.6). On reflection it may have been preferable to have smaller volumes per category, which would have allowed a more accurate calculation.

Table 6.6 Contractors' average compost usage

Compost per annum (m³)	Frequency	Percentage %
0 – 500	34	82.9
501 – 1499	4	9.8
1500 +	3	7.3
Total	41	100

A number of questions were also put to the respondents concerning products typically used by contractors, for example they were asked for details of the annual amounts used of a number of different types of product.

Q: What quantities of the following products would you require per year?

Options available:

Turf Dressings
Top Soil
Compost
Mulch
Soil Improvers
Bark Chips

It is clear from Table 6.7 that topsoil and compost are the two products most widely selected. Surprisingly, bark chips also ranked quite high and since these can generally demand a relatively high price this could be a potential outlet for green waste oversize that has been shredded.

Table 6.7 Growing media products used by respondents

Products typically used	Number of responses	Percent of responses	Percent of cases
Turf Dressings	12	9.4	32.4
Topsoil	29	22.8	78.4
Compost	29	22.8	78.4
Mulch	21	16.5	56.8
Soil Improvers	9	7.1	24.3
Bark Chips	27	21.3	73.0
Total Responses	127	100.0	343.2

Due to a variable response rate for the exact quantities of materials required it is probably more representative to illustrate the differences between material usages using the mean figures provided. What becomes apparent is that although topsoil and compost were equally ranked in terms of growing media required by contractors, the mean usage figures in terms of volume required can be quite varied. Table 6.8 shows topsoil and mulch in far greater demand than compost.

Table 6.8 Respondent mean usage of growing media

Growing Media	Mean Usage m^3 per year
Turf Dressing	198
Topsoil	1059
Compost	281
Mulch	913
Soil Improver	85
Bark Chips	385

Equally important when trying to understand the contractor market is to know what types of compost the contractors prefer.

Q: Which of these compost products do you typically use?

Options available:

Mushroom
Coir
Peat-based
Green Waste
Other

Table 6.9: Respondent preferred choice of compost

Type of Compost	Number of responses	Percent of responses	Percent of cases
Mushroom	19	31.7	52.8
Coir	1	1.7	2.8
Peat-based	21	35.0	58.3
Green Waste	13	21.7	36.1
Other	6	10.0	16.7
Total Responses	60	100.0	166.7

Table 6.9 shows the preferred choice of landscape contractors is peat-based and mushroom compost, with green waste compost listed as the third preferred choice. Initial qualitative research suggests that the larger contractors would generally use mushroom compost as it is usually cheaper and peat-free, which is often a specification for local government contracts. A cross tab analysis of the products

typically used by contractors against their average annual turnover shows a trend for the use of mushroom compost to increase with each level of turnover. A similar trend was also expected in the reverse for peat-based composts, however this was not the case and peat-based compost seems to be popular throughout the landscape contractor sector. This data was then tested using a chi-square test and it shows definite evidence of a relationship between turnover and use of mushroom compost (Table 6.10), however the same is not true of the peat-based compost as there is no evidence of a relationship.

Table 6.10 Test for relationship between type of compost used and turnover

Product v Turnover	Significance Level
Mushroom Compost	95.7%
Peat-based Compost	24.3%

It might also be interesting to compare these results with similar questions given to the retail sector, as mushroom compost will rarely be a top seller for garden centres. Many domestic consumers would be familiar with peat-based compost and different brand name products, possibly influenced by recent television gardening programmes, which have also advertised the use of coir as a peat replacement. Again, this may be relevant when designing marketing strategies for the different sectors. It is important to understand the main competitors for green waste compost in each sector and to establish the differences in the products.

Q: Approximately what percentage of jobs will specify the use of peat-free compost?

Respondents were also asked to provide approximate figures for demand for peat free as a percentage of the number of contracts they worked on. The most significant of these figures showed that 48% of respondents stated that none of their contracts would specify the use of peat-free compost. Although a small number stated that over 75% of their jobs would request peat-free, these contractors are clearly in the minority. A cross tab analysis was used to compare the instances of

jobs which specify peat-free compost and from which sectors this is most prevalent. The commercial and domestic sectors show a high number of instances where no jobs will request peat-free material. This is particularly interesting as these are the two largest consumer segments for the contractors surveyed. The local authority and government agency sectors show a greater demand for peat-free which would be expected in light of sustainable development policies and the pressure to reduce peat as a growing medium. The four main consumer segments were tested against demand for peat-free compost to see if there was any evidence of a significant relationship. As can be observed from Table 6.11 there is evidence to suggest that there is a relationship between the levels of demand for peat free and the sector. Both the local authority and the domestic sector show a high confidence level, although for very different reasons. The local authority sector showed a positive relationship whereas the domestic sector displayed a high inverse significance figure, suggesting that they are the least likely to demand peat-free materials.

Table 6.11 Test for relationship between consumer sector v peat-free demand

Consumer Sector	Significance Level
Local Authority	92.2%
Commercial and Industrial	55.2%
Government Agency	83.8%
Domestic	97.9%

6.3.3 Experience with Green Waste Compost

Green waste compost is one of the options available to contractors to use as part of their product range. A short section of the questionnaire concentrated on respondents' previous experience of this type of compost. Over 60% of those who responded to the questionnaire claimed that less than 10% of compost used by them was green waste. Three respondents did claim that they only used green waste compost; however it was not clear if this was produced by them or was purchased.

The results of the analysis for this particular section generally support conclusions drawn from the qualitative research, which suggest that aside from quality, price was one of the major barriers to successfully marketing green waste compost.

6.3.4 Composting Standards

The BSI PAS 100 on composting standards was introduced in October 2002 and is at present the only national certification process available specifically for green waste compost. The standard has been developed primarily by WRAP and follows closely the Composting Association's accreditation scheme. The introduction of a uniform standard applicable throughout the industry is a particularly prevalent issue associated with marketing green waste compost.

Q: Are you familiar with the BSI composting standard PAS 100?

Since the introduction of the PAS 100 there have been a number of high profile events within the growing media and more specifically the composting industry to promote the standard. Despite these efforts however, there is some uncertainty as to how effective the marketing of the standard has been and whether the messages are reaching those people ultimately responsible for purchasing compost and similar growing media. When asked whether they were familiar with the PAS 100, 47% of respondents said, 'yes', leaving 53% remaining unaware of the standard. The decision as to whether this response rate can be considered as a positive result is not immediately apparent.

Further investigation was undertaken comparing the contractors' responses to the BSI PAS 100 with their annual turnover to see whether the relative size of the firm influences their knowledge of the composting standard. Although the differences are not overwhelming, there does seem to be a trend for those contractors with a higher turnover to be more aware of the PAS 100. Cross-tabulation showed that

only between 40% and 50% of the smaller contractors are aware of PAS 100, but a positive response of over 65% was recorded for the largest contractors with an annual turnover greater than £750,000. However, further investigation concluded that there was no evidence of a statistically significant relationship, between turnover and awareness of the standard.

Q: How did you become aware of the PAS 100 standard?

Options available:

Through trade association membership
Reading trade journals
Consultant specifications
Membership of Composting Association
Other contractors
Suppliers
Other

In addition to discovering the contractors' awareness of PAS 100 it is also useful to know the advertising channels used to create the awareness and to monitor which campaigns are more successful. For the larger contractors with annual turnovers greater than £100,000 the awareness of PAS 100 seems to originate from trade association membership and trade journals, whereas the smaller contractors (under £100,000) cited 'other' as the source of information, suggesting more casual references rather than formal ones.

The results of the questionnaire also allowed the researcher to gather an understanding of the level of importance contractors place upon certification of products. The results showed that over 50% of contracts will not specify either a supplier or a minimum standard for planting media. In the instances where suppliers or standards were specified one assumption could be that those contractors whose main client base was local government or consultancy based would be more inclined to specify materials. In the case of domestic contracts it would be unlikely for specification documents to be drawn up. The data would suggest however that there is definite scope for improvement to specification documents, particularly

from local government, as they could be encouraged to present any developments as supporting a sustainability policy.

6.3.5 Environmental Awareness

Lastly, the contractors were asked to supply information on their level of environmental awareness (Table 6.12). The objective of this section was to try and measure the impact of some of the more common sustainable practices encouraged by local and central government.

Table 6.12 Sustainable practices employed by respondents

Sustainable Practice	Number of responses	Percent of responses	Percent of cases
No waste off site	9	18.0	25.0
Use of native provenance plants	14	28.0	38.9
Reduction of traffic flow on site	3	6.0	8.3
On-site composting	11	22.0	30.6
Other	2	4.0	5.6
No sustainable practices	11	22.0	30.6
Total Responses	50	100.0	138.9

The respondents selected the use of native provenance plants most frequently. This is probably due to the fact that of all the sustainable practices listed this is the only one that has been written into a number of local and central government specification documents. No waste off site and on-site composting were also quite popular which might be a direct result of increasing landfill taxes. Another interesting factor is the number of contractors not employing any sustainable practices, suggesting that unless these practices are written into all specification documents it is unlikely that they will be voluntarily adopted. Possibly the most effective method to encourage sustainable practices is to make them economically viable and have the less sustainable options more expensive, as is the case with the ever increasing landfill taxes.

As part of increased environmental awareness the survey attempted to examine changes in demand for peat-free compost across the four main consumer sectors and also by each service provided. In terms of local authority contracts there was either no change or a general increase in demand across all the sectors, which is an expected result, as local authorities should really be encouraging the use of peat free compost in line with sustainability policies. The commercial and industrial sector generally exhibited no change in demand or a slight increase. This sector is quite important, as it will generally be the one to require the greatest volume of materials. The government sector highlighted increases in demand particularly from the hard landscaping and construction and engineering sector, which again will usually consist of the larger contractors and therefore also require large volumes of material. Finally, the domestic sector showed no real evidence of change, which is not alarming as in general this sector will be the least regulated in terms of specifications for growing media. The results of this particular section of the survey are consistent with earlier findings concerning the levels of demand for peat-free compost in which significant relationships were observed for the local authority and the domestic sector (see Table 6.11).

Finally, respondents were asked to indicate the level of impact sustainability and the introduction of peat-free compost has had on each individual's organisation in terms of price, availability, performance and changes in working practices. The results showed that overall there was no change in terms of the categories listed, suggesting that although sustainability might be a focus for larger organisations and government initiatives the message has not been successfully transferred down through the purchasing channels.

6.4 Retailer Findings

The growing media retail sector represents the high end of the compost market as it is dominated by the domestic consumer seeking a high value product in relatively small quantities, therefore requiring a varied line of questioning from the contractor sector. However, in order to allow for some element of comparison between the

two sectors both questionnaires were based within similar topic areas with questions devised to be specific to each sector.

6.4.1 Market Segmentation

Q: Which classification would best describe your company?

Options available:

Garden Nursery

Garden Centre

Growing Media Supplier

Growing Media Producer

Other

The retailer questionnaire was distributed throughout Wales to independent suppliers of growing media covering a variety of classifications. The reason for omitting the larger garden retail chains was that this case study aimed to focus primarily within Wales and many of the larger chains tend to source material from a central location, sometimes not even within the UK. In addition, the volumes required to supply the larger retailers would have been too great, at present, for the compost producers in Wales.

Table 6.13 Distribution of retailer outlets

Retailer	**Percent of Responses**
Garden Nursery	20
Garden Centre	74.2
Growing Media Supplier	2.9
Other	2.9
Total Responses	100

The questionnaire was directed at all independent garden retailers and suppliers of growing media in Wales. The breakdown of responses is shown in Table 6.13.

Since the majority of responses belong to either garden centres or garden nurseries, the statistical tests employed concentrated primarily on the relationships between these two types of retailer.

Q: Please indicate your average annual turnover?

Options available:

Under £100,000

£101,000 - £250,000

£251,000 - £500,000

£501,000 - £750,000

Over £1,000,000

The average annual turnover is one of the easiest ways to compare and contrast the data, as often it will be a representation of size and also an indication as to the extent of services or products offered. The cross tabulation analysis indicated a trend between size of turnover and type of retailer as only garden centres appeared in the larger retailer category. A chi-square test confirmed there was a significant relationship between the types of retailers and their annual turnover, with a significance level of 96.1%.

The categories for annual turnover were re-grouped so that it was easier to distinguish between the larger and smaller companies, i.e. those with an annual turnover of over £500,000 and those with less than £500,000. These are referred to simply as the larger and smaller retailers, respectively.

Q: Please indicate your main consumer segments and what percentage can be attributed to each?

Options available:

Domestic

Business

Local Authority

Other

The growing media retail sector is seen as a more homogeneous sector and there are far fewer distinctions between the types of business than was evident with the landscape contractors. With the contractors it was possible to categorise firms depending on their main consumer segments. The main consumer segment for the garden retailers however is dominated by the domestic segment and when answering the questionnaire all respondents selected this group as their main consumer segment. The respondents were also asked to indicate the percentage of business attributed to each of the consumer segments they selected.

Table 6.14 Distribution of retailer consumer segment

Consumer Segment	Mean Percentage
Domestic	90.38
Business	12.20
Local Authority	6.10
Other	20

Table 6.14 highlights that on average domestic householders will account for over 90% of the total business for retailers and they therefore represent a very significant consumer group for this sector. Although the other segments have been selected there is a definite disparity between them and the domestic consumer groups. Therefore, any conclusions drawn from this questionnaire will focus almost exclusively towards the domestic householders as a main consumer group as

opposed to business and local authority. This factor is possibly the main distinction between the ways in which findings from the two questionnaires will be interpreted.

A cross tab analysis was used to highlight that retailers in the larger turnover category were more likely to select local authority and business than those with a smaller turnover. This is probably due to the bigger retailers having larger volumes, or a wider selection of growing media and other gardening supplies in stock.

Q: Which three months would be your peak buying season for compost?

One of the key purposes of this study was to be able to forecast potential demand for compost. As in the contractors' questionnaire, all of the retailers were asked to provide an estimate of their peak buying season when purchasing compost.

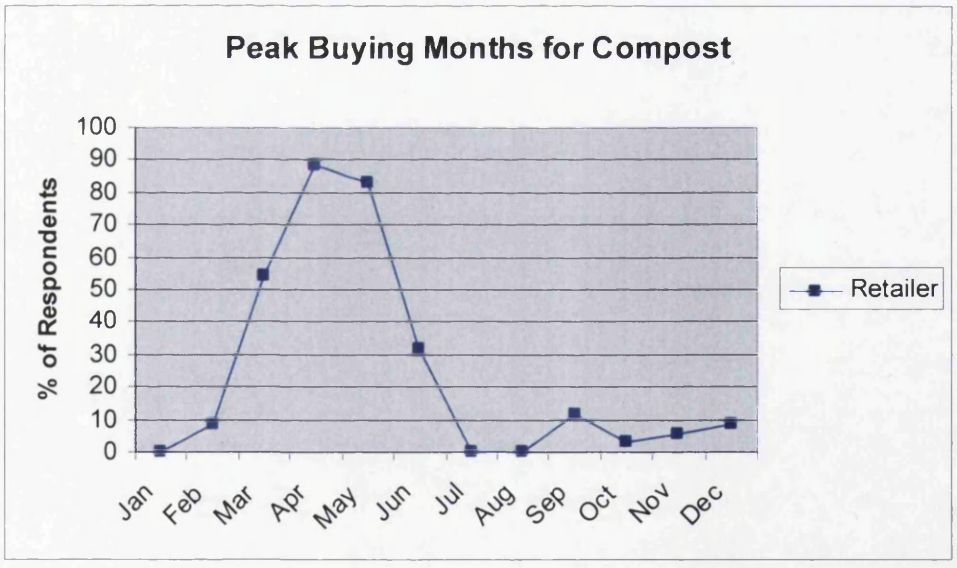


Figure 6.2 The retailers' peak buying months for compost

Figure 6.2 illustrates that March, April and May are the top three buying months of compost for the retail sector. These figures show retailer purchases of compost, rather than indicating the buying behaviour of their customers. The qualitative interviews indicated that retailers prefer to buy their entire year's stock of compost and other growing media at the same time, with any supplementary orders being

used to merely top up any shortfalls. The main advantages for the retailer will be in the cost efficiency of bulk buying, and as this sector is particularly affected by seasonality it is important to have sufficient stocks of growing media for the start of the planting season in early spring. The variance in purchase behaviour between the contractors and the retailers can be observed in Figure 6.3.

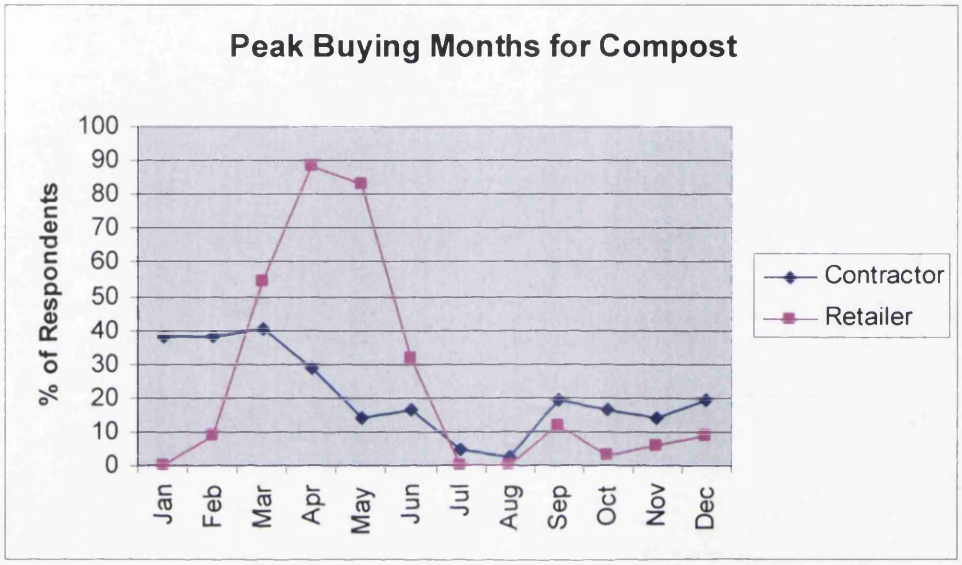


Figure 6.3 Comparison of the peak buying months for the retailers and contractors

Although similar trends are evident between the two sectors the retailer demand for compost is more severe in terms of high and low demand levels. The contractors are more consistent and they tend to purchase compost as and when needed rather than stockpiling it. Suppliers of compost will need to be aware of the different buying behaviours between the two sectors as this might affect the grades of compost required at any one particular time of the year and the quantities which will need to be produced.

6.4.2 Product Range

Q: What compost products does the company supply?

Options available:

Peat-based Compost
Peat-free Compost
Peat-reduced Compost
Manure based Compost
Cocoa Shell Compost
Other

To market green waste compost to the retail sector it is important to understand what types of compost the retailers are currently stocking and in what quantities. The respondents were asked to select, from a multiple response table, the various types of compost they have on offer to consumers.

Table 6.15 Respondent preferred choice of compost

Type of Compost	Number of responses	Percent of responses	Percent of cases
Peat-based compost	32	31.1	94.1
Peat-free compost	26	25.2	76.5
Peat-reduced compost	16	15.5	47.1
Manure based compost	17	16.5	50.0
Cocoa shell compost	6	5.8	17.6
Other	6	5.8	17.6
Total Responses	103	100.0	302.9

Table 6.15 shows that the most popular type of compost is peat-based as 94% of respondents sold this product. Other popular products were peat-free, peat-reduced and manure based composts. However, these figures only display the variety of composts the retailers supply and not the actual quantities sold. The last column, percent of cases has a total of 302.9% meaning that on average, the retailers will supply three different varieties of compost. The retail consumers' persistent reliance on peat-based compost suggests that it may be more difficult to convince this sector to adopt a peat-free alternative.

Table 6.15 does not give any indication as to the volumes supplied by the retailers, only the products they stock. Therefore, respondents were also asked to provide the number of pallets of compost required each year. One potential problem identified during the qualitative research regarded the disparity in the number of bags per pallet quoted by each of the retailers interviewed. To overcome this problem, in the survey the respondents were asked to provide on average the number of 75 litre bags (as this is the industry standard) which would be delivered on each pallet. Responses ranged between 30 and 50 bags per pallet and the mean response was 40 bags per pallet. In order to arrive at an approximate level of demand from this sector, the number of pallets ordered by each retailer for each type of compost was investigated.

Table 6.16 Respondent requirements for compost

	Number of Pallets Required		
Type of Compost	**Mean**	**Median**	**Mode**
Peat-based	89	84	100
Peat-free	14	5	2
Peat-reduced	25	10	2
Manure based	18	10	10
Cocoa shell	5	5	1

Table 6.16 shows that although the majority of the retailers will stock peat-free and peat-reduced composts the volumes required are significantly lower than those relating to peat-based compost. This is probably a reflection of demand and supports the findings from the qualitative interviews in which many of the retailers expressed a desire to offer more peat-free and peat-reduced, but due to consumer scepticism or increased prices it was not economical.

Q: Has there been an increase or decrease in sales of compost over the past 5 years?

Options available:

Increase in demand
Decrease in demand
No change in demand

Levels of demand for compost in the retail sector have on the whole increased over the past five years, 65% of respondents cited an increase in sales of compost and only 11% reported a decrease with the remainder noticing no particular changes in demand. Compost producers should see this as a positive trend as there does seem to be a growing demand for the product, and as the retail sector represents the high-end level of the market it is important to capitalise on this demand. When these figures were compared with the average annual turnover of the retailers they indicated a slightly higher increase in demand levels from the larger retail organisations.

Q: What brands of compost does the company carry?

Options available:

J Arthur Bower	*Levington*
Sinclair	*Scotts*
Gem	*Clover*
Own Brand	*Independent*

There are several brands of compost currently available and the study focused upon seven of the most commonly available. The two most popular brands were J Arthur Bower and Levington. This is interesting as the J Arthur Bower range is usually synonymous with quality and is priced at the high end of the market. Levington however, although also a high performer will often be marketed using price promotions. When the respondents were asked to comment on why the chosen brand was preferred the responses were either quality or price. Westland compost was another popular choice, particularly with the smaller outlets (significance 0.002) suggesting that possibly this company tends to market exclusively to the smaller outlets, however this would need further investigation before any firm conclusions could be drawn.

Q: Do you supply topsoil?

The use of compost within topsoil has become a particular area of interest throughout this study due to evidence of an increasing demand for the product. The increase of brown field development and continuing restrictions on green field development has resulted in less topsoil being available. One solution to finding an outlet for the additional volumes of compost becoming available is to blend the compost with topsoil. Within the contractor sector there is a substantial demand for topsoil, which would not be expected in the retail sector, however it would be interesting to have an indication as to the demand levels for the product. The results of the questionnaire show that 60% of the retailers sell topsoil. The average volume sold was calculated at 35.2m^3 per year. Although the levels of demand are less than those within the contractor sector the value of growing material per cubic metre is usually significantly higher in the retail sector and therefore this should always be considered as a potential outlet.

6.4.3 Peat-free Compost

Respondents were asked what percentage of their annual compost sales would be peat-free. Based on the responses to the questionnaire the average percentage of peat-free compost sold annually is only 9% of total compost sales. The qualitative interviews suggest that the main reason for such a low demand is due to the price of green waste and peat-free compost and a general uncertainty as to the quality of non-peat composts. The survey found that the most popular brand of peat-free compost was J Arthur Bower, which is possibly due to this brand of compost being one of the more recognised brands. Again when the respondents were asked why this is the preferred brand price and quality were cited as the main reasons for purchase.

Q: Has there been an increase or decrease in demand for peat-free compost over the past 5 years?

Options available:

Increase in demand
Decrease in demand
No change in demand

As with previous questions concerning peat-based compost, respondents were asked whether demand for peat-free compost had increased over the past five years. Table 6.17 highlights the differences in demand for peat-based and peat-free compost. Although there is some increase in demand for peat-free and less of a decrease the reported sales of peat-free are still considerably lower than peat-based.

Table 6.17 Changes in demand for compost over last 5 years

Compost	Increase in demand as %	Decrease in demand as %	No change in demand as %
Peat-based	67.6	11.8	20.6
Peat-free	40.6	9.4	50.0

Results from the qualitative and quantitative research suggest that demand for compost will be largely influenced by price and perceived quality. The majority of domestic consumers will only be familiar with peat-based compost and could have a pre-conceived idea as to how compost should look and feel. Often with peat-free composts the appearance is not as rich in colour and it could possibly have a larger screen size due to the different feedstock. Despite these minor changes consumers may be persuaded to try alternative non-peat based compost if it were to make a contribution to an environmental campaign. The retailers were asked to provide their opinion as to why the demand for peat-free compost is lower than that of peat-based compost: 72% cited "too expensive" as the reason why consumers did not purchase peat-free. Unfortunately, most consumers will not be prepared to accept the changes if they coincide with an increase in price.

6.4.4 Composting Standards

Although the BSI PAS 100 was not designed with retail sales of compost in mind, but rather for the landscape contractors, it still remains the only industry wide certification for green waste compost. The respondents were asked whether they were familiar with the standard, to allow a comparison to be made between the two sectors and to see whether the promotion of PAS 100 has had any impact upon the retail sector.

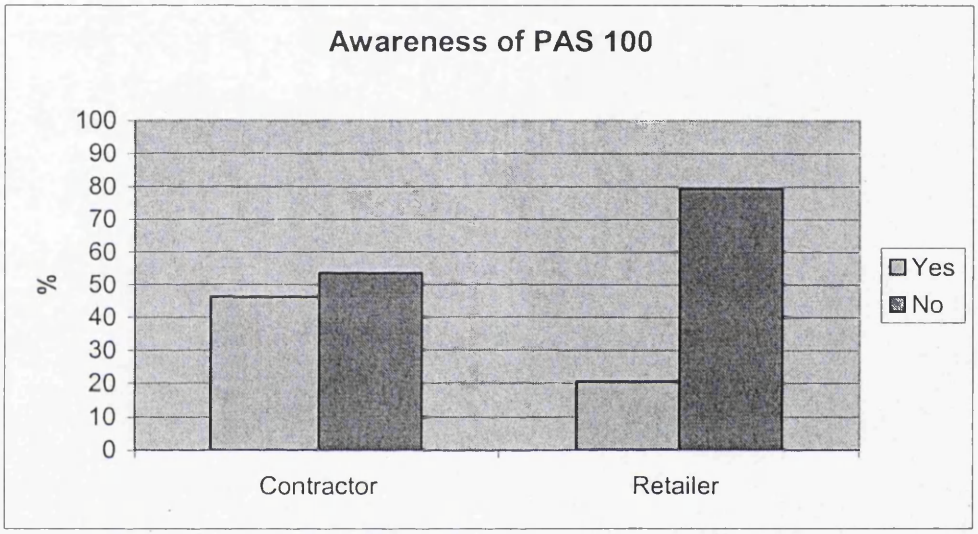


Figure 6.4 Comparisons of familiarity with composting standard PAS 100

The results show that only 20% of the retailer respondents were familiar with the standard. Although this statistic is relatively low compared to the landscape contractor sector, as shown in Figure 6.4, the awareness level is quite encouraging, as the majority of the awareness campaigns have been directed towards the contractors.

6.5 Investigating the Marketing Problem with Conjoint Analysis

The final section of the questionnaire was not based on the techniques used in a standard consumer survey, but instead used a conjoint analysis approach. Some explanation will be provided detailing the approach used before presenting the discussion of its application to the landscape contractor and retailer surveys (Probert, Dawson and Cockrill, 2005).

When marketing a product it is important to know to what extent the various characteristics of that product, such as the price, the packaging or the raw materials from which it is made, contribute to its overall attractiveness to the consumer. Conjoint analysis is a research tool which can be used to answer these questions; it is a method which can be used to quantify the value that consumers place on different levels of a product's characteristics. For example, do they consider price to be of paramount importance, or is a higher value placed on the quality of the goods? In a conjoint analysis exercise, combinations of product attributes are presented to potential consumers, and they are asked to make judgments through trade-offs or comparisons. Analysis of their choices allows the researcher to make predictions about their future behaviour. Conjoint analysis does not rely on self-reports about the importance of attributes, but rather infers the relative importance of product attributes from respondents' choices.

A conjoint measurement model was originally developed by Luce and Tukey (1964) and the name of conjoint analysis was later adopted by Green and Srinivasen (1978). Since then, the method has grown in popularity and has been used in industrial applications both in the U.S. (Wittink and Cattin, 1989) and in Europe (Wittink et al, 1994). Conjoint analysis has been used for a wide variety of products and purposes. It has been found to be applicable to practically all sorts of products. Fast moving consumer goods such as shampoos, detergents and cakes, consumer durables like cars, cameras and television sets, and also industrial goods have all been the subjects of conjoint analysis investigations. In addition, the technique has been used for a variety of purposes including competitive analyses, promotional decisions and distribution purposes. However, conjoint analysis has

proved particularly successful in the most popular areas in commercial practice i.e. market segmentation, product development and pricing (Vriens, 1999). A recent example of its use in relation to environmental goods is a study by Anderson and Hansen (2004), which assessed the impact of environmental certification on consumer preferences for a wooden furniture product, with a view to identifying that segment of the market which would be prepared to pay a price premium for the product. To date, conjoint analysis has not received attention within the field of waste and resources, but it could prove a useful technique to apply to the market development of recyclate.

6.5.1 The Conjoint Analysis Technique

Conjoint analysis is a statistical technique used to understand why customers prefer one product to another. A full explanation of the technique can be found elsewhere (e.g. Green and Srinivasan 1990; Hair et al, 1998; Churchill and Iacobucci, 2004) but an outline of the ideas will be given here, before describing how they were applied to the landscape contractor and retailer survey.

The technique is based on the idea that consumers determine the value of a product by combining the separate amounts of value provided by each feature or attribute of the product. The basis for respondents' overall preference in conjoint analysis is a quantity called utility, which is a subjective measure of judgment unique to each individual consumer. Utility is assumed to be based on the value placed on each of the features of the product, and an overall utility is determined by, for example, summing the utility values associated with each feature. The assumption is then, that consumers would prefer to choose those products on which they place the highest overall utility value.

At the start of the research process the researcher must construct a set of hypothetical products by combining different values for each attribute of the product. The researcher must be able to describe the product in terms of its attributes, and to assign relevant values to each attribute. In conjoint analysis, the

term used to describe specific attributes is factor, and the possible values for each factor are called levels. For example, the attributes (or factors) of a green waste compost product might be acidity, screen size and price. There may be three possible levels of pH, slightly alkaline, slightly acidic or neutral; three levels of screen size, 5mm, 10mm or 20mm, and two levels of price £5 per m^3 or £7 per m^3. Thus a potential product might be pH neutral, 10mm screen size and £5 per m^3. A stimulus is the term used to describe this potential product, and the researcher must generate a number of such stimuli. The set of stimuli is then placed before the subject, who is asked to give an overall evaluation of the product. In this way he is being asked to perform a very realistic task by choosing among a set of potential products. The subject is not asked to give any more information; he does not need to say how he has evaluated the product or how important each product feature is to him. The conjoint analysis method will determine the influence of each feature and how it contributes to the overall utility judgment of the subject. When these contributions have been determined the researcher could then (Hair et al, 1998):

- Determine the best combination of features which would produce the ideal product.
- Show the relative importance of each attribute of the product to the consumer's overall choice.
- Predict how consumers would rate potential products with differing sets of attributes.
- Determine segments of the market which place different importance on the different product attributes.
- Identify marketing opportunities by exploring the market potential for feature combinations not currently available.

These options will all be explored in relation to the contractor and retailer preferences for green waste compost products.

6.5.2 Designing a Conjoint Analysis Experiment

Since performing conjoint analysis is very similar to carrying out an experiment, the design of the research is critical to its success. In the experiment, a number of independent variables (factors) are specified and these variables are allowed to take certain values (levels). A dependent variable (utility) depends on a combination of the effects of the independent variables. The researcher has the power to choose the independent variables, to vary their values and to observe the effect this has on the dependent variable. If a variable is not anticipated in the research design, it will not be available for analysis. Since the experiment is limited in the number of variables which can be included, the researcher cannot just include any additional variables which might be relevant, but must think very carefully about which ones to specify.

The objectives of this experiment are: firstly to determine the contributions of the predictor variables and their values on the dependent variable, utility, which is a measure of consumer preference, then to establish a valid model to predict utility and thus predict consumer judgments. A valid model would allow the researcher to predict the consumer acceptance of any combination of attributes, even those not originally evaluated by the subjects of the experiment. Choices which the researcher must make are thus:

- What factors/levels should be included in the experiment?
- What model should be used to determine utility?

When deciding which factors to define for the experiment, the researcher should consider what makes the product unattractive, as well as attractive. It is important to include all attributes that can add to or detract from the overall acceptability of the product, since including only positive factors may distort the subject's judgment. When developing the model the researcher must decide whether to adopt a simple linear relationship between the factors and the utility, simply adding up the value of each factor to provide an overall measure of consumer preference, or whether a more complicated relationship is needed to model the process adequately. The issues concerning the choice of factors and models are discussed in more detail in the following sections.

6.5.3 Choosing Factors and Levels

Practical guidance on the choices of factors and levels is available from a number of sources (e.g. Hair et al, 1998; Churchill and Iacobucci, 2004). The number of stimuli which need to be produced will depend on the number of factors used. The larger the number of factors, the more stimuli will be needed. As factors and levels are increased, the burden on the respondent will also increase as he is asked to evaluate a larger number of stimuli. Consequently a balance must be drawn between including sufficient factors and levels, without overburdening the respondent to such a degree that he does not complete the process.

Factors should not be vague concepts such as 'over-all quality', but clear and unambiguous such as price, and specific values such as £5 per m^3 should be presented in the stimuli. Study has shown that the importance of a particular variable increases as the number of levels increases (Wittink et al, 1990), so it is advisable to try to equalize the number of levels across factors. Otherwise if, for example, eight different screen sizes were presented to the respondent, but only two different pH levels were specified, then it is likely that the analysis would show that screen size was more important than acidity. It appears that this is because the extra categories would call attention to this particular attribute and would cause the respondent to focus on this factor rather than on the others.

When creating levels, the researcher should consider practical relevance and feasibility. Totally infeasible products should not be suggested; the researcher should avoid creating stimuli that the subject will favour but which will never have a realistic chance of occurring. When creating levels, the range of values which should be assigned to each factor should be set at a believable level, but slightly outside current or existing values in order to reduce the correlation between different attributes. The levels should not be too extreme, however, as to make the product entirely unrealistic.

6.5.4 Choosing the Form of the Model

Next the researcher must decide on the form of the model. Two decisions must be made in choosing the form of the model to be adopted for the conjoint analysis. These decisions will affect the analysis of the overall evaluations which the subjects will make on the stimuli which are presented to them. The first question which must be answered is:

- Within a stimulus, what is the relationship between the factors?

That is, how does the respondent combine his evaluation of each factor to determine the overall worth of that stimulus? In conjoint analysis there are two possibilities for specifying the way in which the subject combines his evaluation of each of the factors: the additive model or the interaction effects model. The additive model is the simplest and most common model. In this model the respondent simply adds up his evaluation of each individual factor to give an overall evaluation of the stimulus. For example, if price and screen size were the only two factors in the stimulus and the respondent placed a value of 4 on the price presented and 2 on the level of acidity, then this stimulus would have total worth of 6. In the interactive model, it is assumed that combinations of certain factors interact and that when this interaction occurs the evaluation of the whole is greater than the sum of the parts. In the previous example, if there was considered to be an interaction between price and level of acidity, then the interactive model could allow for the overall score to be greater than (or less than) 6. The interactive model may be a more accurate representation of the way in which respondents actually value a product. However, it is more complicated to analyse and it requires more evaluations by the respondents. In addition, the analysis can usually only be performed at the aggregate level, where subjects are considered as a group, rather than at the level of an individual subject. For most applications, the simpler additive model is considered to be appropriate (Hair et al, 1998).

The second decision which the researcher must make concerns the way in which the respondent gives preference to the different levels within a factor. Here the question is:

- Within a factor, what is the relationship between the levels?

In other words, how are the respondent's preferences for the levels of the factor related to each other? For example, if one factor is screen size and three levels are specified within this factor: 5mm, 10mm and 20 mm, what relationship is there between the preference the subject gives to each of these sizes? The conjoint analysis method allows three alternative relationships: linear, quadratic (ideal or anti-ideal) or discrete. These three basic types of relationship are shown graphically in Figure 6.5.

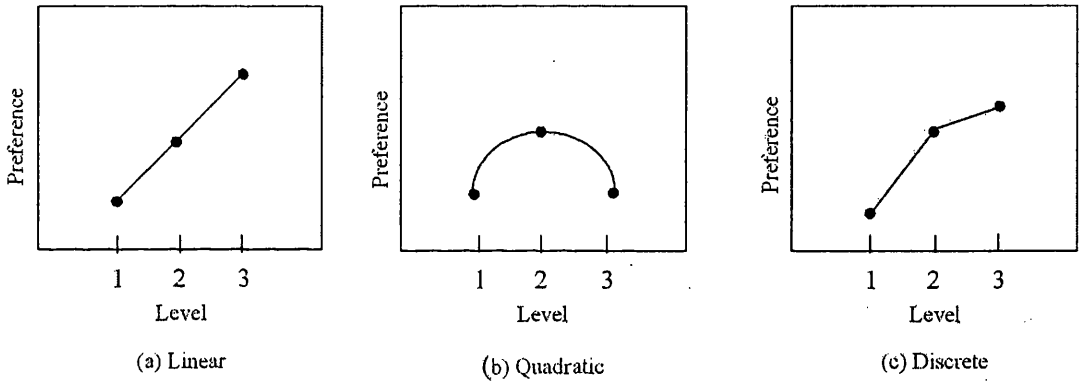


Figure 6.5 Conjoint analysis: relationship between levels within a factor

The linear model is the simplest, but most restricted. Whereas the discrete model, where there is no clear relationship between preferences for the different levels is the most general. In the quadratic model the assumption is that there is an ideal (or anti-ideal) level and that the respondent will give that level the maximum (or minimum) preference. The type of relationship can be specified for each factor independently, so in the case of green waste compost the researcher might specify a simple linear relationship between levels of price and a discrete relationship between levels of acidity. The more restrictive the relationship specified, the more efficiently, or quickly, the calculations can be performed. However, the specification of the least restrictive, discrete relationship will probably give a more accurate representation of how, in practice, a consumer actually forms an overall preference for a product (Hair *et al*, 1998).

6.5.5 Choosing the Method of Presenting the Stimuli

Once factors and levels have been chosen, it is then necessary to decide how to present the product descriptions so that they can be evaluated by the respondents. Three possible presentation methods are:

- Trade-off
- Full-profile
- Pair-wise combination

Although all of these methods are acceptable, each has its advantages and disadvantages, and these will be discussed briefly here.

In the trade-off presentation method, two factors at a time are presented in the form of a matrix; Figure 6.6 shows an example of this presentation approach for a green waste compost product.

	5mm	**10mm**	**20mm**
No standard			
PAS 100			
Own specification			

Figure 6.6 Trade-off presentation method: example of a trade-off matrix for green waste compost product

The respondent is asked to rank all the combinations of these levels in order of preference, by placing a rank number in each cell of the matrix. In this way the researcher is testing whether the respondent is prepared to trade off one attribute for a more desirable level of another attribute. This method is easy to explain and to administer, and it avoids information overload since only two factors are being considered at any one time. However, for the very reason that only two product attributes are being compared simultaneously, it is not very realistic. In practice, consumers actually have to weigh up all the pros and cons of a product at the same time. In addition the respondent has to make a large number of evaluations. The number of trade-off matrices which must be prepared is equal to

$\frac{N(N-1)}{2}$ where N is the number of factors,

and the total number of ranking evaluations which must be carried out is

$\sum_{i=1}^{N-1}(\sum_{j=i+1}^{N} n_i.n_j)$ where n_i is the number of levels in factor i.

If for example, five factors are used, each with three levels then ten trade-off matrices will be presented and ninety evaluations will need to be made. This can result in confusion and boredom and the respondent may not complete the process.

The full-profile presentation method avoids some of the pitfalls of the trade-off method, as complete product descriptions are presented instead of information about pairs of attributes. A typical full-profile stimulus for green waste compost is shown in Figure 6.7.

Stimulus 1
pH 7.0
10mm screen size
PAS 100
£5 per m^3

Figure 6.7 Full profile presentation method: example of a stimulus for a green waste compost product

Respondents are presented with a list of such full-profile descriptions of the product, and they can be asked either to rate them on a scale e.g. (1 – 7), or to rank them in order of preference. Ranking is easier to administer if personal interviews are being carried out, as the interviewer can present the product stimuli on cards, and help the respondent to put the cards in order. If a pen-and-paper questionnaire is being completed, then ranking is more difficult to explain and rating is the preferred method. The main disadvantage of the full-profile method is that the number of full-profile descriptions can quickly become very unwieldy. If five factors are employed, each with three levels, then the number of stimuli would be 3 x 3 x 3 x 3 x 3 = 243. It is unrealistic to expect a respondent to complete this number of

product evaluations. However, it is possible to simplify the process by using a fraction of the full set of stimuli; this is known as fractional factorial design. The subset of stimuli which are selected must be balanced (i.e. each level in the factor appears the same number of times) and orthogonal (i.e. there is no correlation among levels across attributes). Statistical software, such as SPSS, can automatically select orthogonal subsets from amongst the complete set of profiles, making the generation of fractional subsets of stimuli for the full-profile presentation method relatively straight forward.

The third possible method of presentation is pair-wise combination, which combines the ideas of the other two methods. The stimuli consist of part profiles, such as those shown in Figure 6.8.

Stimulus 1	Stimulus 2
pH 4.5	pH 4.5
PAS 100	No standard
£5 per m^3	£2 per m^3

Figure 6.8 Pair-wise comparison presentation method: example of a pair of part-profile stimuli for a green waste compost product

Part profiles are presented in pairs, and the respondent is asked to use a rating scale to indicate a preference for one profile over the other. The profiles do not contain all the attributes of the product, instead only a few attributes at a time are selected when constructing the profile stimuli. As with the trade-off method, this method is easier to explain and to administer if the researcher is present when the judgments are being made.

6.6 The Conjoint Analysis Experiment within the Contractor and Retailer Survey

The final section of the questionnaire, which was sent to the landscape contractors and retailers, was designed as a conjoint analysis experiment; the application of the technique to this investigation will now be explained.

6.6.1 Design of the Conjoint Analysis Experiment

The initial task of designing this part of the study involved deciding what factors or attributes were considered as important or influential to consumers when selecting a green waste compost product. A wide range of factors were considered, however it was determined that the test should ideally have no more than four factors as any more might confuse the respondents and reduce the level of responses returned. The four factors considered to have the most influence over a purchase decision were price, screen size, pH levels and standard of specification. These factors were pre-tested with David Skidmore, Chief Executive of Tirlun, the Wales Landscape Industry Forum (Skidmore, 2003).

The price attribute was allocated four levels which were either expressed as price per 75ltr bag or price per m^3. The reason behind the two types of unit was to enable the same test to be administered to both the contractors and the retailers thereby allowing a direct comparison between the two sectors. Four prices were used in total, two for each type of unit, ranging from the relatively inexpensive to the more costly. Purchasers would, of course, prefer to pay the minimum possible price for a product. However, the experiment was intended to determine whether they are prepared to make a trade-off by purchasing a more expensive product in return for other characteristics that they value, such as quality.

Screen size was the second attribute selected, and this factor was presented to the consumer with three screen sizes, 6mm, 12mm and 20mm. The general understanding within the growing media industry is that the smaller the screen size,

the higher value and higher quality the product will be. To obtain a finer particle size, a number of screening processes are required to remove the larger particles, and this process will also reduce the evidence of physical contaminants. The results would hopefully indicate each sector's ideal preference for screen size.

Slightly more difficult was deciding how to represent the pH levels without over complicating the questionnaire. Initially the pH levels were represented in numerical form ranging from 4.0 to 8.0 to include acidic, neutral and alkaline products. However, when the questionnaire was pre-tested it was suggested that using a written description would be less restrictive than numerical levels and the attribute was relabelled as slightly acidic, neutral and slightly alkaline. The reason for selecting to test this attribute was to see whether there were any distinct requirements between either of the two market segments.

The final attribute to be tested aimed to understand what level of specification each of the products needed to meet to satisfy the requirements of the market. The introduction of a uniform standard applicable throughout the industry is a particularly prevalent issue associated with the marketing of green waste compost. In the design of the conjoint analysis experiment, three levels of standards were identified: compost which has been produced to a consumer's individual specification, compost produced to the BSI PAS 100 specification and finally compost which has been produced to no particular specification or standard. This particular factor was chosen to test whether there is a real requirement for standards within the compost market. The reference to the BSI PAS 100 specification was included to highlight general awareness and acceptance of the standard from both sectors.

Having determined which factors and levels to use, it was then necessary to decide how to present the product descriptions so that the respondents could evaluate them. Possible presentation methods were trade-off, pair-wise combination, or full-profile. In the trade-off presentation method the respondent is shown a set of matrices, each representing two factors, and is asked to rank combinations of the levels of these two factors. In this way he is expected to make a trade-off between, for example,

levels of price and levels of screen size. Although this method is simple, it does not realistically model actual purchasing decisions. In practice the consumer needs to weigh up all the factors associated with a product at the same time, rather than two in isolation. In addition, the number of matrices and ranking decisions needed can quickly become unwieldy and lead to boredom on the part of the respondent. The pair-wise comparison method, on the other hand, does provide the subject with a set of products to compare in turn, but none of the stimuli contains a full product profile. In contrast to these methods, in the full-profile method the respondent is shown a list of stimuli each representing a potential product with one level taken from each factor.

Since it allows realistic evaluations of complete profiles to be made, the full-profile method of presentation was chosen for the landscape contractor and retailer survey. An additional consideration was that this method is also easier to administer with a pen-and paper questionnaire than the other methods, which benefit from explanation by an interviewer when the judgements are being made. Examples of typical full-profile stimuli for green waste compost, using the factors and levels chosen for the study, are shown in Table 6.18.

Table 6.18 Product profile examples: levels varied across the factors

Stimulus No.	Price	Screen Size	pH Level	Standard
1	£5.50/75ltr.	12mm	slightly alkaline	own specification
2	£3.20/m^3	6mm	neutral	none
3	£6.80/m^3	20mm	neutral	PAS 100
4	£3.30/75ltr	12mm	slightly acidic	none

As already indicated, the main disadvantage of the full-profile method is that the number of full-profile descriptions can be quite large. With the factors and levels chosen (four levels of price, and three levels each of screen size, pH and standard) the total number of possible combinations would be 4 x 3 x 3 x 3 =108. As it was not realistic to expect the respondents to complete this number of product evaluations without becoming bored, the process was simplified using fractional

factorial design, as described in Section 6.5.6. The statistical software package SPSS was used to automatically select an orthogonal subset from amongst the complete set of profiles, and a list of twenty full-profile stimuli was generated, as shown in Appendix C. Prior research suggests that up to twenty conjoint evaluations can be completed before the responses start to become less reliable (Johnson and Orme, 1996).

Respondents were asked to consider each of the twenty stimuli, or products, using a scale to provide an indication as to how likely they would be to purchase that particular product. As a pen-and-paper questionnaire was being used rather than personal interviews, the method of rating was chosen, as suggested in the literature (Hair *et al*, 1998), in preference to ranking and a sliding scale was used. The initial scale consisted of numbers zero through to ten with indications of likelihood to purchase at each end and 'may or may not' purchase decision in the middle. Following the pre-tests it became apparent that using a scale with eleven numbers allowed the respondent to discard many of the intermediate values, and labelling the middle options tended to draw respondents to a middle value. The scale finally adopted was smaller, a sliding scale ranging from one to seven with preferences labelled at each end. At the one extreme, respondents could specify a rating of one, suggesting that they were not at all likely to purchase the product. At the other extreme a rating of seven would suggest that they were certain to make the purchase.

6.6.2 Results of the Conjoint Analysis Experiment

Responses from the survey were analysed using SPSS version 11.5. The data obtained from both the contractor and retail sectors were entered together in the same statistical package. However, the responses were labelled slightly differently so that it was possible to differentiate and make comparisons between the two sectors. SPSS produces a utility figure for each respondent for each level of each factor based on their preferences for the stimuli or products presented. In the analysis a discrete model was used to describe the relationship between levels

within each factor, in preference to a simple linear or quadratic model. The discrete model is the least restrictive, and it was chosen because it would give a more accurate representation of how, in practice, the contractors or retailers would form a judgement about a product. An additive model, summing the utilities for each individual level, was used to determine the overall utility placed on a product.

Table 6.19 Utility and importance estimates for the contractors, the retailers and overall

	Contractors		Retailers		Overall	
Factor	Utility	Averaged Importance	Utility	Averaged Importance	Utility	Averaged Importance
Price		53.85%		55.10%		43.78%
£3.20/m^3	1.0594		-0.3056		0.6358	
£6.80/m^3	-0.2656		-1.0278		-0.5022	
£3.30/75ltr	0.1594		1.2222		0.4892	
£5.50/75ltr	-0.9531		0.1111		-0.6228	
Screen size		11.04%		12.24%		14.09%
6mm	0.1958		0.2963		0.2270	
12mm	0.0208		-0.2037		-0.0489	
20mm	-0.2167		-0.0926		-0.1782	
pH		15.05%		19.73%		22.19%
Acidic	-0.1042		-0.1667		-0.1236	
Neutral	0.3333		0.4861		0.3807	
Alkaline	-0.2292		-0.3194		-0.2572	
Standard		20.07%		12.93%		19.94%
None	-0.3875		0.0556		-0.2500	
PAS100	0.3625		0.2361		0.3233	
Own spec.	0.0250		-0.2917		-0.0733	
Kendall's τ	0.924		0.979		0.924	

The complete table of conjoint analysis experimental results for the overall sample and the contractor and retail sectors is given in Table 6.19. Based on the information provided by the utility scores, it was possible to calculate the relative importance which consumers placed on each of the four factors: price, screen size, pH level and standard. Average importance percentages were calculated at an aggregate level for the group of contractors, the group of retailers and the overall group. These figures were determined as follows. Firstly, the range of utility for each factor was calculated; for example, amongst the contractors the highest utility for price was 1.0594 and the lowest was -0.9531, therefore the range across this factor was 2.0125. These ranges were then summed. The range for each factor was divided by the sum of the ranges, and finally multiplied by 100 to provide an average importance percentage.

Kendall's τ is the appropriate statistical measure used to assess the validity of the results. This measures the ability of the model to predict the preferences of the consumers in the survey. It can be used to identify any respondents whose responses should be discarded. The ideal value of the statistic is one, representing a perfect prediction. Respondents for whom Kendall's τ was less than 0.6 were excluded from the summary analysis presented in Table 6.19. Generally, these individuals did not distinguish sufficiently between the list of products they were shown. For example, some respondents assigned an identical rating to all the stimuli, and the model is incapable of analysing such results. The combined results for the remaining contractor, retailer and overall groupings all show a high level of reliability.

The utility figures in Table 6.19 represent a measure of the value that is placed on each level of each factor. It is possible to clarify the insight given by the utility figures by plotting the responses to represent each sector and the overall preferences. The following graphs highlight the overall and sector preference for each of the four factors: price, screen size, pH levels and standards.

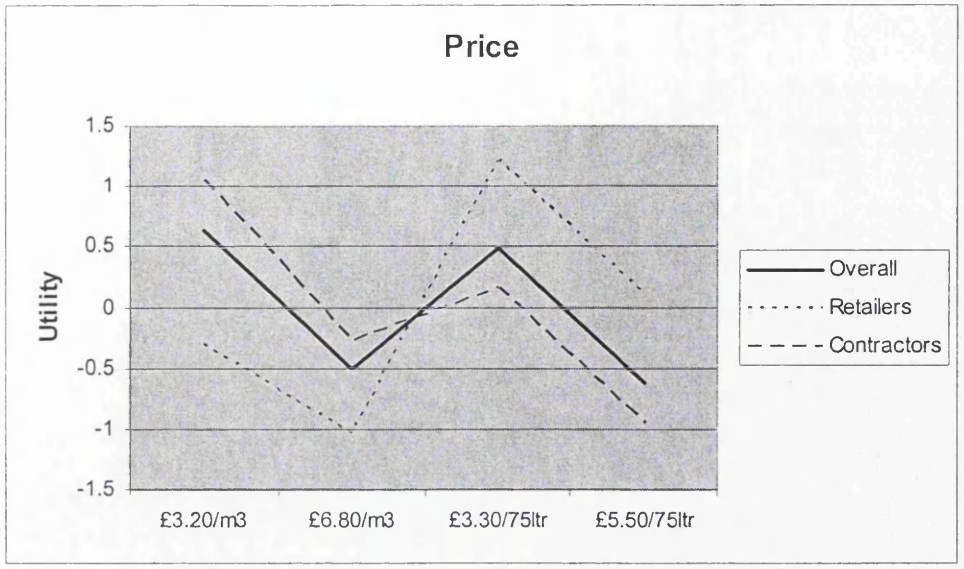


Figure 6.9 Utility estimates for the contractor, retailer and overall groupings across each level of price

Figure 6.9 shows that in the majority of cases the most popular choice is governed by the price, irrespective of the form of delivery unit. Furthermore, as expected there is greater preference from the contractors for compost sold loosely by the cubic metre, whereas the retail sector will generally require compost in smaller units.

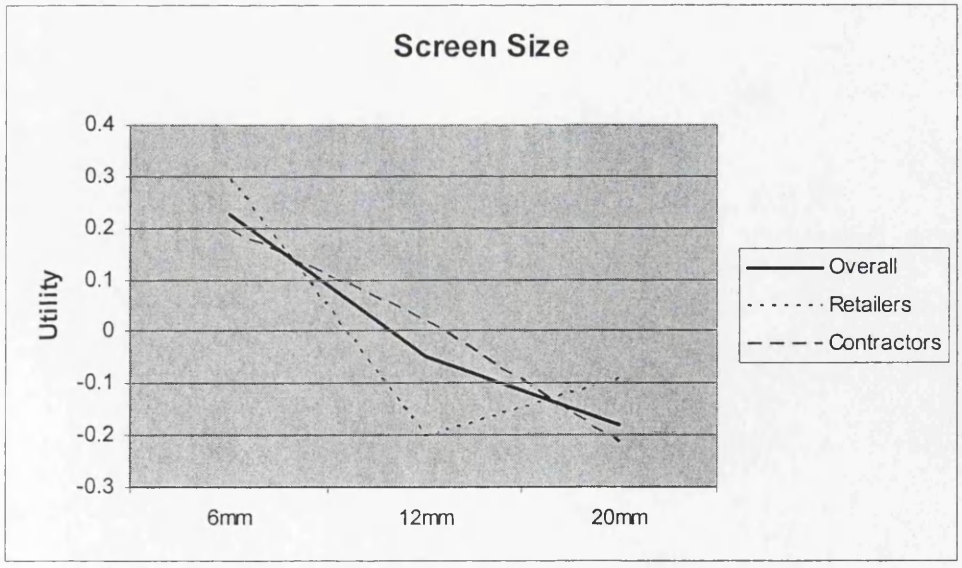


Figure 6.10 Utility estimates for the contractor, retailer and overall groupings across each level of screen size

The overall preference in Figure 6.10 shows a decreasing relationship between utility and the screen size, with greater utility for a smaller screen size. A similar relationship is suggested for the contractors' preferences. The retailers show a distinct preference for the 6mm screen as opposed to the 12mm. One slightly obscure and unexpected result is the retailer preference of a 20mm screen compared to the 12mm screen. As this particular finding is contradictory to information obtained from the qualitative research this is an area which may benefit from further investigation to support or to contradict the results.

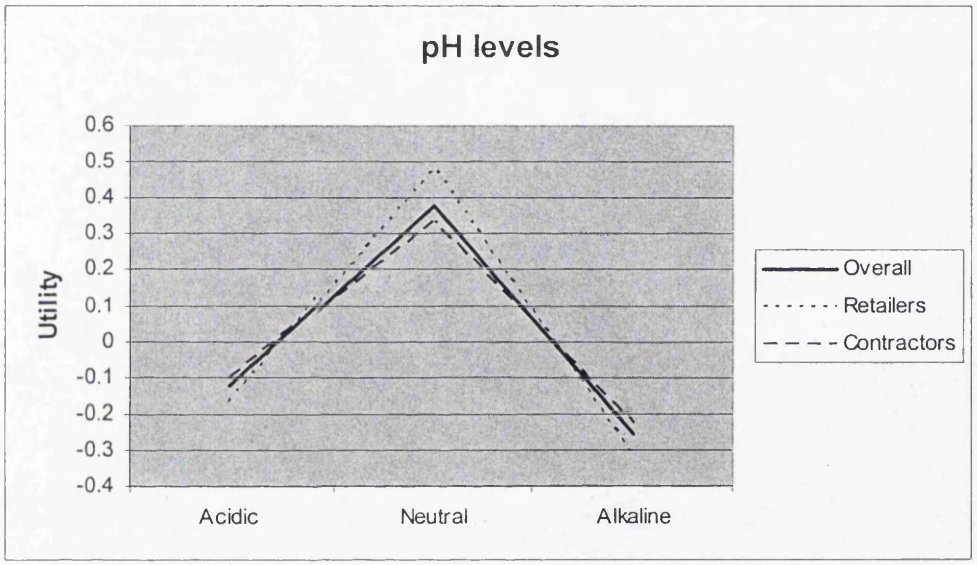


Figure 6.11 Utility estimates for the contractor, retailer and overall groupings across each level of pH level

The preference for pH levels is unanimous among all respondents, both contractors and retailers, as shown in Figure 6.11. The graph suggests that although pH neutral is preferred by the majority it seems as though slightly more acidic compost is preferred to a slightly more alkaline product. What might be interesting to note is the variances between individual respondents within the same sector and this will be investigated further in the next stage of the analysis.

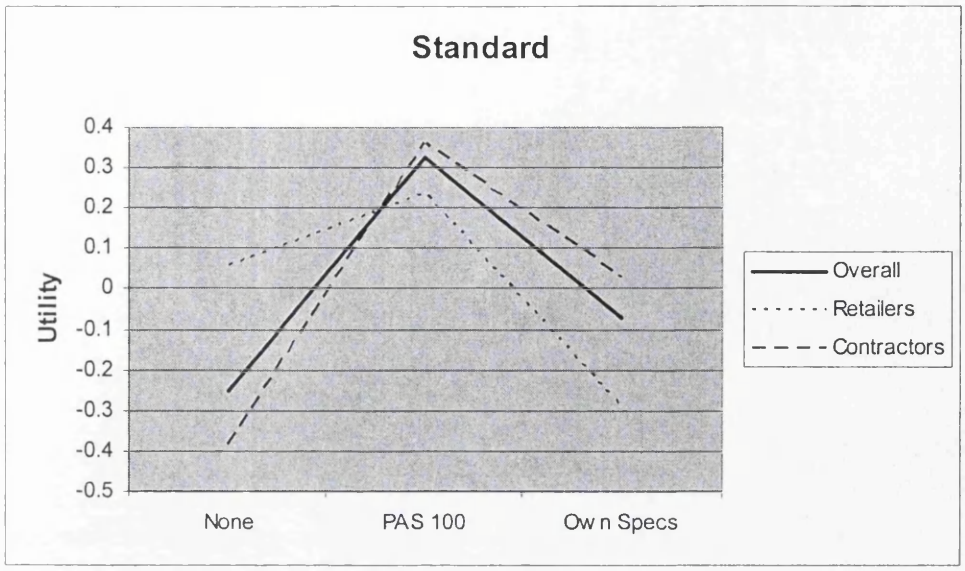


Figure 6.12 Utility estimates for the contractor, retailer and overall groupings across each level of standard

The desire for compost to meet the PAS 100 standard is strong across both the contractor and retailer sector, as indicated in Figure 6.12. This is encouraging to see, particularly from the retailers, as the exposure of the standard has been much less focused on the retail sector. The option of having compost produced to a particular specification is also important to the contractor sector; this possibly reflects the common practice of landscape architects providing a specification document with each project. One last observation could be that the retailers seem to be less concerned whether or not the compost has been classified with any type of standard, whereas the contractors are more negative towards composts with no standard at all.

In separating the responses from each sector it is possible to observe the variances in preference between the contractors and the retailers. However, it is also possible to interpret each individual response to each factor, and to compare the result with the average response from the respective sector and also with the combined results of both sectors. The purpose of this is to observe any particularly unusual or unexpected results which may have been masked by the overall results, and then to investigate why a particular respondent might have preferences vastly different from the rest of their sector.

The first factor to be considered is price. The combined response from the contractor sector almost mirrors the overall response pattern and follows a logical thought process as discussed previously. There is almost always a preference for the lower price bulk material as opposed to the higher price product available in smaller units and this will generally reflect the contractor's need for larger volumes of material at any one time. The majority of the responses seem to follow the overall pattern however there are an isolated number of incidents where the responses are noticeably different from the overall, and from each other.

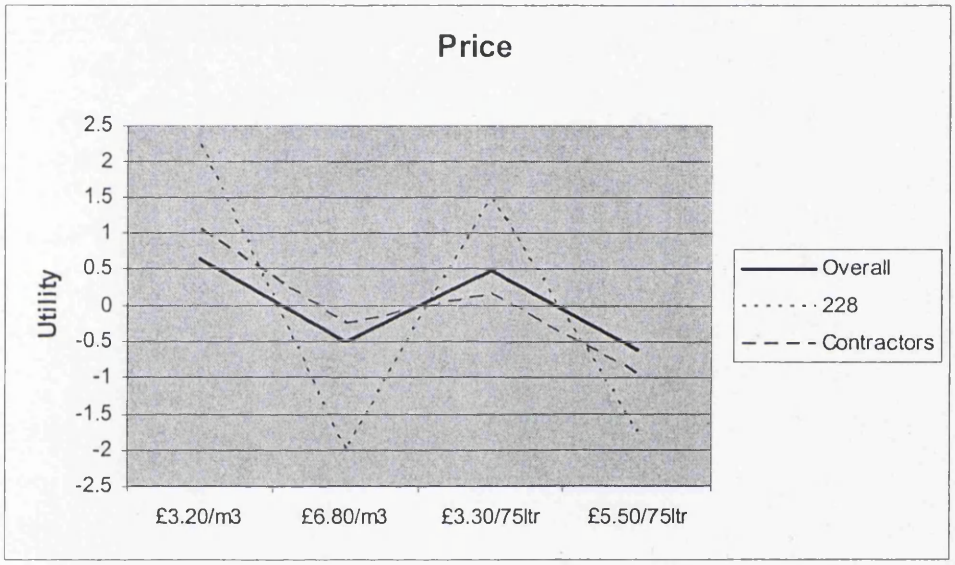


Figure 6.13 Utility estimates for Respondent 228 in comparison to the contractors and overall group

Figures 6.13 and 6.14 illustrate two conflicting preferences in choice of presentation of the product. The respondent represented in Figure 6.13 is clearly motivated by the price of the compost, whereas the respondent represented by Figure 6.14 is more concerned with the unit in which the product is made available. These two examples represent two extreme preferences whereas the majority of the respondents follow a more similar line. As mentioned previously, however it is important to appreciate that individuals within the same sector may hold quite different opinions on what is considered an ideal product.

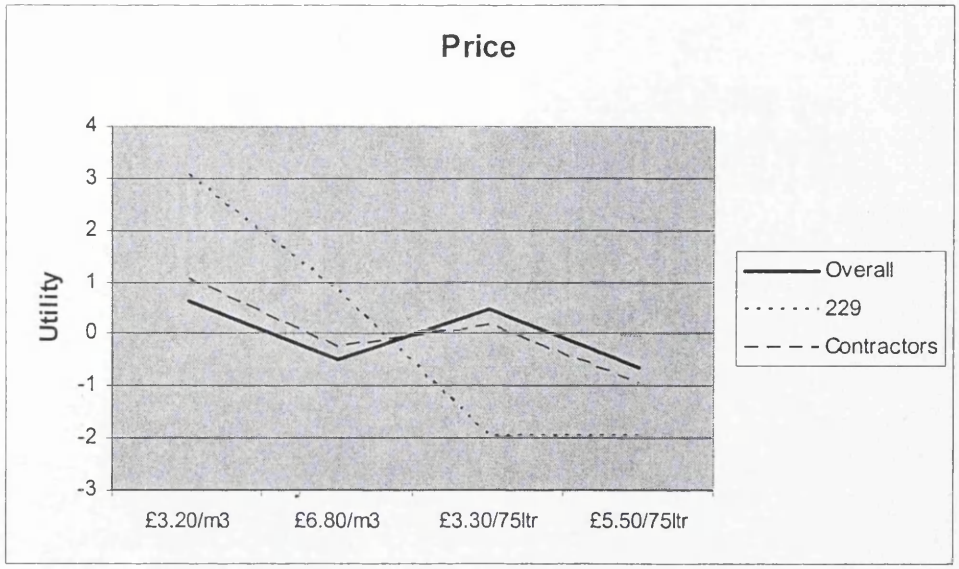


Figure 6.14 Utility estimates for Respondent 229 in comparison to the contractors and overall group

The majority of the retailers followed the overall response pattern by opting for the more expensive compost delivered in smaller units as opposed to a cheaper product delivered by the cubic metre. The only clear exception is shown in Figure 6.15 where the respondent is less concerned with the unit of delivery of the product. One possible explanation could be that the retailer has regular customers who are prepared to purchase compost as a loose product, or the retailer may have the facilities to bag the material themselves, therefore being able to take advantage of the price reduction with bulk purchasing.

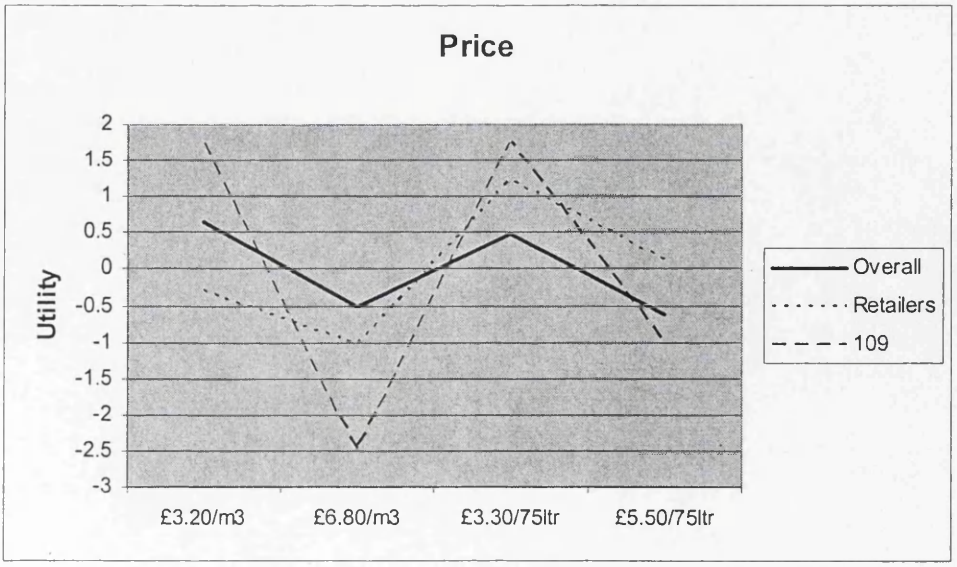


Figure 6.15 Utility estimates for Respondent 109 in comparison to the retailers and overall group

As regards screen size, the contractors largely selected the 12mm screen compost, with a small number preferring the 6mm. This would be expected, as the more specialist landscaping jobs would require a higher grade screened compost. However, a number of the retailer individual profiles did not produce the preference levels expected for each of the screen sizes available. Rather than showing a negatively sloped curve as the screen size increased there was instead a number of retailers who preferred the 20mm option over the 12mm. This is particularly evident in Figure 6.16; it is unclear why this is the case without investigating this particular retailer's situation, business or operation.

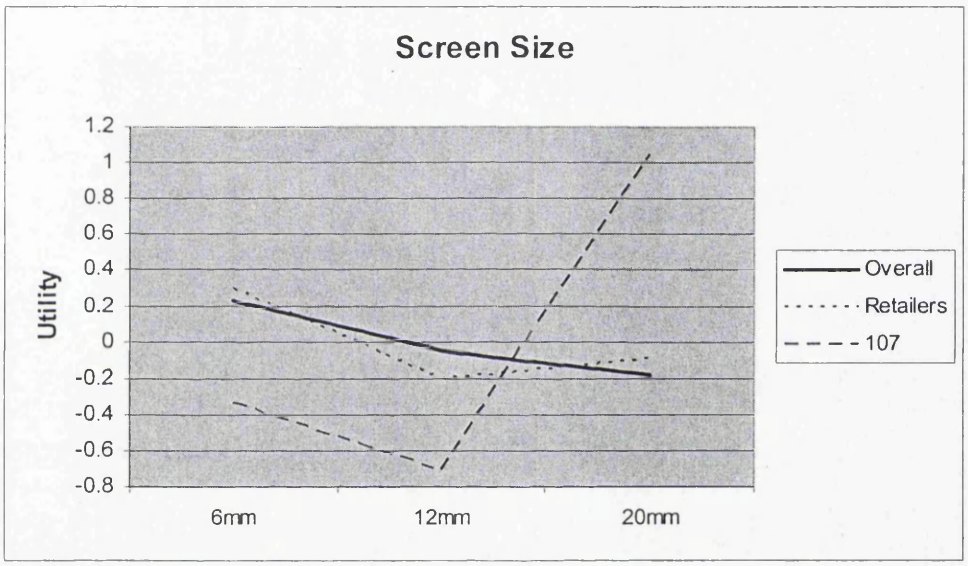


Figure 6.16 Utility estimates for Respondent 107 in comparison to the retailers and overall group

The overall response from respondents concerning the quality and standard of the compost favoured the PAS 100 certification. Further investigation into individual responses highlighted two separate preferences from the contractor sector. Within the contractor sector it was possible to categorise a number of respondents into either those who wanted compost which complies with PAS 100 or compost made to their own personal specification. The retail sector was slightly more divided and there were three groups whose preferences were distinctly in favour of one particular level of standard. Consequently, the next step was to see if there were any common factors shared by respondents in each of these groups. Size, turnover and location were all considered, however, following further investigation there

seemed no clear link between the preferences for standards and the type, size or location of the respondent.

The individual preferences for pH levels tended to follow the mean preference of neutral. There were a small number of preferences for alkaline within the contractor sector which may indicate that the respondent works with acid intolerant plants, however this was a small minority.

A profile of all the individual responses was also examined to see whether those respondents with slightly abnormal responses for one factor were repeated in the other factors presented. The results for this test were negative and there were no noticeable trends or patterns evident from a single respondent.

6.6.3 Summary Results of Conjoint Analysis Experiment

The summary results for the contractors, the retailers and the overall group are presented in Figure 6.17. The overwhelming factor which stands out is the importance of price. Despite the differences between both sectors, when the summary results were collated there was a distinct indication that price is the most important factor for the landscape contractors and retailers when purchasing compost.

These results allowed the researcher to gather an understanding of the level of importance contractors and retailers place upon certification of products, in comparison to price. In the final analysis, it is the relative importance of the attributes which will determine the extent to which the landscape contractors and retailers will prioritise their actions, and price stands out as the most important factor determining purchasing in this sector. As these transactions involve business-to-business buying, perhaps this emphasis on price should not be surprising. The result confirms other research, for example Webster's claims that, in business-to-business purchase decisions, price is the key determinant of

purchasing behaviour, as long as the product is of acceptable quality and readily available (Webster, 1991).

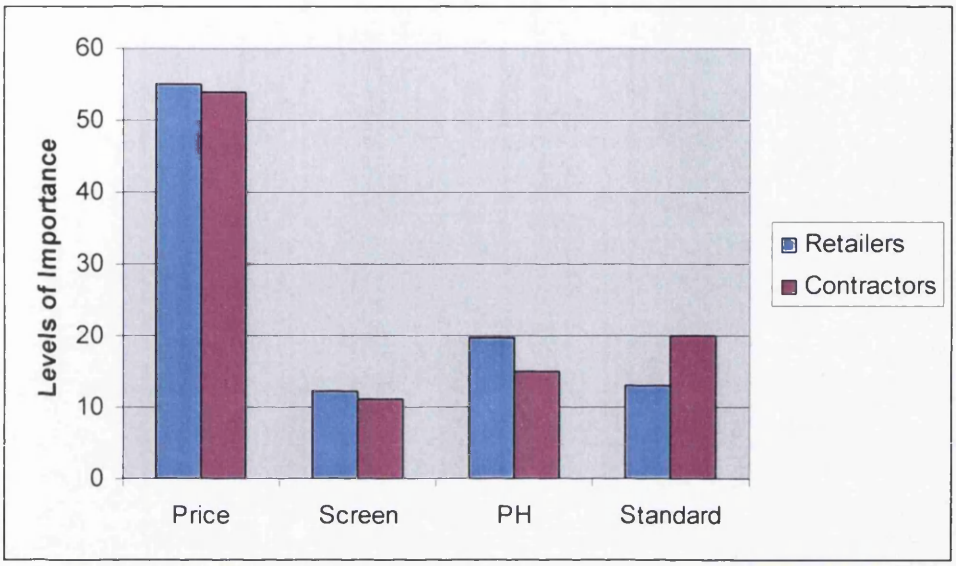


Figure 6.17 Estimates of the level of importance placed on each factor by the retailer and contractor groups.

The relatively low level of importance placed on the compost specification was still a rather unexpected result, since the information gained from the in-depth interviews suggested that a recognised standard of quality would be important (Dawson and Probert, 2004a). However, the BSI PAS 100 was in its infant stages at the time of the survey. Since that time, this specification has been promoted more widely and there is greater recognition of the standard. A follow-up study would show whether there have been any changes in consumer attitudes since the original work was carried out.

6.6.4 Simulated Market Shares

The purpose of conducting the conjoint analysis experiment was to compile an understanding of which combination of attributes were considered preferable by the respondents from both the contractor and retail sector. The questionnaire which was administered contained twenty profiles, with products of varying price, screen

size, pH level and standard allowing the researcher to identify which level within each factor was most popular overall and for each sector. The results of the initial experiment have been outlined above.

The list of twenty possible products, which featured in the questionnaires distributed, was selected by the statistical programme based on the number of factors and levels provided to ensure a balanced and orthogonal distribution. The researcher was therefore restricted in terms of what levels were chosen for each attribute in each product, and occasionally the result was not always representative of a product currently found within the market.

Another option available within SPSS is to create a number of realistic products which could be put onto the market, and to test those products using the survey data. SPSS simulates what the market preference for each product would be based on the responses provided in the original survey.

A number of combinations of possible products were tested with choice simulators, which predicted the market share a product would achieve if it was placed on the market together with one or two other specified products. These market share predictions were made using a maximum utility model and two types of probabilistic model: the Bradley-Terry-Luce (BTL) and Logit models (Dobson, 1990). These probabilistic models are inbuilt in SPSS; both assess the relative importance of each product and estimate the proportion of times a respondent, or set of respondents, would purchase a product.

The simulations were conducted for the contractors and the retailers separately as the research suggests that they are two totally separate markets and to test the two together would not provide a reasonable estimate of demand. In addition, it should be noted at the outset that this type of analysis is normally performed with much larger sample sizes than the one available for this investigation, and that the results presented here illustrate the capability of the technique as applied to the contractor and retailer survey, but cannot be regarded as definitive predictions of market shares for compost products.

Initially, combinations of six products were tested using the contractors as one set of respondents; these products are shown in Table 6.20. Each of the products was tested against the other in groups of three in preliminary tests to identify any trends. The most notable conclusion was that for every simulation the product with the lowest price per m^3 would invariably take the greater market share.

Table 6.20 Descriptions of potential compost products for landscape contractors

Product	Price	Screen Size	pH Level	Standard
A	£3.20/m^3	20mm	Neutral	PAS 100
B	£3.20/m^3	20mm	Neutral	None
C	£6.80/m^3	12mm	Neutral	PAS 100
D	£6.80/m^3	6mm	Neutral	PAS 100
E	£6.80/m^3	6mm	Neutral	Own Spec
F	£6.80/m^3	12mm	Neutral	Own Spec

In practice it might only be feasible for compost producers to produce and promote two or possibly three different products, as the more diverse the range the higher the costs of production due to loss of some economy of scale. Using the technique outlined above four tests were conducted using varying combinations of the six products shown in Table 6.20; the combinations selected were intended to reflect a realistic scenario.

The tests contained two products with varying prices. Although it would be expected that the cheaper product would achieve the greater market share it would also be important to observe the expected breakdown of the market share, as the higher priced product might earn a cash equivalent to the lower grade material. One point to note is that although the simulations can predict the percentage market share expected from the number of sales of the products, the figures cannot depict expected sales volume i.e. the model cannot predict what volumes of each product that proportion of the market is expected to buy.

Table 6.21 Predicted market shares of products A and C

Product	Max Utility %	BTL %	Logit %
A	100	54.72	67.07
C	0	45.28	32.93

In Table 6.21 we can observe the possible outcome of placing products A and C on the market at the same time. Product A gains the maximum utility figure meaning that overall when given the choice the respondents are more likely to choose the cheaper option despite the compromise on screen size from 12mm to 20mm. If we assume that the maximum utility is based on the respondents' purchasing the product which is the nearest to the ideal suitability, of which price would be the most important factor, then the cheaper product will always achieve the maximum utility. By also using the BTL and Logit methods the researcher is able to consider the respondent's preference proportional to the score and the natural logarithm, respectively (Dobson, 1990).

Table 6.22 Predicted market shares of products A and B

Product	Max Utility %	BTL %	Logit %
A	100	53.56	63.37
B	0	46.44	36.63

Table 6.23 Predicted market shares of products C and D

Product	Max Utility %	BTL %	Logit %
C	100	50.50	51.68
D	0	49.50	48.32

Table 6.24 Predicted market shares of products C and F

Product	Max Utility %	BTL %	Logit %
C	100	52.21	57.16
F	0	47.79	42.84

As price has been determined as the main choice factor it was decided to hold price constant and to alter the screen size and standards variables so that it would be possible to investigate the consumer preference for one screen size or standard over

the other using a realistic product. Tables 6.22, 6.23 and 6.24 show the result of these investigations.

Table 6.22 shows how the inclusion of the PAS 100 standard compared to no standard has a definite effect on consumer choice when all other factors are constant.

In Table 6.23 the effect of a varied screen size, when the price and standard are held constant, can be seen. In theory, Product D should have the higher utility as a 6mm screen size is considered to be of a higher value than 12mm, however it is possible that due to the nature of work undertaken by contractors a 12mm would be more preferable. However, the breakdown in the results of the BTL and Logit methods indicates that there is in fact very little difference between the two choices and probably either product would perform just as well in the market.

Finally, Table 6.24 shows a comparison of standards once again, but this time PAS 100 is compared with the contractors' own personal specification. As with the test shown in Table 6.22 the PAS 100 is preferable to the alternative. This result helps to confirm the growing acceptance of PAS 100 as an industry standard for green waste compost.

For the independent retail sector only three combinations of product were used for these investigations, as they reflected the three most realistic products which could be placed on the market. The profiles of these products are shown in Table 6.25.

Table 6.25 Descriptions of potential compost products for retailers

Product	Price	Screen Size	pH Level	Standard
X	£3.30/75ltr	12mm	Neutral	PAS 100
Y	£5.50/75ltr	6mm	Neutral	PAS 100
Z	£5.50/75ltr	6mm	Neutral	Own Spec

As with the contractors, any tests which contain variable prices show that the cheapest option will always have the highest utility value, however the probabilistic test results in Table 6.26 show that the market shares of the three products are more evenly divided.

Table 6.26 Predicted market shares of products X, Y and Z

Product	Max Utility %	BTL %	Logit %
X	100	38.05	50.14
Y	0	33.70	31.83
Z	0	28.25	18.03

Table 6.27 shows a comparison of two compost products, both with the PAS 100 standard but with varying prices and screen size. As mentioned previously, the primary choice will always lean towards the cheaper product and therefore achieve the maximum utility, but as seen in Table 6.27 the probabilistic shares between the two products shown by the other two methods, in particular the BTL method, are quite close and suggest that the more expensive product may actually perform well.

Table 6.27 Predicted market shares of products X and Y

Product	Max Utility %	BTL %	Logit %
X	100	53.03	61.17
Y	0	46.97	38.83

Table 6.28 Predicted market shares of products X and Z

Product	Max Utility %	BTL %	Logit %
X	100	57.39	73.55
Z	0	42.61	26.45

Table 6.29 Predicted market shares of products Y and Z

Product	Max Utility %	BTL %	Logit %
Y	100	54.39	63.83
Z	0	45.61	3617

The final test in the retail sector compared the respondent preference for standards. The results shown in Tables 6.28 and 6.29 indicate that the PAS100 standard was preferred over the 'Own Specification'. This is a little surprising as the earlier research conducted through the qualitative interviews in the retail sector suggested that many retailers had concerns over the development of green waste composts and

were doubtful whether the new standard went far enough to safeguard those concerns.

In conclusion, when deciding on an appropriate product mix to place on the market a number of points should be considered based on the results presented in these tests. The main factor affecting the utilities representing consumer preferences is price, with screen size and standards having less impact. The tests performed here illustrate the capability of the conjoint analysis technique in predicting market shares (in terms of numbers of purchases) which might be expected if certain combinations of products were available. However, further investigation with larger samples would need to be conducted before any firm predictions could be made regarding sales volumes.

6.7 Summary

The aim of the quantitative element of this study was to establish the growing media products currently used by the contractor and retailer sectors, how much they used, where they sourced their products and who were their main customer groups. The results of the survey indicated a number of differences between the two sectors in relation to these questions. For example, the landscape contractors would favour mushroom compost whereas the results from the retailers indicate that domestic consumers still favour peat-based compost. The survey results also show distinct differences in purchase behaviour, retailers will generally prefer to purchase growing media products for the entire year at the same time to gain benefits of economies of scale, landscape contractors on the other hand would only purchase materials as and when the specific job required the product.

The overall response to green waste compost from the survey was rather negative, and this can be attributed to a number of factors. Firstly, there is a lack of awareness about developments of the green waste composting industry in Wales, a number of respondents who have used the product in the past complained of unsatisfactory levels of quality and there seems to be a reluctance to switch from

current growing media materials. Finally, the survey, in particular the conjoint analysis model demonstrates that a key priority for both landscape contractors and the independent retailers is price and this factor will remain a priority in all purchasing decisions despite any obvious environmental benefits a product may carry.

CHAPTER 7

BARRIERS AND ACTIONS TO CLOSE THE SUSTAINABILITY LOOP

7.1 Introduction

The research reported in the preceding chapters suggests that there are a number of barriers to the market development of green waste compost both within the composting industry as a whole and more specifically within Wales. The practical problems associated with the development and promotion of compost in Wales can be attributed to both supply and demand constraints. These barriers can be summarised as:

Supply

- Waste management licensing
- Size of composting operations
- Logistics
- Communication
- Standards

Demand

- Quality
- Price
- Specifications

This chapter will firstly explain these barriers and then discuss possible ways of overcoming them.

If green waste compost is to become a viable competitor within the growing media market, collaboration will be required between the three main actors: the waste management industry, government bodies and commercial enterprises (Dawson and Probert, 2005). Two separate Welsh sustainability initiatives have the potential to encourage information sharing and collaboration between these actors within Wales. These initiatives are: a Wales Compost Network and a Welsh Procurement Initiative (WPI).

The Welsh Compost Network's role will be discussed in relation to the supply side barriers, while the function of WPI will be analysed in relation to demand side barriers. The Welsh Procurement Initiative seeks to encourage sustainable procurement within organisations in Wales, and this organisation may have a role to play in overcoming demand barriers, which still exist, to the uptake of compost produced from waste in Wales.

The chapter will also report on the results of a series of follow up interviews which were conducted with Welsh procurement officers, in an attempt to determine the remaining barriers that prevent the specification of green waste compost within the composting industry in Wales.

7.2 Supply Side Barriers

Despite the large volumes of green waste compost currently being produced in Wales many of the waste management sites are unable to sell compost

commercially because of the conditions of their waste management licenses. The compost is given freely to consumers, often in return for green waste brought to civic amenity sites. Although this provides an outlet for the accumulating volumes of compost it can also serve to devalue the product and possibly make it harder to sell the compost at a later stage, as consumers may be reluctant to purchase a product previously given away (Dawson and Probert, 2004b). The key with marketing green waste compost is to present a product in its own right rather than a recycled product which may be used as a substitute. There are two problems often associated with products commonly labelled as 'green' or 'recycled'. Research suggests that many consumers will commonly associate a 'recycled' product with a lower quality product in comparison to similar products made from virgin materials, despite the recent improvements in product quality of recycled products (Dawson and Probert, 2004a). Another common misconception with green products is their increased cost and this has been suggested as the main constraint to implementing greener purchasing (Warner and Ryall, 2001). However, quite often it is the changes to policy and procurement which will involve a one-off cost rather than the price of the product or material.

The size of individual composting operations varies across Wales and this could present potential supply problems for smaller operations which may not always be capable of providing the volumes required at the time when supply is needed. One solution to this and other potential problems is to set up a composting network between the compost producers in Wales where they could effectively pool their resources and possibly sell under a single brand. The development of a network however brings its own problems as the transport infrastructure in Wales and the natural geography of the country is such that the links between North Wales and South Wales are only comprised of trunk roads rather than motorways. Providing links between the relevant actors is generally much easier in theory than in practice. It has been recognized that the integration of environmental management into supply chain management is not well documented (Warner and Ryall, 2001), and, in comparison with other supply chains the location of compost producers may have an even greater bearing when attempting to move into the growing media industry. A survey has recently been conducted into the opportunities for the use of

composted materials in the UK growing media manufacturing industry (Waller, 2003). This research was carried out as part of WRAP's market development programme for organic material, and there are a number of points raised within the report which would apply to Welsh compost producers. Compost is naturally a bulky product and therefore transport costs are critical to the viability of using green waste as part of the feedstock for growing media products. Waller's (2003) report illustrates that green waste producers would need to be situated very close to the growing media manufacturers to make green waste compost a viable replacement for peat or other peat alternatives. At present in the UK many of the growing media manufacturers are located close to peat-producing areas. Green waste compost production however, is typically located close to centres of population, for obvious reasons, but not close to growing media manufacturers. In order for green waste compost to become a practical replacement for peat it would be necessary for the growing media manufacturers to be located close to a large centre of population.

Growing media manufacturers however, are unlikely to want to rely on a large number of small producers. They will generally require contracts with one or two large suppliers with the capacity and systems to produce consistent, high quality product throughout the year and with such a scale that costs are minimised. So, a large number of individual compost producers is probably not the best solution. "*It is unlikely that a proliferation of small green compost producers will meet the needs of the growing media manufacturing industry*" (Waller, 2003). Consequently, Wales needs to develop close collaboration between a large compost producer and a growing media manufacturer, which given the current sporadic locations of compost producers may present itself as a potential obstacle.

Another problem associated with the supply of a reliable product is the issue of communication. Communication between the main actors needs to be improved, which is an onerous task due to the constraints of the current logistical infrastructure in Wales. The success of a composting network will depend largely upon the ability of the operators of each composting site to liaise with each other (and with contractors) directly or via a coordinating body. The compost producers in Wales need to instil a level of confidence that they will be able to provide

sufficient quantities and quality of material at specified times and locations. Currently, many of the waste management operations in North Wales work in conjunction with companies based in North West England. Similarly, in South Wales, the major transport links are with centres along the M4 corridor in the South of England which provide easier points of transfer. If the long-term aim of the Welsh Assembly Government is to produce a good quality green waste compost of the same standard across Wales, localised investments may provide a more practical and economical solution to transferring large volumes of material across the UK. Enticement of a growing media manufacturer to Wales would require its location close to a large centre of population, and therefore compost production, in South Wales.

Prior to any thoughts of growing media manufacturers relocating to Wales a number of technical criteria will need to be met as the growing media producers will need to be assured of quality and standards. At present, the majority of compost producers in Wales are not in a position to offer a sufficient quantity of product of a recognised certified standard. Crucial to the adoption of green waste compost as a practicable peat-substitute is the establishment of an industry wide standard. "*The most widely used criterion for selecting greener products is manufacturer's or supplier's assurance of a product's environmental credentials*" (Warner and Ryall, 2001). The British Standards Institute PAS 100 introduced in October 2002, is at present the only national certification process available specifically for composted waste materials. The introduction of the standard has managed to achieve a marked significance in the recognition of green waste compost as a product. The introduction of this standard however, will not guarantee the success of the product, particularly as the role of technical specifications and standards are still evolving.

7.2.1 Addressing the Supply Barriers through the Wales Compost Network

Composting as a process is relatively simple and can be undertaken with relative ease, however, making the product a viable business alternative to peat and peat-alternatives is not straightforward. In an ideal situation all the compost production

in Wales would occur in a central location, close to good transport links and suppliers of growing media (Waller, 2003). Unfortunately, this is not the case and in reality there are a large number of compost producers in a number of different locations throughout the country, as shown in Figure 7.1 (details of these compost operations can be found in Appendix D). In addition, the composting process is not standardised throughout the country in terms of technical specifications and levels of output and therefore it is difficult to construct an accurate estimate of compost available for supply.

Given all these impediments, the challenge is to create a network of compost producers who can efficiently and consistently supply demand irrespective of their location and method of production. The initial task in creating a network is to collate data on all the active compost producers in Wales, estimate their annual production and whether these volumes can be submitted towards the Welsh recycling/composting targets. If the feed stocks have not been source segregated then they are not permitted to be included in the targets set by the Welsh Assembly Government. Despite there being a large number of compost producers registered with the Environment Agency, many of these operations are not consistently producing compost and any produced will generally be for personal use. As a result and to improve efficiency a Wales Compost Network has been formed, which intends to focus on three regional facilities across Wales with the aim of promoting the compost produced as a commercial product.

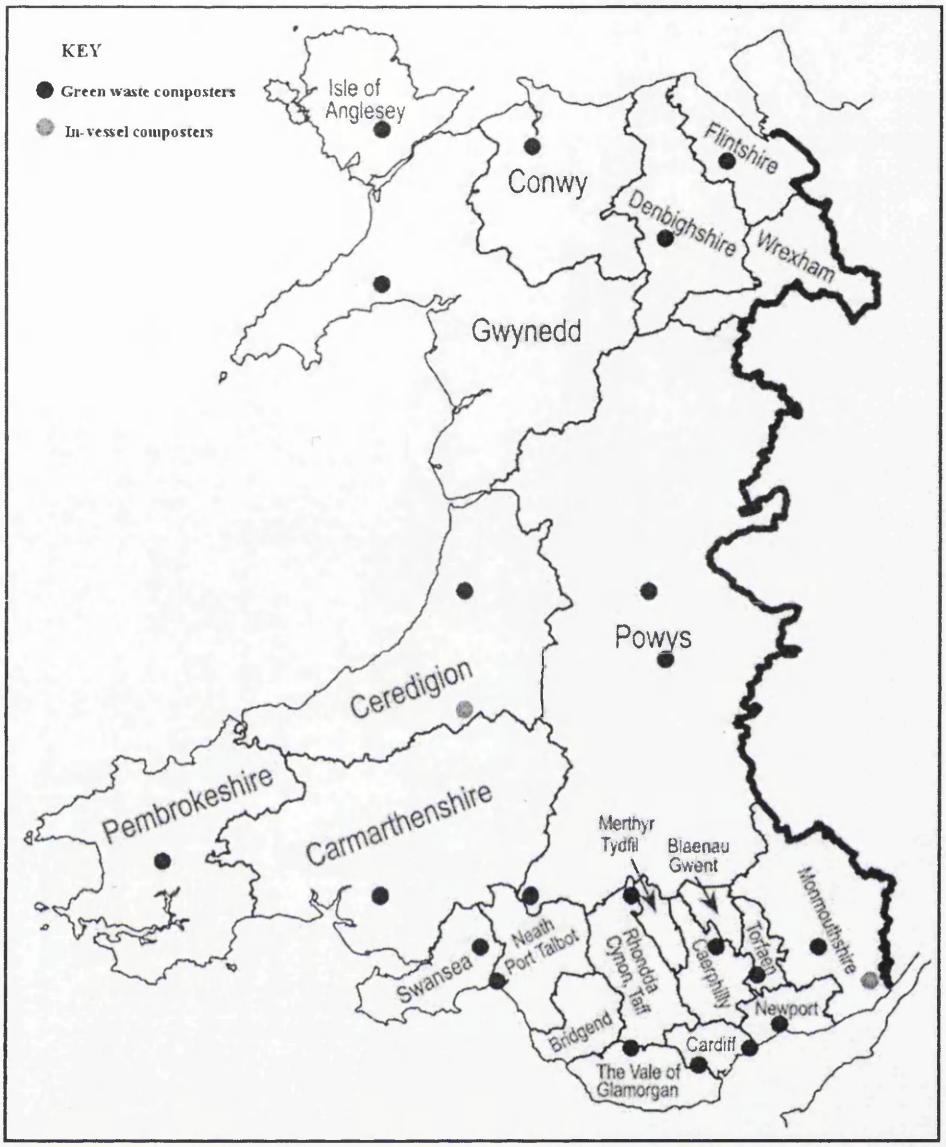


Figure 7.1 Map to show current composting operations in Wales

The three regional facilities will also provide opportunities for research and development of a number of composting processes, to include the traditional outdoor windrows, in-vessel composting plants to accommodate kitchen waste and possibly a vermi-composting site. Each of the proposed sites will have individual research objectives and potentially aim to produce a material with specifications aimed at one particular sector. The three operations will represent all the areas of greatest population, with one facility proposed in North Wales, one in South East Wales and one in South West Wales. The conditions of the funding will require that all three facilities be run as educational demonstration sites which will look to provide examples of best practice compost production and help to meet the targets

set by the Landfill Directive whilst providing a viable business alternative to landfill.

It is intended that the facility in North Wales will concentrate on the development of an in-vessel composting plant which will be designed to compost a range of food wastes including kitchen wastes collected from households. At present the majority of composting facilities in Wales are outdoor windrow tunnels and therefore exclude all kitchen and catering waste due to the constraints of the Animal By-Products Regulation (ABPR). Kitchen and catering waste currently accounts for approx 8% of waste in Wales (Welsh Assembly Government, 2002) and an in-door facility will allow compost producers to reach the required temperatures and control the release of any possible harmful spores as stipulated within the ABPR. It is intended that the research element of the development will be undertaken by the University of Wales Bangor, with a specific interest in the use of compost as an application for the agriculture sector. The predicted tonnage for the facility is approximately 10,000 tonnes per annum and it is hoped that composting will begin in 2006.

The South East Wales facility, currently under construction, will also involve the construction of an in-vessel facility for composting food wastes, to include kitchen waste collected from households as part of a partnership between local authorities in the South East region. Compost systems based on tunnel technology are likely to be constructed, providing an estimated 20,000 tonnes per annum capacity. In conjunction, a research and development study by University of Wales Aberystwyth and IGER (Institute of Grassland and Environmental Research) will investigate the use of the derived compost as suitable material for landscape and land restoration applications.

It is proposed that the third facility will be based in Swansea, in South West Wales, with the intention of providing the option of upgrading locally produced composts to such a specification as to provide a product suitable for the growing media market. It is intended that the polishing and blending plant will also include the facility to bag the final product and will have the capacity to produce up to 40,000

tonnes of product per annum. The facility will be constructed as part of a three year research and development initiative which will develop blending and media formulation and conduct growing trials. Contributions from both this study and one running parallel with Cardiff University will report on research into the potential outlets for compost as a peat-free additive in the growing media market, and possibly develop a vermi- composting operation. It is hoped that building work of the facility will commence in 2006.

7.2.2 Analysis of the Role of the Wales Compost Network

This section will analyse the role of the Wales Compost Network, as a potential solution to the supply side problems associated with green waste compost in Wales. The establishment of a Wales Compost Network with a focus on three regional facilities will enable each centre to specialise in producing a product specific to the needs of the target market, whether that is the agriculture, landscape or retail sector. The results of the survey presented in Chapter 6 indicated that the demands of each sector will vary in terms of volumes required per delivery, measure of the screen size, method of product delivery, whether in bulk form or in bags. Peak demand periods throughout the year will also vary from sector to sector. Having each demonstration plant specialise in production for one sector will allow economies of scale to be achieved by producing large amounts of the same product. A central bagging plant is also important as the bagging process will require a substantial investment in terms of machinery costs and it would not be economical to invest in machinery for more than one facility.

The development of a composting network in Wales has in the past been delayed by a number of setbacks and obstructions. The timescales for application and subsequent award of funding can be a particularly lengthy process. However, despite securing funding there remain a number of potential barriers to operating a successful composting network in Wales.

Keeping transportation costs to a minimum is crucial to the economic viability of producing compost as a commercial investment. Having three separate plants across Wales could result in additional transportation costs if feedstocks from one part of the country are required at a particular plant situated in another part of the country. In addition, based on the information gathered during this study, the current demand from the agriculture and horticulture or retail sector may not be immediately sufficient to absorb all the compost being produced in each of the facilities specialising in production of material specific to each of these sectors.

By only producing one type of compost for a specific end user the market may prove to be restrictive in terms of level of demand. The in-depth interviews and larger scale survey concluded that the landscape contractors provide the most readily available demand, as current demand for green waste compost in the retail and horticulture sectors is still relatively low. This is partly due to the very recent development of the quality control mechanism provided by the certified standard for green waste compost and a general reluctance to use a peat-substitute which is not traditionally seen by growers as a consistent product. This factor is particularly relevant in relation to the promotion of food waste derived compost which may cause added concerns among the retail and agricultural market.

Part of the success of appealing to a growing media market will eventually depend upon securing a contract with one of the larger retail outlets as they constitute a significant proportion of the retail industry (Office of the Deputy Prime Minister, 2001). The polishing and blending plant in South West Wales will effectively act as a growing media manufacturer. So, rather than enticing an established business to relocate to South Wales the South West plant would be filling this role itself. It would then need to displace the established brands from their current contracts with local retail outlets. As the main supplier to a large retail chain the South West plant would need to be able to guarantee high demand levels and this would more likely be achieved with a central polishing and blending plant. However, a large retailer may require the product to be centrally blended and then bagged with its own brand, which may in turn reduce the expected returns of even the highest quality compost.

The expected research and development time of the three regional facilities is approximately three years beginning with commencement of building work, which for both the NW and SW plants will not be until 2006 at the earliest. Until the time at which these facilities are fully functional there will still be requirements to meet the Welsh Assembly Government's landfill diversion targets.

7.3 Demand Side Barriers

The Wales Compost Network will primarily address issues associated with the supply of a good quality product, but efforts will also need to be made to encourage its demand. Emphasis on the product's sustainable quality may not necessarily be a strong enough reason to persuade consumers to purchase the product, Russel (1998) has suggested that eco-labelling schemes have had little effect on consumer behaviour except in countries where consumers are strongly environmentally motivated and more importantly there is no evidence that companies would take them into account in their purchasing decisions. One significant point and potential barrier to the market that was highlighted during the in-depth interviews and re-enforced by the empirical study was the reluctance of contractors to use a product unless specified by the consultant or policy makers. In response to enquiries about using green waste compost the contractors pointed out that unless it appears directly in the specification documents then it is unlikely that there will be an increase in demand for the product (Dawson and Probert, 2004a). Unless the product is much cheaper than its industrially produced competitors, the contractors will only be influenced by specifications. Consequently, action is needed in this area.

Rather than relying on environmental rules and regulations, studies have suggested that integrating environmental considerations into purchasing policies could be a more effective means of achieving long term reductions of environmental impacts (Warner and Ryall, 2001). There are a number of potential consumer groups to target to encourage sustainable purchasing including, individual consumers, private sector corporations and public sector purchasing. One study has investigated the use of environmental supply chain management where firms integrate

environmental issues into supply chain decisions without having to suffer a trade-off between being environmentally friendly and profitable (Handfield *et al,* 2005). Although the study was based upon research conducted within the private sector the same principles can be transferred to the public sector. Although pressure from the ordinary consumer can have influence on the purchasing decisions of a company, Russel (1998) recognised the corporate buyers, particularly within the public sector, as being able to go some way to expediting sustainable procurement practices. With a combined public spending power of approximately £4 billion (Welsh Assembly Government, 2004b) the public bodies within Wales could potentially represent a large market segment, more so than local private initiatives.

Perhaps the most logical step in an attempt to encourage the adoption of green waste compost as a suitable alternative to peat or other peat-alternatives is to incorporate its use within central government and local authority initiatives. Warner and Ryall's (2001) study on local authority green procurement in the UK highlighted that the most important stage in the selection of greener services is contract specification, and this was also reflected in the interviews conducted with the landscape contractors in Wales, for whom a substantial percentage of jobs would originate from either local authority or government funded organisations. The total expenditure of local and central government on services and contracts far surpasses any individual private contract and therefore represents a substantial and accessible portion of the market.

Although the use of a sustainable recycled material in place of using virgin materials seems logical, the transfer of this knowledge into working practices is often the greatest challenge. Changing any type of purchasing policy, particularly in the public sector can be an arduous task sometimes resulting in increased costs. The need to implement these changes into purchasing decisions must therefore be instilled into those responsible for direct purchasing.

The role of sustainable procurement could potentially have a significant impact on the success of the National Waste Strategy for Wales and subsequently meeting the Landfill Directive targets. Achieving the recycling and composting rates only goes

half way to meeting the targets as it is still necessary to divert the materials from landfill. The most effective way to do this is to find suitable outlets and ultimately obtain revenue from the materials. In this context, the next sections will first introduce the idea of sustainable procurement, and then discuss its specific role in the take up of compost produced from waste.

7.4 Sustainable Procurement

Green procurement, "*encompasses all activities that aim to integrate environmental considerations into the purchasing process, from the identification of the need, through the selection of an alternative, to the provision of the end user*" (Coggburn, 2004).

Sustainable procurement has a broader meaning, and can be defined as, "*Giving due consideration to the impact of the procurement on the environment, on the community and on the social conditions of those delivering or receiving the product or service*" (Welsh Assembly Government, 2004b)

Traditionally products and services would be selected based on the best economic value and highest efficiency. Sustainable procurement widens the parameters of the decision making process to include a life cycle analysis which does not focus solely on economic indicators but also those of society and the environment as whole. By incorporating this type of life cycle analysis into public procurement policies government and local authorities can have a significant impact on contractors and service providers who will strive to achieve these environmental standards in order to secure tenders.

7.4.1 Sustainable Procurement in the International Community

Green purchasing has been implemented throughout the international community with varying rates of inclusion and success. Current public policy on sustainable

procurement can be observed and evaluated within a number of countries, although these tend all to be part of economically developed nations, rather than newly industrialised countries. Some examples of sustainable procurement initiatives can be seen in Japan, Australia and the US.

In October 2004 Japan hosted the First International Conference on Green Purchasing and formally launched the International Green Purchasing Network with the aim of helping to increase communication and collaboration between environmental purchasing policy makers. Japan itself has been pioneering the development of their own Green Purchasing Network which was founded in 1996 and now boasts almost 3000 member institutions (Case, 2004b). The network has also been instrumental in the facilitation of the 2001 Law on Promoting Green Purchasing which requires public purchasers to implement green purchasing activities.

In a similar effort the Australian government introduced the ECO-Buy program in 2004. The scheme was piloted in the state of Victoria and due to its success in attracting the support of local governments and at expanding purchases of recycled and sustainable products the program was launched across Australia and New Zealand. The scheme has, over a period of two years increased green purchasing expenditures by $27.6 ($21.4 USD) million (Case, 2004b).

The US Federal Government is the single largest consumer of goods and services in the US and likely the world, (Bergeson, 2002) and therefore has the potential to have a significant impact on green procurement. The US Environmental Protection Agency (EPA) is responsible for issuing and enforcing procurement policies and these come under four separate headings; the recycled content products program, energy efficient products program, Environmentally Preferable Purchasing (EPP) program, and Biobased Products program. The EPP program is probably most relevant to greener purchasing as it designates products that are environmentally preferred, based on a number of attributes. The comparison of products is performed using various software tools, comparing the environmental and economic costs of a number of competing generic products within a similar category. Despite

the growing awareness of the necessity for sustainable purchasing the programs currently operating are still in the early stages of development. To have any substantial impact on the procurement process these schemes will need to be adopted across each state.

7.4.2 Sustainable procurement in the European Union

Closer to home, UK government decision making is becoming increasingly influenced by EU thinking, and this extends to public procurement policy, with reference to sustainable purchasing. The EU has recognised the cumulative spending power of the Member States' public authorities and their potential contribution to sustainable development by promoting green procurement and subsequently influencing the market place. This influence however will have varying levels of impact on EU Member States depending on the current procurement policy within each country. In order to try and align procurement policies throughout the Member States without issuing directives the European Commission has produced a green handbook, Buying Green, to provide clear guidance on how member states can incorporate environmental considerations into their purchasing decisions (European Commission, 2004b). The development of the handbook results from a culmination of developments throughout European Union history outlined in the political timeline:

- **1997** – Sustainable development officially recognised as overarching goal of the EU
- **2001** – EU sustainable development strategy at the Gothenburg European Council[1] – aim to promote economic growth and social cohesion while paying due regard to environmental protection
- **2002** – Sixth Environmental Action Programme[2] – setting out the EU roadmap for the next 10 years and identifying four priority areas where

[1] COM(2001) 264 final
[2] Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the sixth Community environment action programme (O J L 242, 10.9.2002)

action is urgently needed: climate change, nature and biodiversity, resource management, and environment and health

- **2002** – Johannesburg – World Summit on Sustainable Development – green public procurement is specifically mentioned – encourages 'relevant authorities at all levels to take sustainable development considerations into account in decision-making'
- **2004** – Public Procurement Directives[3] adopted on 31 March consolidate and complement the legal context

Buying Green, the handbook which has resulted from these developments contains six chapters detailing green purchasing strategies, organising public procurement, defining the requirements of the contract, selecting suppliers, service providers or contractors, awarding the contract and contract performance contracts. These sections include:

Green Purchasing Strategies

- Provides a step-by-step approach to selecting products and services where greener alternatives are available, particularly those products that have a high environmental impact.

Organising Public Procurement

- Public authorities need to prioritise 'best value for money' rather than only selecting the cheapest offer
- Need to act within the parameters set by public procurement directives and national legislation.

Defining the requirements of the contract

- The requirements of the contract will involve drawing up technical specifications that describe the contract, including the standards required,

[3] Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (hereinafter: Directive 2004/18/EC) and Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services (hereinafter: Directive 2004/17/EC)

and provide scope for potential bidders to submit green variants to the traditional brown equivalents.

- The purchasing authority has the right to insist that the product be made from a specified material or the percentage content recycled, however, they cannot stipulate tenderers to be registered under a certain eco-label scheme.
- Eco-labels are developed purely to communicate information on the environmental credentials of a product.

Selecting suppliers, service providers or contractors

- It is not allowed to set requirements that potential bidders comply with any particular environmental management system.
- However, companies who provide proof of compliance with environmental management systems such as EMAS will be regarded as better equipped regarding green considerations.
- It is possible to exclude those companies that have acted against environmental legislation.

Awarding the contract

- It is possible to apply environmental award criteria, provided those criteria:
- Are linked to the subject matter of the contract;
- Do not confer unrestricted freedom of choice on the contracting authority;
- Are expressly mentioned in the contract notice and tender documents and comply with the fundamental principles of EU law.

Contract performance clauses

- The contract performance clauses are used to specify how a contract must be carried out.
- They can be used to include environmental considerations such as the way the goods are to be supplied and even methods of transport, provided that the clauses are published in the contract notice or comply with Community[4] law.

[4] Article 26 of Directive 2004/18/EC and Article 38 of Directive 2004/17/EC

The benefit of producing a handbook such as this is that it can be used within a broad range of organisations and manages to cover all main aspects of purchasing policy and hopefully act as a beneficial reference point for procurement officials attempting to integrate sustainability. The usefulness of the guide as a procurement tool however is dependent on the number of purchasers that are aware of its existence and the level of encouragement placed upon them to use it.

7.5 Sustainable Procurement Policy in Wales

In Wales, approximately £4 billion is spent on public goods and services each year (Welsh Assembly Government, 2004b) which means that cumulatively public bodies are the largest specifiers of goods and services in the country and have the potential to have considerable influence on contractors. The implementation of a successful sustainable procurement policy in Wales will continue to increase in importance as factors such as the landfill tax take more effect. During 2005/6 without an overall reduction in waste and increased recycling, Wales will be required to pay £27 million in landfill tax, with these figures rising to £52 million over time (Welsh Assembly Government, 2004b). Sustainable procurement may have a role in increasing recycling by providing the government with a credible solution to the development of markets for recyclate. In response to the targets set by the Welsh Assembly Government in their Wise about Waste document (Welsh Assembly Government, 2002) a substantial amount of investment has been conducted into the development of markets for recycled products. If local authorities can successfully implement sustainable procurement policies it could alter their purchasing behaviour and their selection criteria for contractors, therefore providing a market for recycled materials whilst also influencing the commercial sectors. Local government must be seen to champion the adoption of sustainable procurement if there is to be any hope of transferring these policies to the private sector.

7.5.1 Sustainable Development Policy in Wales

Wales is unusual among EU nations, as the Welsh Assembly Government has a statutory duty to promote sustainable development and it is required to produce a scheme indicating how that duty will be implemented. The Assembly has a vision of a sustainable Wales, set out in its sustainable development scheme 'Learning to Live Differently'. This scheme was up-dated and re-issued in March 2004, entitled 'Starting to Live Differently', and a Sustainable Development Action Plan followed shortly afterwards (Welsh Assembly Government, 2004c). As part of this Action Plan, the Welsh Assembly has listed its top ten priorities which will enable Wales to achieve the goals specified. These top ten commitments are:

1) By 2010 100% of electricity used in all Assembly buildings will be supplied from renewable sources or good quality embedded generation; and will work towards a similar figure for other public sector buildings
2) The Assembly Government, its agencies and the NHS in Wales will report annually on the use of energy in its estates
3) From January 2005 will specify in all contracts for new or refurbished public buildings procured by or for Welsh Assembly Government that the design achieves as a minimum, the BREEAM 'very good' standard or equivalent and the 'excellent' standard wherever possible.
4) By 2006 to have established pilot projects that explore the potential of using renewable energy solutions in public policies and programmes aimed at tackling fuel poverty amongst low income vulnerable households.
5) The Assembly and its agencies will encourage the development of an indigenous microgeneration 'renewables' industry in Wales, with a particular focus on SMEs, WDA, Carbon Trust and EST, and where appropriate, other renewables focused organisations.
6) Commission a project to investigate the benefits and barriers to promoting the uptake of alternative fuels in Wales, such as biofuels, biogas, natural gas and hydrogen

7) Work with Local Authorities and school governing bodies so that, as they come up for renewal, all specifications for contracts for school meals address issues of health and nutrition and food seasonality
8) Introduce a targeted top tier agri-environment scheme to encourage cooperative action, bringing about wider environmental benefits in the countryside across farm boundaries
9) Produce a Wales-wide strategy for Education for Sustainable Development and Global Citizenship by Spring 2005
10) By Spring 2005 introduce the ECOHomes environmental assessment process and set energy efficiency standards significantly above that currently required by building regulations for all new homes built in Wales by Registered Social Landlords using Social Housing Grant

A number of the commitments outlined above specifically relate to sustainable procurement. However, with the exception of number three, design of public buildings, and number seven, the school meals initiative, those commitments relating to procurement seem to concentrate specifically on renewable or sustainable sources of energy. Energy usage is classed as having a particularly high impact on the earth's resources and is considered a top priority in the development of sustainable procurement. While attempts to reduce energy usage is commendable and necessary as part of a sustainable procurement initiative there is no specific mention within the top ten commitments of how to tackle waste and promote market development of recyclate.

Waste has been recognised as one of the key issues requiring immediate action in Wales. Unfortunately, this recent publication by the Welsh Assembly Government seems to have omitted the increasing need for a reduction in the levels of waste produced. The initiative focuses upon inputs having an effect on the environment but not on the outputs such as waste, which is a problem that is continuing to grow.

7.5.2 Welsh Procurement Initiative

Despite these limitations in the sustainable development policy commitments, there is at least a mechanism for implementing sustainable procurement in Wales, the Welsh Procurement Initiative (WPI). The Welsh Procurement Initiative was established in 2002 to improve the value for money obtained through procurement, and support the delivery of public services, while benefiting the Welsh economy, its environment and its communities. WPI has outlined a number of actions which are considered necessary within the scope of sustainability in the public sector (Welsh Assembly Government, 2004b):

- Senior management commitment to sustainable development, particularly requiring a champion of sustainable development within policy decision boards
- Recognising the need for change management as an integral part of each organisations corporate policy, particularly at the specification stage
- Integrate sustainable development into decision making processes
- Changing processes and procedures to reflect sustainable development policy
- Apply sustainable development into each stage of the procurement cycle
- Use sustainable development risk assessment to identify priority areas which have a high positive or negative impact
- Set realistic action plans, focusing on both process and policy change, and the review of specific high risk goods and services
- Walk the talk, a review of procurement should go alongside a review of internal policies
- Invest in a strong procurement function, resources should be reviewed to ensure that there are robust processes to monitor contract compliance and manage supply chains to ensure that the desired outcomes are actually achieved
- Invest in external management systems, cannot effectively manage external resources without information

In an attempt to achieve some of the goals and objectives outlined within the guidance documents, one of WPI's first steps is to enlist those organisations that have in the past shown an interest in making their procurement more sustainable. The Welsh Procurement Initiative has devised a Procurement Programme which involves encouraging these organisations to:

- Setting up a cross functional team to address Sustainable Procurement
- Completing the WPI Sustainable Procurement Self Assessment Tool and providing WPI with results
- Reviewing the available guidance
- Attending the WPI programme of training and development events
- Creating and following a twelve-month action plan based on the WPI guidance, and
- Sharing the plans and resulting activities with WPI and the wider public sector in Wales

Owing to its early stages of development, the goals outlined by WPI concentrate on establishing the initial links within the wider public sector rather than a detailed list of specific targets. The project was initially co-ordinated with an informal consultation process with all major sectors involved and the feedback from the process has been used to clarify the specific areas in need of support. WPI will effectively look to bridge the gap between public policy at the government level and implementation within each individual organisation.

7.6 Barriers to the Adoption of Sustainable Procurement

Public and private sector organisations regularly encounter a number of obstacles when trying to implement a sustainable purchasing policy, but despite the increasing awareness of the need to move towards a more sustainable procurement policy, it is the public sector which is often reported as lagging behind private sector companies. Often within the private sector companies will actively encourage the adoption of strict environmental self-regulation as a precautionary

measure (Handfield *et al*, 2005). The private sector will in many ways have the edge over the public sector in terms of stronger corporate leadership on sustainability, which can sometimes be overlooked in the public sector due to budget pressures and the need for short term decision making. While government realise their importance in providing a link within the recycling chain, and actively encourage sustainable procurement on a national level, it is the implementation of these policies at the decision-making unit which is often deficient. Pento (1998) suggests a number of reasons for this;

- the decision making unit may consist of one person or a number of people,
- the functionality of green products may be a concern i.e. lower performance or a perceived lower performance, the decision making unit may not wish to be criticised for a poor purchase and,
- the decision making unit may also perceive the principles of a green procurement programme as an encroachment on their purchasing authority.

The methods used to inform staff of how to implement sustainable purchasing policies may have also led to a reduced success rate for greener purchasing. In their study on green purchasing activities within local authorities in the UK, Warner and Ryall (2001) state that the most widely used strategy for informing staff of a purchasing policy was a green purchasing guide. The EU green handbook could be used effectively as a basis for local government purchasing guides and should ensure that EU guidelines are being adhered. However, Warner and Ryall's study indicated that in the absence of training green purchasing guides were relatively ineffective as they presented no opportunity for questions to be answered or further information to be provided. The experience of the Welsh Procurement Initiative supports this view. As a result of the consultation process WPI were able to identify a number of barriers to progress. Initial indications suggest that the main areas of development should include a focus on improving communication and providing access to external support rather than the preparation of guidance documents.

7.7 Sustainable Procurement and the Welsh Composting Industry

Despite a positive reaction from the Welsh Assembly Government regarding the introduction of the Landfill Directive, in the form of the National Waste Strategy for Wales, and subsequent increases in recycling among local authorities, finding markets for recyclate remains a prominent issue. The public sector has been identified as a significant potential market sector for green waste compost and sustainable procurement has been established as an approach which could deliver significant environmental outcomes. Sustainable development and sustainable procurement policies are supported by public bodies in Wales, but the evidence of this research project suggests that barriers still remain to prevent the procurement of compost produced from biodegradable waste. Consequently a further series of interviews was conducted with purchase officers and specifiers from within public bodies in Wales, with the intention of following up the results of the earlier empirical study. These follow up interviews were conducted during the first half of 2005. The intention of the research was to try and pinpoint specific barriers to the specification of recycled products within procurement policy, where those policies were available.

One particular organisation approached was the Welsh Development Agency (WDA). The WDA has been highlighted previously in this study as a potential purchaser of green waste compost and a representative from the Agency had been interviewed during 2003 as part of the earlier qualitative element of the study. That interview was reported in Chapter 5. Since the initial interview there have been a number of developments both in terms of sustainable policies produced within the Agency and also progress within the composting industry in Wales.

The WDA is a body sponsored by the Welsh Assembly Government with the primary aim of helping to create and develop businesses in Wales. Many of the projects undertaken by the WDA will reflect a type of PFI contract. Private investment is often crucial for any development project to take off and be successful, whether that investment takes the form of cash, land or services. The

WDA must assess the overall advantages of a proposed project, to include social and political effects as well as economic.

In order to fulfil the environmental aspects of their remit the WDA have recently published a document titled *'Creating Sustainable Places'* (Welsh Development Agency, 2005) devised using the Welsh Assembly Government *'Working Differently'* document as a template, to encourage the adoption of sustainable development. The aim of the initiative is to advise all future partnerships of the importance of creating a sustainable environment in all new developments.

The results of the empirical study reported in Chapters 5 and 6 indicated that although there seem to be a number of such documents produced dedicated to the development of sustainable practices in Wales, there seems to be a void between the publishing of guidance documents and their incorporation into purchasing practices. The purpose of the subsequent interviews, conducted in 2005, was to try and uncover what is preventing sustainable procurement from being integrated into public purchasing practice, with particular reference to the purchase of green waste compost where possible.

The follow up interviews highlighted four main areas which could be attributed to the slow adoption of sustainable procurement practices:

- The influence of external partners on the ability to incorporate sustainable procurement
- Conflict between sustainable and economic purchasing decisions
- Inadequate dissemination of information regarding current price, quality and availability of recycled products
- Requirement for training and guidance on how to effectively integrate sustainable purchasing into current procurement policy

Across many public bodies in Wales there is an increasing reliance on collaboration between institutions and private sector investment. The WDA in particular relies heavily on private sector investment as part of its business development programme

and therefore would prefer at this time to slowly usher the partners to look to provide development solutions that benefit Wales on social, economic and environmental levels rather than try to enforce these ideas through specification documents. When asked why the new *'Creating Sustainable Places'* document did not include specific goals or targets it was suggested that by specifying only sustainable materials this may cause potential investors to be reluctant to accept strict purchasing terms. As explained previously, each development can involve a number of partners of varying levels of investment and therefore it is necessary to construct individual specification documents unique to each project.

For many public bodies across Wales procurement is often linked through a form of collaboration that enables them to take advantage of economies of scale. Therefore many purchasing decisions are not just made on an institutional level but sometimes on a regional or national level. In these situations quite often the purchasing decisions will not rest with an individual purchasing officer but will require agreement from all those in the consortium, which could possibly have an adverse effect when trying to factor in sustainability into the decision making process.

Crucial to all public procurement policies is the issue of cost. Unfortunately purchasing officers report that there is often a cost disadvantage associated with the procurement of sustainable alternatives, and this has previously deterred public bodies from setting specific goals and targets. For example, the WDA felt that at the time of publishing *'Creating Sustainable Places'* it was unrealistic to include specific environmental sustainability targets as they might fail to achieve them, and with the added complication of partnerships with the private sector it is difficult to impose strict guidelines on sustainable procurement. Practical constraints can also occur when attempting to satisfy current procurement procedures. The majority of public procurement guidelines will simply specify that purchase decisions should try and achieve "best value for money" which usually translates to purchasing goods and services that are of an appropriate quality in respect to the specific function required of the product/service and are also environmentally sustainable. Combining these two criteria can often be difficult and one example of this is where purchasing regulations state a preference for products to be sourced locally to

reduce the environmental effects of transport, however in order to achieve the best purchase price this requires being part of a central purchasing collaboration, which will inevitably involve sourcing from further away. Trade-offs such as these are presented to purchasing officers on a regular basis, with the ultimate decision criteria dependent upon the price.

The dissemination of information regarding the developments in recycled materials has improved considerably over the last few years, particularly with the development of bodies such as WRAP and more locally the Wales Environment Trust and the Welsh Procurement Initiative. However, despite these efforts quite often it is the producers of materials who are becoming more knowledgeable rather than the purchasers. A great amount of time and effort has been invested since the introduction of the Landfill Directive to improve the quality of recycling processes and subsequently the quality of the final product. On many levels this investment has paid off as the quality of recycled materials in Wales has increased significantly, particularly in the area of green waste and compost. Unfortunately, this message has not been transferred effectively amongst the key market sectors for the materials, in the case of green waste compost, the landscape specifiers. Even within organisations such as the WDA which would be expected to receive much of the latest information concerning recycled materials developments, the interviews indicated that the relevant personnel were still slightly concerned with the perceived lack of confidence in the market surrounding the quality of recycled products and how this might appear to potential investors. This highlights a greater need for improved dissemination of information regarding the developments in recycling in Wales, with a particular focus upon departments ultimately responsible for purchasing decisions within both public and private sector.

Unfortunately, not all recycling processes are without problems and one of the purchasing officers interviewed did raise concerns with the quality of one of the recycled products purchased within the department. Although the product was in fact cheaper than the virgin alternative, both the quality of the product and its life-span was not comparable to that of the virgin product. Problems such as these may simply require minor changes to the manufacturing and quality testing procedure.

Possibly a greater challenge to the manufacturer in light of such problems will be to regain consumer confidence with their products as many purchasers may be unwilling to try a recycled product in the future. In circumstances such as these feedback to the producer is essential in order to retain customers and allow them to try and regain consumer confidence.

The final hurdle that was identified through the interviews was a definite need for training for specifiers and purchasing officers possibly wishing to include sustainability into specifications but unsure of how to do it. Generic guidance, such as that provided by the EU's green handbook, would be unable to provide the level of practical detail required in such an instance. Following the interview with the WDA the representatives present expressed an interest in incorporating PAS 100 certified green waste compost but were unsure of the best way to proceed. Areas of concern included the way in which the PAS 100 certification was monitored and the extent to which the accreditation had been gained amongst compost producers in Wales. As with any procurement decisions the WDA wanted to be sure that by incorporating PAS 100 into the specification documents they were not inadvertently placing restrictions on the potential suppliers wanting to bid for tender. Information relating to these issues will need to be readily available to specifiers if materials such as green waste compost are to be considered as a potential product on a national level.

Promoting sustainable procurement at an institutional level may also require adjustment in order to achieve a more balanced and informed choice. At present the purchasing or decision-making-unit of a department may be held by a junior member of staff who may not have the purchasing knowledge required to accurately assess the product deemed as 'best value for money' and therefore may instead opt for the cheapest product.

7.8 Taking Action to Close the Sustainability Loop

This chapter has discussed both supply and demand side barriers to the development and promotion of green waste compost in Wales. A number of conclusions can be reached from this discussion, and actions can be recommended to close the sustainability loop.

If the potential barriers to the supply of green waste compost as a growing media product, both within the landscaping and retail sector, can be overcome by the Wales Compost Network and the facilities outlined earlier, then it should be possible to supply the country with sufficient quantities of good quality product. If this product was specified for use by public bodies in Wales they would close the recycling loop by purchasing and using compost produced from Welsh municipal waste collections. Market development would thus be facilitated through effective public procurement policies and practices. The success of the initiatives would also largely depend on effective communication between the Compost Network and the Welsh Procurement Initiative to ensure the transfer of correct information from producer to end user. Figure 7.2 illustrates the independent roles of each organisation and how they could complement each other in this instance to achieve a number of common goals.

In theory, the integration of sustainable or green procurement into public purchasing policies and procedures appears to be relatively straightforward. In practice however, the employment of sustainable procurement policy does not appear to extend much past the policy making stage, as currently the policies are not being translated into action on the ground. Reports conducted on current sustainable procurement efforts show that although there has been progress in creating awareness with top level management, this has not been communicated effectively to those in charge of implementing policy on a day to day basis. Although Welsh Assembly Government policy is to advocate the use of sustainable materials and processes wherever possible, problems are often encountered during the tendering and specification process. A lack of communication between policy makers and those responsible for implementing the services often results in tender documents

reverting to a traditional format, with price having the greatest impact upon the final decision.

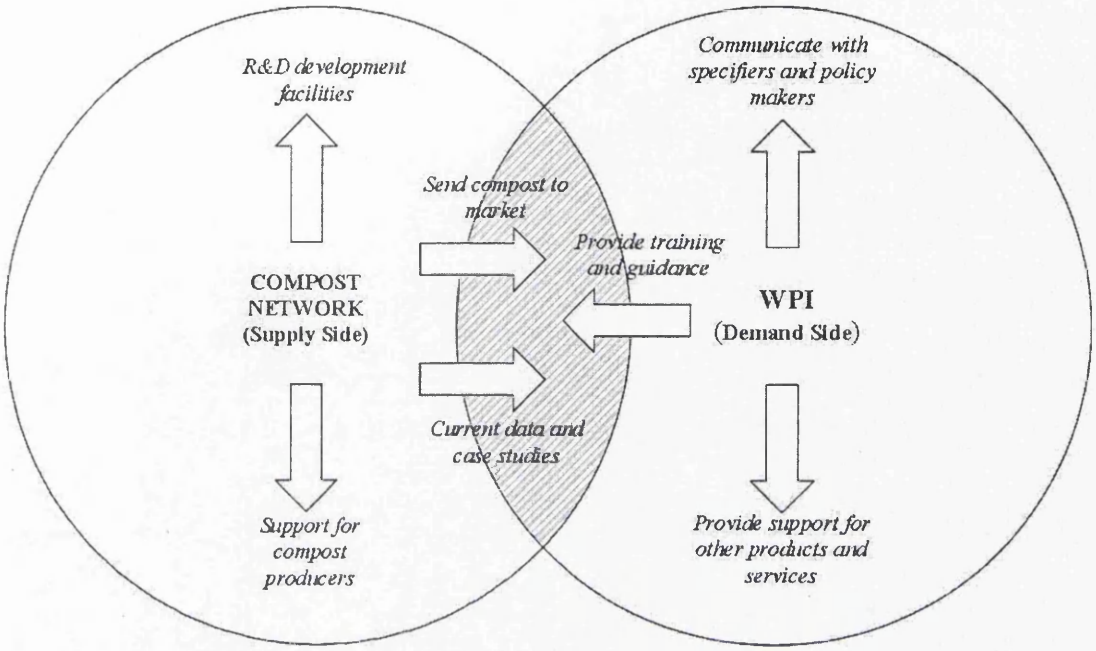


Figure 7.2 Independent and inter-dependent roles of the two Welsh sustainability initiatives.

Fully integrating green procurement into public purchasing policy may require approaching the task from an administrative angle, rather than from a purely environmental standpoint. In his article 'Achieving Managerial Values through Green Procurement' Coggburn (2004) considers green procurement from an administrative perspective and discusses whether it is possible for green products to satisfy performance and economic criteria as well as sustainability.

Coggburn identifies the managerial values which are most prominent when assessing public administration policy: effectiveness, efficiency and economy. The ultimate purpose within the managerial values is to "obtain the most appropriate and highest quality good or service possible for the least cost" (Coggburn, 2004). Previously, the most common approach to incorporating environmental consideration into the supply and demand procedures has been to use environmental regulation. Government regulation of any public function will inevitably incur a

substantial cost and is not always the most efficient or effective way to achieve environmental objectives. Green procurement is an alternative approach to encouraging environmental considerations within the supply and demand chain, however, this process in itself is not without its own conflicts of interest when trying to achieve the three managerial values, effectiveness, efficiency and economy.

A traditional view of green procurement is that it will generally involve a trade-off, either in performance compared to a virgin product, in price or in availability. The overall reported effectiveness of green or recycled products has improved greatly in recent years (Coggburn, 2004) and performance in many cases is equal to that of traditional "brown" competitors. The development of green waste compost production has improved significantly in recent years, particularly with the introduction of the PAS 100 industry standard. The standard must be used to allay any misconceptions about the product based on previous bad experiences or reputations, and to encourage incorporation of the product within set government and consultant specification documents. Standardised green procurement policies would encourage the use of recycled materials without having to enforce regulation.

The public sector in Wales has recognised the need for increased commitment to sustainable development and that change management is needed to fully integrate sustainability into the decision making process. In terms of practical changes Warner and Ryall (2001) suggest that there be a designated person in each authority to whom all information and training be given and they can then communicate this information to the procurement departments. Training is not currently widely used but has been suggested as "one of the keys to the successful implementation of a green purchasing policy because it involves purchasers and raises awareness" (Warner and Ryall, 2001). These ideas could be incorporated into a set of recommended actions, as shown in Table 7.1. If successful, such actions could effectively overcome the remaining barriers, and close the sustainability loop within the Welsh composting industry.

Table 7.1 Barriers and actions to close the compost sustainability loop

	Barriers Identified	Recommended Actions	
		W P I	Wales Compost Network
1.	Lack of communication between main actors (waste management industry, compost producers, government bodies)	Send emails / mail shots to potential purchasers providing information and contact details	Develop information sharing forum for compost producers in Wales. Organise demonstration events to highlight advances in composting in Wales.
2.	Lack of current data on all the active compost producers in Wales	Disseminate data to specificers and potential purchasers.	Collect data. Disseminate data through Compost Network, WAG, Composting Assoc, landscape magazines
3.	Specifiers currently unaware of sustainable products and corresponding standards	Organise workshops to introduce PAS 100 as minimum industry standard for compost. Explain its accreditation procedure.	
4.	Currently no inclusion of PAS 100 green waste compost into specification documents	Direct action - personal training for specifiers to implement sustainable procurement policy, particularly within public bodies such as the WDA, WAG and local authorities, but also private sector landscape consultants.	
5.	Insufficient awareness of local examples of best practice	Disseminate case studies e.g. Capita and other similar examples of best practice in sustainable development projects	
6.	Concern over price		Produce an estimate pricing guide so green waste compost can be compared to closest equivalent

7.9 Summary

The development of sustainable development policies and training guides within the EU and particularly within Wales (Welsh Procurement Initiative, 2004) are laudable. However, in order for these policies to be seen to be effective, changes to purchasing behaviour will need to happen. The choice is now not 'whether' to implement sustainable policy, but 'how', either by enforcing environmental

regulation which can result in reduced efficiency and economy or to encourage adoption through sustainable procurement. By raising awareness of green products and services available and dispelling misconceptions about green products performance and cost, sustainable procurement can be successfully integrated within purchasing policy. In order to achieve this integrated approach in Wales, the Welsh Procurement Initiative has embarked upon a project which seeks to "embed sustainable development principles into public sector procurement across Wales" (Welsh Procurement Initiative, 2004). This project could work in conjunction with the Welsh Composting Network to provide information and training to overcome the remaining barriers to the uptake of compost produced from waste in Wales.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

Biodegradable waste has been targeted because of its nature, and also because of the quantities of waste produced. As mentioned previously, in 1999/2000 Wales land-filled approximately 1.038 million tonnes of biodegradable municipal waste and if we assume a growth rate of 2%, it is estimated that 1.258 million tonnes biodegradable municipal waste will need to be diverted from Welsh landfill by 2020 (Welsh Assembly Government, 2002). The obvious solution to diverting the waste from landfill is to compost, and this technique is already being adopted by many waste management facilities in Wales.

In 2002, Wise about Waste: a National Waste Strategy for Wales was introduced (Welsh Assembly Government, 2002). The strategy includes specific instructions regarding recycling and composting rates. The Wise about Waste targets state that by 2009/10 and beyond Wales must achieve a 40% recycling/composting rate with a minimum of 15% composting and 15% recycling. This differs from the English strategy, which seeks to recover value from waste either by recycling or by composting (Department of the Environment Transport and the Regions, 2000). The Welsh strategy outlines specific targets for composting the biodegradable fraction

of municipal waste; the emphasis on composting is therefore greater than in other parts of the UK, and significant quantities of compost will be produced from biodegradable waste in Wales.

Biodegradable municipal waste includes food waste as well as garden waste. However, in the context of this study the development strategies have primarily focused upon markets for green garden waste compost. Initial investigations with the main stakeholder groups uncovered a substantial amount of consumer scepticism towards green waste compost, with particular concerns regarding the quality and safety of the product. These reservations towards using a waste derived product seemed to present a formidable challenge to the industry which would need to allay fears about quality and consistency of the product. The decision not to include composted food wastes into the study at these early stages in the product's development was to limit the possibility of confusion between the different types of feedstock and reduce any affect this might have had on the results for green waste compost.

Consequently, an intention of this thesis has been to present the current options available to producers of green waste compost in terms of potential market sectors for the product in Wales, the level of accessibility to each of the sectors and marketing strategies available to promote the product.

8.2 Summary of research findings

The information gathered as a result of the depth interviews with stakeholder groups provided a basis for further investigation through a larger quantitative survey. The results of the survey of the landscape contractor and independent retailer sectors highlighted a number of key issues that might influence what marketing strategies are to be adopted and which areas in particular would need to be focused upon. The focus may also vary depending upon the sector to which the strategy was aimed.

Some of the key points highlighted by the survey were:

- Mean usage of topsoil is greater than all other growing media products in the landscape contractor sector in Wales

- 48% of landscape contractors surveyed stated that none of their contracts would specify the use of peat-free compost

- Currently, the preferred choice of landscape contractors is peat-based and spent mushroom compost

- Mushroom compost will rarely be a top seller for garden centres. Many domestic consumers would be familiar with peat-based compost and particular brand name products

- March, April and May are the top three months for the independent retail sector to purchase compost in Wales.

- The average percentage of peat-free compost sold annually is less than 10% of total compost sales in the independent retail sector in Wales

- Over 60% of landscape contractors surveyed claimed that less than 10% of compost used by them was green waste

- In the landscape contractor sector 47% of respondents were familiar with the compost standard BSI PAS 100 at the time of the survey

- In the independent retail sector only 20% of respondents were aware of the compost standard BSI PAS 100

- In the landscape contractor sector 22% of respondents admitted that they did not employ any sustainable practices, unless such requests were written into specification documents

These key issues have been highlighted as significant as the information may indicate areas of development required to increase awareness of green waste compost in Wales within the relevant sector, and identify differences between each sector.

The research identified a number of market barriers which will need to be overcome if products containing green waste are to be successfully promoted in Wales. Figure 8.1 summarises the main barriers to the market, as highlighted by the results of the qualitative and quantitative research.

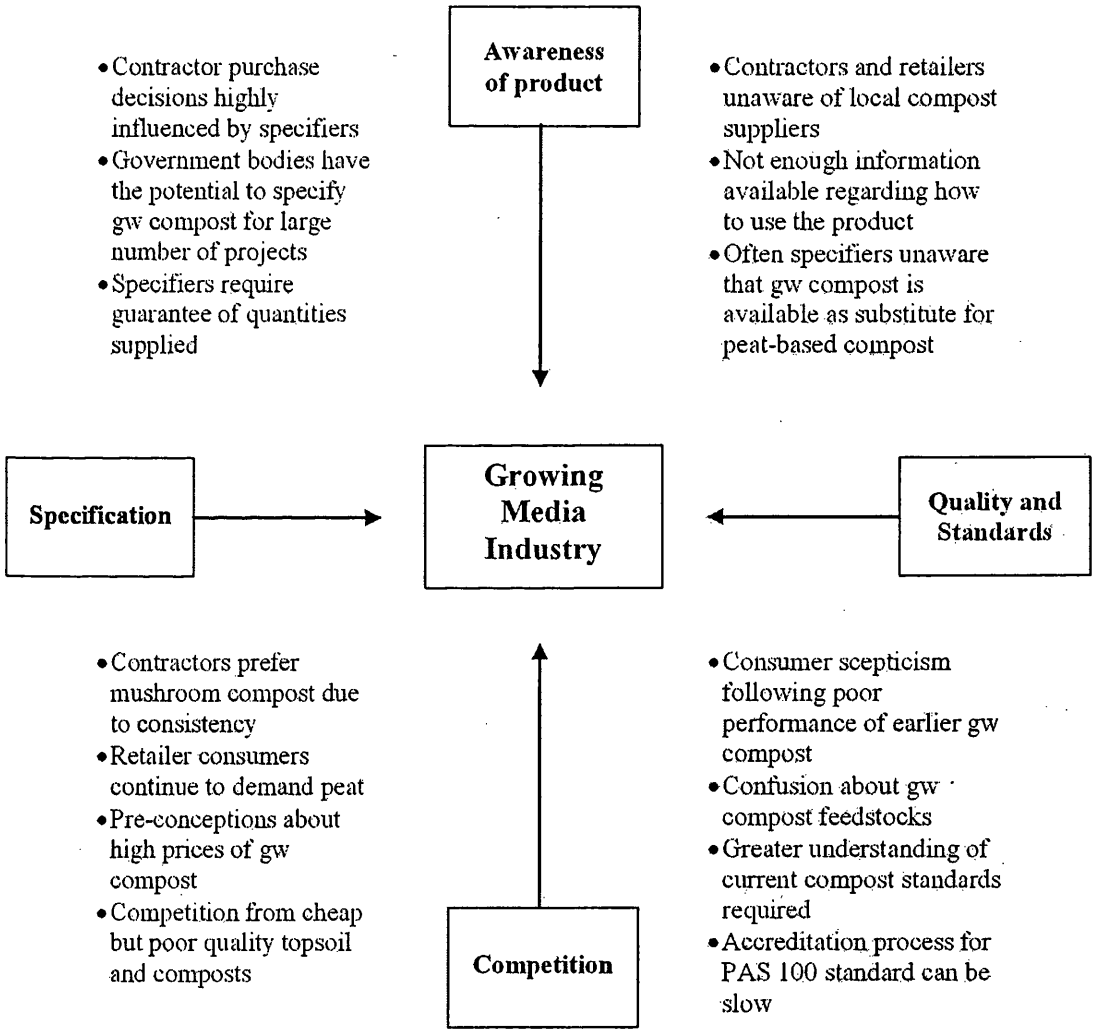


Figure 8.1 Barriers identified to the growing media market

Chapter 4 has discussed the importance of focusing upon the needs and wants of the consumer when designing any marketing strategy, and the necessity of using appropriate techniques to satisfy these needs. One example could be the need to

consider when each sector is most likely to require the largest volumes of product. The survey results presented in Chapter 6 suggest that March, April and May are key months for the retail sector as they tend to purchase the bulk of their growing media products during this time. Compost producers in Wales will need to ensure that they have sufficient quantities available during this period to satisfy demand. Landscape contractors however, despite increased volumes of demand, tend to spread purchasing over a longer period.

As part of the research it was also important to investigate the options available to producers of green waste compost when deciding how to market the product. One option used by growing media producers when marketing peat-free or recycled material is to focus upon the environmental benefits the product offers. During this study the development of green marketing as a marketing tool was considered. Chapter 4 examined the successes and failures of other green and recycled products and discussed how the theory has evolved since first being introduced in the late 1970s.

In the past it is clear that many companies quickly adopted the green consumer phenomenon at a time when consumer concern for the environment was at its most influential. These initiatives were more consumer-led than legislative and most industries were left to introduce their own individual labelling schemes. Unfortunately, due to a lack of regulation many consumers felt misled by many 'green' and 'environmentally friendly' claims from producers which were either false or deliberately confusing.

Another setback for the green industry was in relation to the markets for recyclate. Early attempts at producing recycled products often resulted in poorer quality products compared to the conventional, virgin alternatives. Although technology and production processes have improved, many consumers still associate recycled products with poorer quality. The research suggests that when it comes to buying recycled products many consumers feel they must make a trade off between quality and price, which in many purchase decisions will result in the recycled product losing out. In the case of green waste compost the issue of standards and quality will need to be addressed before any attempts at promoting the product are

introduced. Consumers will be unlikely to try a product more than once if they find the quality to be unsatisfactory. Therefore it is essential that all green waste compost can meet a minimum quality standard before attempts are made to sell the product commercially.

The disappointing sales of products aimed solely at the green consumer have resulted in many producers re-analysing their marketing strategy. Lessons learnt from the history of green marketing suggest that there are similar issues which have direct relevance to the marketing of green waste compost; the quality of the product must be high, any claims made for its attributes must be verified and the stamp of authority, via specification or regulation, could be used to aid the promotion of the product. These are lessons which those responsible for marketing green waste compost should take on board.

Any strategies aimed to encourage demand for green waste compost as an alternative to peat would need to consider what products are currently being used in each of the target sectors, either peat-based compost or a peat-free alternative such as mushroom compost. The advantages of green waste compost would need to match the individual needs of each consumer segment, which would not necessarily be the same across all sectors. One growing media product clearly in demand in the landscape contractor sector is topsoil which could be a potential outlet for green waste compost if blended with a sub-soil. This solution may prove to be an effective route to obtain a balance between selling a substantial amount of volume without having to devalue the product. One of the companies interviewed avoided the problem of surplus product by diffusing their product into the soils market where a percentage of compost was blended and sold as nourishing topsoil. This slight diversification does in fact provide a value outlet for green compost in terms of volume and price rather than having to use the product as landfill cover as can often happen.

The composting industry may also benefit from drivers to encourage green procurement. The survey, reported in Chapter 6 draws attention to the level of influence of specifiers in the landscape contractor industry. Specifiers seem to have

more of an effect upon the purchasing decisions of the contractors than any desire to be seen to employ sustainable practices. As reported from the interviews presented in Chapter 5, it is not uncommon for contractors to have a substantial percentage of contracts direct from local or central government. In these situations it may be possible for green compost to be included in the specification documents where suitable, as a peat-free growing media. An increase in the awareness and implementation of the BSI PAS 100 will hopefully encourage landscape consultants to specify green waste compost as an alternative to peat-based or mushroom compost in the future.

8.3 Limitations and values of the research

The apparent continuity in themes and issues highlighted by both qualitative and quantitative results are encouraging, however it is also important to consider the level of reliability placed upon any individual conclusion and the obvious limitations which are presented with quantitative postal surveys. Although a comprehensive list of landscape contractors and retailers was compiled, and every method was made to encourage participation, a full response to the postal survey was not received. Consequently one obvious limitation of the study is the limited sample size. There is also a possibility that there are differences between those organisations contacted who decided to participate in the survey, and those who decided against it. The conjoint analysis technique which was employed has the potential to predict market shares of products, with attributes chosen from any of the factors and levels used within the study. However, a further study with a larger sample size would be needed to predict such market shares with confidence.

Despite the limitations discussed, the conjoint analysis approach used in this study should result in more reliable results than a standard consumer survey. In many traditional consumer surveys, customers assign ranked values to product attributes. The assumption is that the perceived value will be reflected in their buying behaviour. However, research has shown that this is often not the case. For example, Speer's results show that people have felt inclined to indicate in a survey, a purchase choice they would not necessarily choose in reality, in order to appear to

be concerned for the environment (Speer, 1997). In the context of the compost study, in a traditional survey of views on green waste compost, respondents might have ranked the importance of, say PAS 100, highly. However, if the certified product was more expensive than its uncertified competitor, buyers would not be prepared to pay the higher price when it came to an actual purchase. In contrast to traditional methods, conjoint analysis tries to establish the value of each of a product's attributes on the basis of a set of choices that respondents make about hypothetical products with a number of different features. This means that the importance of each separate feature is inferred from their choice behaviour rather than from self-reporting on individual attributes. This makes it less likely for the respondents to predict how the choices they make will affect their overall preference structure, and provides the researcher with a truer picture of their underlying attitudes. In the green waste compost survey, the high importance of price as determinant of purchasing decisions was the overwhelming factor which emerged from the underlying attitudes of the landscape contractors and retailers.

Despite some of the limitations of the research the results compiled through the depth interviews and surveys have been both consistent and functional in delivering key barriers to the market. However, in addition to the practical recommendations which this research project has been able to make to those responsible for sustainable waste management strategies in Wales, its use of conjoint analysis is novel within waste management research. Although conjoint analysis is a technique which is well established in the marketing field, it has not been used routinely to evaluate the attitudes of consumers to environmental issues and to determine the trade-offs which they are prepared to make (UNEP, 2004). Waste has been recognised as a major environmental problem; however, consumer attitudes remain a barrier towards more sustainable approaches to waste management. Tools and techniques which contribute to an understanding of perceptions, attitudes and responsibilities towards waste and resource management are still required. For example, the local acceptability of waste management facilities, routine public participation in recycling schemes and the market development of recyclate are issues which require further study. Future research could benefit from the use of conjoint analysis to evaluate consumer attitudes, to provide a deeper understanding into the motivations of the public towards waste management issues. This

information would make a useful contribution within the field and could be used to encourage a wider adoption of sustainable waste management practices.

8.4 Recommendations

This thesis presents information gathered through empirical research into the development of markets for green waste compost in Wales in order to suggest appropriate strategies to enable green waste compost producers to effectively reach these markets. The following recommendations focus upon three specific areas, product development and marketing, product sales, and product specification and awareness; these are summarised in Figure 8.2.

8.4.1 Product Development and Marketing

The issue of standards and quality will need to be addressed before any attempts at promoting the product are introduced. Consumers will be unlikely to try a product more than once if they find the quality to be unsatisfactory and therefore it is essential that all green compost can meet a minimum standard across the industry before attempts are made to sell the product commercially. At present the most obvious quality standard comes in the form of the British Standards Institution PAS 100.

As a result of the empirical research presented in Chapters 5 and 6 a number of best practice ideas emerged that could be used to market green waste compost to potential consumers in their respective target market segments. In order to build up a solid consumer base, either commercial or domestic, it is necessary to establish a brand image for the product. This can be accomplished by providing potential consumers with detailed information concerning the green compost, ensuring that it highlights the full uses and benefits of the product. Any literature produced should be appropriate to the target segment at which the product is aimed e.g. commercial contractors may require a detailed breakdown of the product analysis whereas domestic consumers may need more simplified instructions for use. The nature of the branding is also very important in order to portray green waste compost as a

clean, high quality product that is also good for the environment. The emphasis should concentrate on the benefits of the product to the consumer first and benefits to the environment second. The resulting marketing strategy would assume that consumers are interested in buying high quality compost and any benefits for the environment would reinforce the purchase decision.

8.4.2 Product Sales

The commercial sector may benefit from legislative drivers to encourage contractors to purchase green compost as it is evident the contractor sector is very much price driven. Although the retail sector is also largely price driven the issue raised by a number of retailers was that peat-free compost was priced proportionally higher than the closest equivalent. Improving promotion of the product and realigning the price to become more competitive could address this problem.

8.4.3 Product Specification and Sustainable Procurement

Although there have been definite steps made to improve sustainable procurement in Wales, through the establishment of the Welsh Procurement Initiative, so far there has been insufficient focus on the role of sustainable procurement in helping to reduce the effects of waste. Sustainable procurement has the potential to assist in the market development of recyclate; specifically in the development of green waste compost as a sustainable product.

The Welsh Assembly Government has recognised the importance of dealing with waste, and it is providing support for composting initiatives and encouraging the Wales Compost Network. What is required now is the link between the composting network and the sustainable procurement initiative, to effectively close the sustainability loop by promoting the purchase of green waste compost. Chapter 7 summarised the barriers to sustainable procurement and presented a number of recommended actions which illustrate how the Welsh Procurement Initiative and the Wales Compost Network could work together to achieve this aim. These actions are incorporated into the overall market development strategy presented in Figure 8.2.

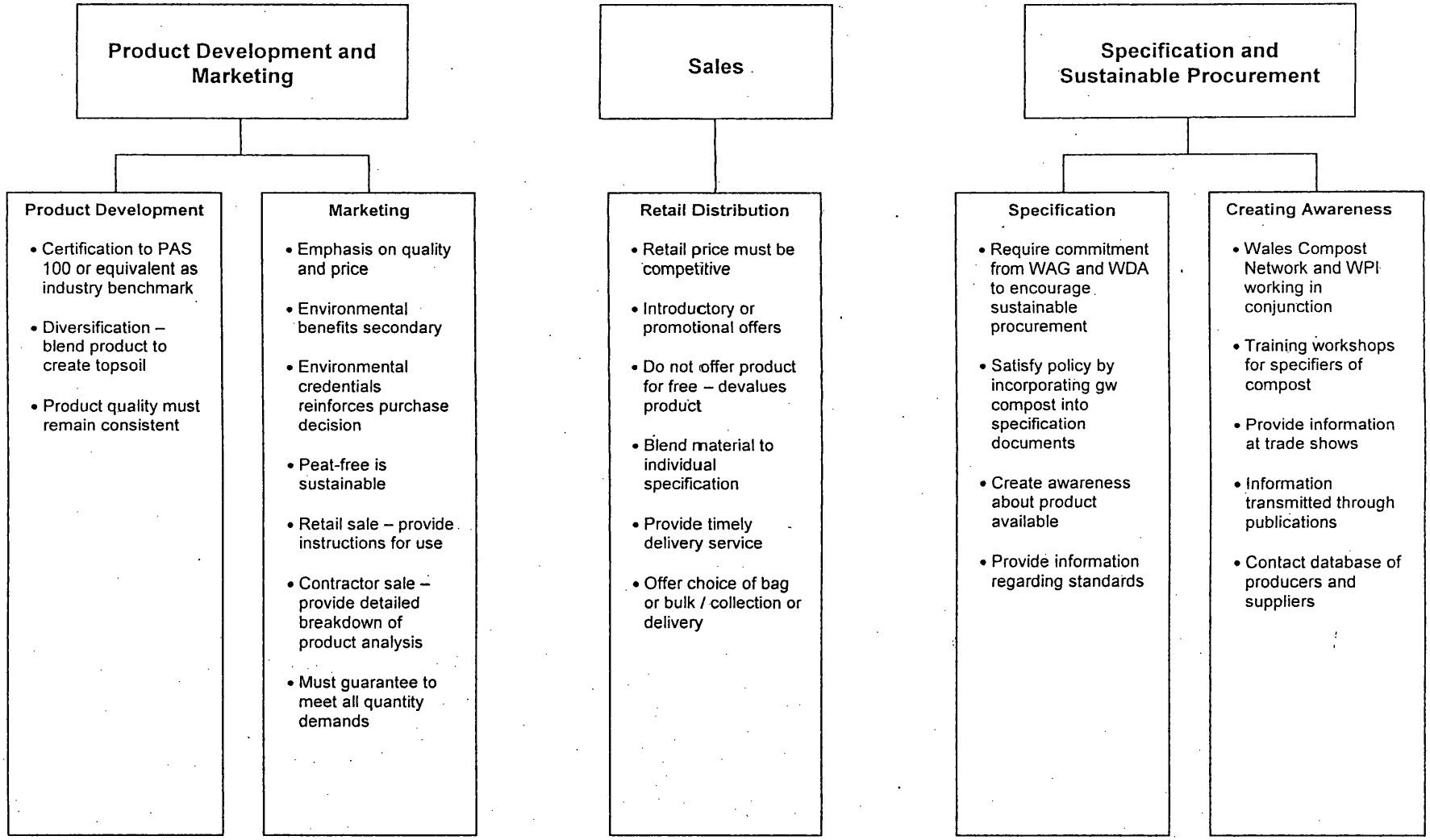


Figure 8.2 Suggested market development strategy for green waste compost

8.5 Further Research

It is hoped that the results of this research have culminated in a better understanding of the current situation regarding the status of green waste compost within the growing media industry in Wales. This has been accomplished by identifying current barriers to the market and suggesting solutions of how to best overcome those barriers. At the start of this research it was also the intention to follow the development of three proposed regional composting facilities in Wales and to have some input into the development of marketing campaigns for the final products produced by these facilities. Unfortunately, due to a number of setbacks governed by factors outside of the realms of this research, the development of the sites has been delayed and therefore the producers are not currently at an appropriate stage where such marketing trials could have been constructed.

As the regional facilities become fully operational this will provide an opportunity to conduct marketing trials, investigating appropriate use of branding to reflect the needs of the relevant consumer groups. The trials could also contribute to establishing the most effective distribution channels to reach the target markets, taking into account the current attitudes and behaviours of the respective consumer groups represented within this research.

Similarly, the development of long-term markets through integrating recycled products and sustainable procurement procedures is an area requiring further investigation. Although this research project has resulted in a clearer commitment by public bodies to incorporate green waste compost in publicly funded landscape projects, difficulties may still exist. Future research would hopefully uncover any remaining concerns or practical barriers associated with changes to purchasing policy. In a similar vein, given more time it would have been beneficial to develop the idea of providing specific training to specifiers and purchasing officers within both the private and public sector and to monitor whether this training had the desired effect on changes to purchasing behaviour, or whether psychological barriers were proving to be a hurdle to encompassing sustainable procurement.

The long term objective of the Welsh Assembly Government in its approach to encourage composting as a means of reducing waste being sent to landfill is in line with targets set by the EU Landfill Directive. The achievements of composting operations throughout Wales to reduce the amount of green waste being sent to landfill has been reported as successful, however, the composting of green waste alone will not be sufficient to achieve the 2010 targets set by the Welsh Assembly Government in the National Waste Strategy for Wales. In 1999/2000 8% or 129,270 tonnes (Welsh Assembly Government, 2002) of the total municipal waste in Wales were compostable kitchen waste. However, in the light of a number of health scares associated with foot and mouth disease and Bovine Spongiform Encephalopathy (BSE) this has meant that composting of these materials now requires strict adherence to the Animal By-Products Regulations introduced in 2005. The composting of food waste requires all feedstock to be enclosed in a container or other in-vessel system which can satisfy the demands of the State Veterinary Service.

The research reported in this thesis was conducted in a dynamic environment, and at the start of the study the development of in-vessel facilities capable of composting food wastes was not at a suitable stage in Wales such that market development strategies could be applied. As the numbers of in-vessel facilities composting food waste increases in Wales, so will the requirement for markets for the final product. However, the challenge to establish markets for composted food wastes may present an even greater challenge to compost producers than the challenge presented by green waste, as public perception regarding the safety of food waste as a feedstock could present itself as a potential barrier to the market.

The decision was made to concentrate this initial research study on markets for green waste compost. This would avoid any possible confusion between composts produced from different waste feedstocks and would enable the researcher to accurately predict stakeholder reactions to green waste compost without the additional complication of food, particularly animal derived wastes. Many of the findings of the research are applicable to the marketing of compost derived from any type of biodegradable waste. However, considering the consumer scepticism still surrounding the quality and consistency of green waste composts, the

introduction of food waste derived compost might require further investigations and closer monitoring than that conducted for green waste compost. One possibility might be to market the product without disclosing the fact that food waste was part of the feedstock. Although this decision may not contravene the product description once the materials are fully composted to the relevant standard, there might be ethical implications of not disclosing the original feedstock and these would also need to be considered.

The suggestions for further research presented here represent only a fraction of the research and work required to fully integrate recycled and waste derived products into mainstream procurement processes. It is the author's belief that without the continued support and proactive involvement of government driven sustainable purchasing schemes, the development of markets for recycled and sustainable products will continue to compete with the better known, often cheaper, virgin alternatives.

APPENDIX A

POSTAL SURVEY QUESTIONNAIRE FOR LANDSCAPE CONTRACTORS

Market Segmentation Questions

1. What range of services does the company provide? (*Tick all that apply)*

Hard Landscaping	☐
Soft Landscaping	☐
Grounds Maintenance	☐
Construction/Engineering	☐
Tree Surgery	☐
Land Reclamation	☐
Other	☐ please specify _____

2. What percentage of the services provided require the use of compost? (*Tick one)*

0 – 10 %	☐
11 – 25 %	☐
26 – 50 %	☐
51 – 75 %	☐
76 – 100%	☐

3. Please indicate your main consumer segments and what percentage can be attributed to each? (*Tick all that apply)*

		(These should sum to 100)
Local authority	☐	____ %
Commercial and Industrial	☐	____ %
Government Agency e.g. WDA	☐	____ %
Domestic	☐	____ %
Other	☐	____ %

4. On average per year how much **compost** will you typically require per **year**? *(Tick one)*

0 – 500m³	501 – 1000m³	1001 – 1500m³	1500+m³
❑	❑	❑	❑

5. Which 3 months would be your peak buying season for compost?

(Rank 1 through to 3. 1 = highest buying month)

January	_____	July	_____
February	_____	August	_____
March	_____	September	_____
April	_____	October	_____
May	_____	November	_____
June	_____	December	_____

Composting Standards

6. Are you familiar with the BSI composting standard PAS 100? *(Tick one)*

Yes ❑ (go to Q. 7)

No ❑ (go to Q. 8)

7. How did you become aware of the PAS 100 standard? *(Tick all that apply)*

Through trade association membership (e.g.BALI) ❑

Reading trade journals ❑

Consultant specifications ❑

Members of Composting Association ❑

Other contractors ❑

Suppliers ❑

Other (please specify) _____ ❑

8. Which of the following best describes the nature of the specification of planting medium presented by the client? (*Tick one)*

Most contracts require the use of a specified supplier ❑

Most contracts require the use of a specified supplier or equivalent ❑

Most contracts require that the supplier meets with a specific standard ❑

Most contracts will not specify either supplier or standard ❑

Service Coverage

9. Which of the following best describes the location of your jobs?

(*Tick one*)

Mostly local (within 1hrs drive) ❑

Mostly regional (within 2hrs drive) ❑

Mostly within Wales ❑

Throughout the UK ❑

10. Which of the following best describes the conditions under which you usually source compost? (*Tick one)*

____ % of suppliers will not be regular suppliers, but local to the job

____ % of suppliers will be regular suppliers local to the job

____ % of suppliers will be regular and not local to the job

11. Will the cost of haulage for compost from the supplier generally be included in the price quoted? *(Tick one)*

Yes ☐

No ☐

Product Range

12. What **quantities** of the following products would you require per **year**?

*(Tick all that apply and estimate **quantities** and **unit price**)*

Turf Dressings	☐	_____ m^3/year	£_____/ m^3
Top Soil	☐	_____ m^3/year	£_____/ m^3
Compost	☐	_____ m^3/year	£_____/ m^3
Mulch	☐	_____ m^3/year	£_____/ m^3
Soil Improvers	☐	_____ m^3/year	£_____/ m^3
Bark Chips	☐	_____ m^3/year	£_____/ m^3

13. Which of these compost products do you typically use?

(Tick all that apply and estimate quantities)

Mushroom	☐	_____ m^3/year
Coir	☐	_____ m^3/year
Peat-based	☐	_____ m^3/year
Green Waste	☐	_____ m^3/year
Other (please specify)	☐	_____ m^3/year

_____

14. Approximately what percentage of jobs will specify the use of peat-free compost?

_____ %

Experience with Green Waste Compost

15. What percentage of compost you currently use can be classed as green waste compost?

_____ %

16. How did it compare to the closest alternative?

	Unfavourably		About the same		Favourably
Price	1	2	3	4	5
Nutrient composition	1	2	3	4	5
Texture	1	2	3	4	5
Ease of use	1	2	3	4	5

17. What level of importance would you attribute having the following information available when purchasing green waste compost?

	Not Important				Very Important
Certified minimum standard	1	2	3	4	5
Feedstock used	1	2	3	4	5
NPK levels	1	2	3	4	5
Physical contaminants (grit etc.)	1	2	3	4	5
pH levels	1	2	3	4	5

Environmental Awareness

18. In your experience, have any of the following practices been introduced by either client or consultant to encourage sustainability?

(Tick all that apply)

No waste off site	☐	No sustainable practices	☐
Use of native provenance plants	☐		
Reduction of traffic flow on site	☐		
On-site composting	☐		
Other (please specify)	☐		

_____

19. Has there been a change in demand for peat-free compost within the past 5 years in the following sectors?

	Increase in demand	**No change in demand**	**Decrease in demand**
Industrial and Commercial Business	☐	☐	☐
Domestic	☐	☐	☐
Local Authority	☐	☐	☐
Government Agency (e.g. WDA)	☐	☐	☐

20. What effect has the introduction of peat-free compost and other sustainable initiatives had on your organisation in terms of the following?

	Positive Effect	**No change**	**Negative Effect**
Price of growing media	☐	☐	☐
Availability of growing media	☐	☐	☐
Performance of growing media	☐	☐	☐
Changes in working practices	☐	☐	☐

21. Are there any additional comments you wish to mention concerning recent developments of sustainable materials and in particular the use of peat-free or peat reduced growing media?

_____

_____

_____

_____

_____

Classification Questions

In order to help me classify your responses please can you indicate below your average turnover and number of employees.

22. Please indicate your average annual turnover. (*Optional*)

Under £100,000 ☐

£101,000 - £250,000 ☐

£251,000 - £500,000 ☐

£501,000 - £750,000 ☐

£751,000 - £1,000,000 ☐

Over £1,000,000 ☐

23. How many employees in your organisation?

_____ permanent/ full-time members of staff

_____ seasonal / part-time

APPENDIX B

POSTAL SURVEY QUESTIONNAIRE FOR INDEPENDENT DOMESTIC RETAILERS

Market Segmentation Questions

1. Which classification would best describe your company? (*Tick one)*

Garden Nursery ☐
Garden Centre ☐
Growing Media Supplier ☐
Growing Media Producer ☐
Home and Garden Centre ☐
Other (please specify) ☐
_____

2. What compost products does the company supply and how many pallets would be required per year?

(*Tick all that apply*)

Peat-based Compost ☐ _____ pallets/year
Peat-free Compost ☐ _____ pallets/year
Peat-reduced Compost ☐ _____ pallets/year
Manure based Compost ☐ _____ pallets/year
Cocoa Shell Compost ☐ _____ pallets/year
Other (please specify) ☐ _____ pallets/year
_____

3. On average, how many 75-litre bags would be on each pallet?

(*Tick one)*

30 bags per pallet ☐
35 bags per pallet ☐
40 bags per pallet ☐
45 bags per pallet ☐
50 bags per pallet ☐

4. Has there been an increase or decrease in sales of compost over the past 5 years? *(Tick one)*

Increase in demand	**Decrease in demand**	**No change in demand**
☐	☐	☐

5. What brands of compost does the company carry?

(Tick all that apply)

J Arthur Bower	☐	
Levington	☐	
Sinclair	☐	
Scotts	☐	
Gem	☐	
Clover	☐	
Own Brand	☐	
Independent	☐	(please specify _____

6. Which is the best selling brand of compost?

_____

7. Why do you think this brand is preferred? *(Tick all that apply)*

Price	☐	
Quality	☐	
Brand loyalty	☐	
Other	☐	(please specify) _____

8. Which 3 months would be your peak buying season for compost?

(Rank 1 through to 3. 1 = highest buying month)

January	_____	July	_____
February	_____	August	_____
March	_____	September	_____
April	_____	October	_____
May	_____	November	_____
June	_____	December	_____

9. Do you supply topsoil? *(Tick one)*

No ☐

Yes ☐ _____ m^3 / year

Target Market

10. Please indicate your main consumer segments and what percentage can be attributed to each?

(These should sum to 100)

Domestic	☐	____ %
Business	☐	____ %
Local Authority	☐	____ %
Other	☐	____ %

11. What percentage of total sales can be classed as growing media products?

_____ % of sales

Sustainable Awareness

12. What percentage of annual compost sales will be peat-free?

_____ % of compost sales are peat-free

13. Which of the following peat-free brands of compost do you supply?

(Tick all that apply)

J Arthur Bower	☐	Do not supply peat-free	☐
Levington	☐		(Go to Q. 16)
Sinclair	☐		
Scotts	☐		
Gem	☐		
Clover	☐		
Own Brand	☐		
Independent	☐	(please specify _____	

14. Which is the most popular brand of peat-free compost you supply (if multiple brands are available)?

_____ is the preferred brand

15. Why do you think this is the most popular brand? *(Tick all that apply)*

Price	☐	
Quality	☐	
Brand loyalty	☐	
Other	☐	(please specify) _____

16. Has there been an increase or decrease in demand for peat-free compost over the past 5 years?

Increase in demand	**Decrease in demand**	**No change in demand**
☐	☐	☐

17. Initial investigation suggests that demand for peat-free compost is relatively low compared to peat-based compost why do you think this is the case?

(Tick all that apply)

Too expensive	☐	
Poor promotion	☐	
Varied nutrient levels	☐	
Aesthetics	☐	
Other	☐	(please specify) _____

Composting Standards

18. Are you familiar with the B S I composting standard PAS 100?

Yes	☐	
No	☐	(Go to Q.20)

19. How did you become aware of the PAS 100 standard?

(Tick all that apply)

Through trade association membership	☐
Reading trade journals	☐
Consumers	☐
Suppliers	☐
Other (please specify) _____	☐

20. Are there any additional comments you wish to mention concerning recent developments of sustainable materials and in particular to the use of peat-free or peat reduced growing media?

_____

_____

_____

_____

_____

Classification Questions

In order to help me classify your responses please can you indicate below your average turnover and number of employees.

24. Please indicate your average turnover. *(Optional)*

Under £100,000 ☐

£101,000 - £250,000 ☐

£251,000 - £500,000 ☐

£501,000 - £750,000 ☐

£751,000 - £1,000,000 ☐

Over £1,000,000 ☐

25. Please indicate the number of employees in your organisation

0 - 5 ☐ 6 - 10 ☐ 11 - 20 ☐ 20 + ☐

APPENDIX C

CONJOINT ANALYSIS PROFILE FOR LANDSCAPE CONTRACTORS AND INDEPENDENT DOMESTIC RETAILERS

Please would you spare a few more minutes to answer the following scenarios. This aspect of the questionnaire is of vital importance to my research. I am aware that you may find the products are presented in a slightly unusual manner, however this is intentional and this method of analysis will hopefully help me to understand a number of trends within the market. *Thank you.*

						Circle the number in the scale that indicates how likely you are to purchase this item.						
Card no	***Price per***	***75ltr bag*** / ***m^3 loose***	***Screen size***	***pH Levels***	***Specification***	Not at all likely to purchase						Would definitely purchase
1	£5.50/75l bag	12mm	slightly alkaline	Own Spec		1	2	3	4	5	6	7
2	£3.20/m^3 loose	6mm	slightly acidic	Own Spec		1	2	3	4	5	6	7
3	£3.20/m^3 loose	12mm	Neutral	None		1	2	3	4	5	6	7
4	£3.30 /75l bag	6mm	Neutral	PAS 100		1	2	3	4	5	6	7
5	£6.80/m^3 loose	6mm	Neutral	Own Spec		1	2	3	4	5	6	7
6	£3.30 /75l bag	12mm	slightly acidic	None		1	2	3	4	5	6	7
7	£5.50/75l bag	6mm	slightly acidic	None		1	2	3	4	5	6	7
8	£5.50/75l bag	20mm	Neutral	None		1	2	3	4	5	6	7
9	£3.20/m^3 loose	6mm	slightly acidic	None		1	2	3	4	5	6	7
10	£3.30 /75l bag	6mm	slightly alkaline	None		1	2	3	4	5	6	7
11	£6.80/m^3 loose	20mm	slightly acidic	None		1	2	3	4	5	6	7
12	£3.20/m^3 loose	20mm	slightly alkaline	PAS 100		1	2	3	4	5	6	7
13	£6.80/m^3 loose	12mm	slightly acidic	PAS 100		1	2	3	4	5	6	7
14	£6.80/m^3 loose	6mm	slightly alkaline	None		1	2	3	4	5	6	7
15	£3.30 /75l bag	20mm	slightly acidic	Own Spec		1	2	3	4	5	6	7
16	£5.50/75l bag	6mm	slightly acidic	PAS 100		1	2	3	4	5	6	7
17	£6.80/m^3 loose	6mm	slightly acidic	None		1	2	3	4	5	6	7
18	£3.30 /75l bag	6mm	slightly alkaline	Own Spec		1	2	3	4	5	6	7
19	£5.50/75l bag	6mm	slightly alkaline	None		1	2	3	4	5	6	7
20	£3.20/m^3 loose	20mm	slightly acidic	None		1	2	3	4	5	6	7

APPENDIX D

DETAILS OF ACTIVE COMPOSTING OPERATIONS IN WALES 2005

Details of active composting operations in Wales 2005

	Name	Address
1	Evolve Composting	Perthybu,Sarn, Newtown, Powys, SY16 4EP
2	Lower Cwm Hari	Tregynon, Newtown, Powys, SY16 3ES
3	Amgen Cymru	Bryn Pica Landfill Site, Llwydcoed, Aberdare, CF44 0BX
4	Maindiff Court Farm	Maindiff Court Farm, Abergavenny, Momouthshire, NP7 8AY
5	Newport CBC	Docksway Disposal Site, Newport, NP20 2NS
6	Llywnhelig Farm	Llwynhelig Farm, Cowbridge, Vale of Glamorgan, CF71 7FF
7	Race Farm	Race Farm, Newport Road, New Inn, Pontypool, NP4 0TP
8	Wormtech Ltd	1002 - 1006 Centurian Park, Caerwent, Monmouthshire
9	Carmarthenshire Environmental Resources	Composting Facility, Nantycaws Landfill Site, Nantycaws, Carmarthenshire
10	Ceredigion County Council	Rhydeinon Landfill Site, Llanarth, Ceredigion
11	JLA Recycling Ltd	Tir Cannol Transfer Station, Tircannol Farm, Palleg Road, Lower Cwmtwrch, Swansea
12	Swansea City Waste Disposal Co. Ltd	Tir John Landfill Site, Off Fabian Way, Swansea, SA7 9XT
13	A D Waste Limited	Plas Bellin Farm, Oakenholt Lane, Oakenholt, Flintshire, CH7 6DF
14	Conwy County Borough Council	Dolgarrog Composting Site, Old Valley Landfill Site, Dolgarrog, Conwy
15	Gwyn Maple	Cae Star, Llanfair Pwllgwyngyll, Anglesey
16	Rhug Organic	Rhug Estate Office, Corwen, Denbighshire, LL21 0EH
17	LAS Waste Ltd	Cillefwr Ind Estate, Johnstone, Carmarthenshire, SA31 3QY
18	Cardiff County Council	Highways & Parks Dept, Lamby Way Depot, CF3 8EQ
19	HLC	Crymlyn Burrows, Neath Port Talbot, SA1 8PZ
20	Bryn Quarry Ltd	Bryn Quarry, Gelligaer, Caerphilly, CF82 8FY
21	Wenvoe Soil Supplies	Wenvoe, Vale of Glamorgan, CF5 6AH
22	RML	Withyhedge Landfill Site, Bowlings Farm, Haverfordwest, SA62 4DB
23	Glanllynnau	Chwilog, Pwllheli, Gwynedd, LL53 6SJ

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