2013
All Ireland & UK Mushroom Conference and Trade Show

Hillgrove Hotel, Monaghan,
Thursday 17th & Friday 18th October 2013

Investing in the Future

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Foreword

The Organising Committee, in an exciting new collaboration with the Horticultural Development Company, cordially extend a warm welcome to all growers not only from Ireland but from right across the UK for the inaugural **2013 All Ireland and UK Mushroom Conference & Trade Show.**

The theme for this year's conference, ***"Investing in the Future"*** acknowledges the ongoing determination to foster a dynamic, competitive and technologically advanced Industry. To that end, the Conference Programme and Trade Show on Thursday 17th October 2013 reflect the Industry's significant investment in:

- **Research**: with an update on "MushTV" – the EU collaborative research programme developing solutions for the Mushroom Industry to deal with *Trichoderma* and Mushroom Virus X.

- **Sustainability:** with the latest reports on Biomass boilers, LED lighting, the Renewable Heat Incentive scheme and potential investment returns from wind generation and photovoltaic panels to reduce energy costs.

- **Production & Harvesting Strategies:** outlining programmes that maximise profit through picker management, harvesting for quality and enhanced production targets

- **Marketing & Promotion:** with details of the latest marketing, promotion and Industry trends.

- **Technology:** with almost 40 exhibitors present at this year's Trade event to showcase the most up-to-date machinery, packaging, supplies and growing equipment.

Further, the Industry Forum offers an opportunity to discuss the potential for *Growing Market Share* with our Industry's key stakeholders

On Friday, 18th October, a programme of visits has been arranged to state-of-the-art mushroom farms across Ireland.

The Committee would once again like to thank Bord Bia for sponsoring the event. We extend a warm welcome to all and hope that you enjoy the activities in the 2013 All Ireland and UK Mushroom Conference and Trade Show and continue to support the Industry by ***"Investing in the Future"*** for maximum sustainability and profitability.

Commercial Mushroom Producers Co-Operative Society Ltd.

Producer Organisation
Packaging Provision Scheme
Technical & Consultancy Service
Research & Development
Group Insurance
Group Pest Control

Our Mission

To enlighten consumers on the virtues and benefits of mushrooms from our grower members. Promote and drive category growth for our customers. We will do this through an efficient, fair and sustainable supply chain striving always to optimise returns, innovate and provide best value services to our producers.

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www.mushrooms.ie

Conference Programme

Thursday 17th October

11.00 **Trade Show & Registration**

14.00 - 14.30 **Conference Opening - Chairperson Michael Neary (Bord Bia)**
Tom Hayes, TD, Minister for Horticulture
David Small, Deputy Secretary, DARDNI

14.30 - 15.30 **SESSION 1 – Chairperson Katie Irgin (HDC)**
MushTV Research Update
Dr Helen Grogan, Teagasc
Mairead Kilpatrick, AFBI, Loughgall
Harvesting for Quality
Colm Feely, Monaghan Mushrooms Group
Picking to Optimise Profit
Leslie Codd – Codd Mushrooms Ltd
Raise Your Game - production targets
Tom Kellegher, Teagasc

15.30 **Tea/Coffee – sponsored by Northway PO**

16.00 - 17.00 **SESSION 2 – Chairperson: Thomas Martin (CMP PO)**
Back to Basics for Verticillium and Cobweb Control
Dr. Helen Grogan, Teagasc
Energy Update
Brendan Burns, Sylvan
Can you Reduce your Electricity Bill?
David Trimble, Renewable Energy Technologist, CAFRE
Why Does Traceability Matter to me?
Alice McGlynn, Bord Bia
Marketing and Promotion in the UK and Ireland
Michael Slawski, Bord Bia

17.00 **Industry Session**
Growing Market Share
Paul Wilson, Monaghan Mushrooms
Padraic O'Leary, Walsh Mushrooms
Mel O Rourke, Sylvan Europe
Thomas Martin, CMP PO

18.00 **Finger Food – Sponsored by CMP PO**

19.00 **Trade Show & Conference Closes**

Breffni Mushrooms is a key supplier of mushrooms to the Irish and UK market. Located in County Cavan, our three family-run farms are ideally located to supply the Irish and UK market.

Established almost 30 years ago, we specialise in supplying high quality mushrooms to consumers, retailers and the catering and processing sectors. With over 250 employees and 80 mushroom growing rooms, we supply 500,000lb weight of mushrooms per week.

Breffni Mushrooms

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Conference Organising Committee

Gerry Walsh (Chairman)	Teagasc
Brendan Burns	Sylvan
Leslie Codd	Codd Mushrooms
Noreen Cunningham	DAFM
Patricia Erwin	UFU
Michael Flanagan	Custom Compost
Helen Grogan	Teagasc
Katie Irgin	ADHB/HDC
Tom Kellegher	Teagasc/CMP
Mairead Kilpatrick	AFBI
Kieran Lavelle	CAFRE
Ciara McKearney	Northway PO
James O'Brien	Monaghan Mushrooms
Cathal Reilly	Lakeside Mushrooms
Gerry Reilly	Reilly Mushrooms
Michal Slawski	Bord Bia

Missing Ad
QUINN MUSHROOMS

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2013 PROJECTED ALL IRELAND MUSHROOM OUTPUT

Compost cropped and Mushroom farm gate value

	Ireland	RoI	NI
Phase III compost (tonnes)	210,860	173,338	37,472
Phase II compost (tonnes)	84,760	37,660	47,100
Total compost (tonnes)	295,620	211,048	84,572
Mushroom farm gate value		€117.4m	£35.7m

Conference Papers

MushTV – Research Update

Dr Helen Grogan‡
Mairead Kilpatrick*

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Background

Figure 1 First Consortium meeting in Dublin 2012

MushTV is a three year EU FP7 project generating scientific information and technologies for the European mushroom industry. The MushTV Consortium is made up of 17 partners across all sectors of the industry and includes six grower associations, five compost companies and five research organisations in Ireland, Britain, Belgium, Netherlands and Poland (Figure 1). The project is focussed on generating scientific information and technologies in the areas of disinfectants, disease diagnostics and biopesticides to deal with two important diseases affecting mushroom production -*Trichoderma aggressivum* and Mushroom Virus X (MVX).

Trichoderma aggressivum is a fungus that causes compost green mould, which dramatically reduces mushroom yield, while Mushroom Virus X (MVX) disease is associated with a complex of viruses that cause mushroom browning, poor quality, crop delay and less-productive crops. As the Industry knows to its cost, both diseases can have a significant impact, particularly if they infect our technologically advanced “bulk phase 3” compost production facilities. The highly automated systems used in “bulk–handling” spawn-run compost for transportation to growers, mean that the pathogens can be widely dispersed around compost facilities and mushroom farms before either green mould or virus problems develop. The application of the solutions delivered by the project will ultimately aid, not only the detection and diagnostics of the two pathogens, but will also reduce crop losses and increase efficiency and competitiveness.

The objectives of MushTV are covered by seven distinct research work packages (WP) which are summarised as follows:

Project Objectives:

WP1 To identify alternative disinfectant products and methods of disinfection that perform well on mushroom facilities (large air volumes, large machines, high levels of organic matter). **Johan Baars - PRI, the Netherlands**.

WP2 To identify the viral entities that make up MVX and to improve diagnostic tests for use on compost and mushrooms **Kerry Burton & Ed Dobbs - EMR, UK**

WP3 To develop a *T. aggressivum* diagnostic method based on volatiles from infected compost. **Roland Mumm - PRI, the Netherlands**

WP4 To identify where reservoirs of *T. aggressivum* and MVX inoculum occur at compost and grower facilities. **Helen Grogan & Caoimhe Fleming-Archibald - Teagasc, Ireland**

WP5 To evaluate the efficacy of the biopesticide *Bacillus subtilis* for the control of mushroom diseases. **Nancy Pyck - Inagro, Belgium:**

WP6 To describe the pattern of growth of *T. aggressivum* in a bulk compost-incubation tunnel and its dispersal when the compost is bulk handled and transported. **Mairead Kilpatrick - AFBI, UK**

WP7 To track the incidence and spread of MVX inoculum on mushroom facilities before, during and after an outbreak. **Helen Grogan & Caoimhe Fleming-Archibald - Teagasc, Ireland**

WP8 To disseminate and communicate the results to mushroom growers, composters and their staff through a series of technical fact sheets, workshops, seminars and conferences, and to commercially exploit any potentially interesting technologies. **Ruth Ashfield – AHDB, UK**

Results to date:

At just over the half way mark, good progress has been achieved on all objectives and some key results are summarised below:

Alternative disinfectant products and methods.

Identification of alternative disinfectant products that are effective against *T. aggressivum* and MVX (which is carried by *Agaricus bisporus*) is a priority for the industry. In consultation with the Consortium, a shortlist of products for evaluation was drawn up and then tested under laboratory conditions. Spores of *A. bisporus* and *T. aggressivum* were shown to be killed by most of the disinfectants. In contrast however, when the pathogens

were tested within compost particles it was difficult to kill either *Agaricus bisporus* or *T. aggressivum*. This has significant practical implications for the Industry and during the final year of the project a Technical Factsheet will be prepared on the efficacy of disinfectants at killing *Trichoderma* and virus-infected *Agaricus* propagules on farms and compost facilities. It will give clear guidance on the best way to achieve good disinfection of machinery and facilities. Information will also be regularly presented to industry through a range of workshops, seminars and conference presentations.

MVX - characterisation and improved diagnostics.

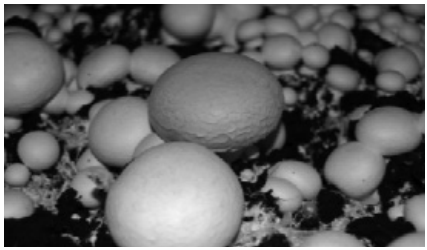

Figure 2 MVX infected mushrooms displaying "brown" symptoms

Characterising the "MVX" viruses present in MVX-infected mushrooms is key to understanding this complex disease (Figure 2). Sequencing and bioinformatic analysis has tentatively identified 17 viruses which fit into ALL of the 11 classes of virus described for fungi. This suggests that *A. bisporus* has received viral infection on multiple occasions. It is unknown whether these have occurred historically or in recent times. Only one of these viruses, Mushroom Bacilliform Virus (MBV), has previously been fully sequenced. The remaining viruses are new to science. This new genetic information will facilitate the development of sensitive QPCR diagnostic tests that will be made available to mushroom industry service-providers. Good progress has also been made in simplifying virus extraction from compost samples which should enable diagnostic tests to be more reliable.

Volatile diagnostic method for *T. aggressivum.*

Figure 3 Small scale volatile detection trials at PRI in the Netherlands

Being able to detect volatile organic compounds (VOCs) of *T. aggressivum* in infected compost would greatly improve control of compost green mould (Figure 3). Preliminary results indicate that VOC profiles from *T. aggressivum*-infected compost can be discriminated from healthy compost after 14 days of growth in bulk tunnels. Data analysis is progressing. Ultimately, this research will lead to the development of a volatile-based diagnostic method to detect *T. aggressivum* in phase 3 compost. Such a piece of equipment will alert composters when there is a *T. aggressivum* infection in phase 3 tunnels.

Composters can then make better informed decisions and take action to minimise the impact of a potential disease outbreak and focus their attention on more rigorous hygiene measures.

Reservoirs of *T. aggressivum* and MVX on mushroom facilities.

Identifying where reservoirs of *T. aggressivum* and MVX occur on compost and grower facilities highlights weaknesses in their hygiene measures. Pilot studies have been completed and critical locations were identified for sampling. Four composters and four growers have been surveyed, and samples were tested for *T. aggressivum* and MVX. Results were reported back to industry on a confidential basis. Further testing of farms and compost facilities are planned or underway. This information will help individual SME's to be more informed of disease risks on their facilities. (Work on tracking the incidence and spread of MVX inoculum on mushroom facilities before, during and after an outbreak is just starting).

Biocontrol of mushroom pathogens using *Bacillus subtilis*.

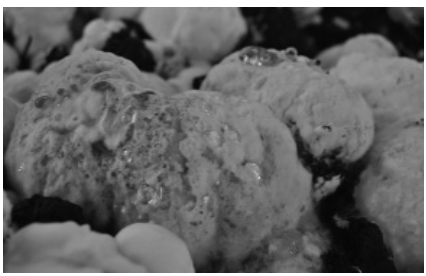

Figure 4 Classic Mycogone (wet bubble) disease symptoms from trials at Inagro, Belgium

Identifying new products to control mushroom diseases is a high priority as there is only one approved product available in most EU countries. *Bacillus subtilis,* a biocontrol agent, is therefore being evaluated. Results indicate that although *Bacillus subtilis* has little effect on *A. bisporus* production it was not effective against *Mycogone* (wet bubble) or *T. aggressivum* (Figure 4). Further work is ongoing to test it against pathogens causing dry bubble and cobweb disease. A second product, Natamycin, is also being evaluated. Should a successful disease control product be identified, the Consortium will co-operate with any company that will support the registration of the product for use in Europe. A new effective disease control agent would greatly reduce anxiety within the mushroom industry. A technical factsheet on disease-control will be produced for any successful product identified.

Growth of *T. aggressivum* in bulk phase 3 tunnels.

In order to characterise the growth of *T. aggressivum* in bulk-incubation tunnels trials were conducted in experimental tunnels (1.8 tonnes), subdivided into vertical and horizontal sections. A *T. aggressivum* infection was introduced into the bottom left hand corner at the rear of the tunnel (Figure 5). During tunnel emptying, (end of spawn-run), *T. aggressivum* was not generally visible in the tunnel however yield from compost at the back of the tunnel (near infected area) was reduced by 100% while in sharp contrast, compost from the front

of the tunnel cropped normally. Further trials that involve mixing the compost to replicate the bulk-handling and transportation processes that occur at commercial bulk phase 3 facilities are now progressing. This research is increasing our understanding of how *T. aggressivum* grows and is dispersed within the Phase 3 compost system .Information from all the *Trichoderma*-related research areas above will be used to compile a technical factsheet for mushroom growers and composters. Information will also be given to industry through workshops, seminars and conference presentations.

Figure 5 Experimental compost tunnels and trials at AFBI, Loughgall

Dissemination and training

To date a number of articles have appeared in the mushroom press in the various partner countries (Ireland, Britain, Netherlands, Belgium and Poland) and a public website for the project is available at http://www.mushtv.eu. The first major dissemination event was held

Figure 6 Irish growers visit the MushTV stand at “Champignondagen” in the Netherlands

on May 29-31st 2013 at the International Trade Show for the Mushroom industry in the Netherlands, known as the "Mushroom Days - Champignondagen," event, where 2,200 visitors from 62 countries had the opportunity to visit the MushTV stand (Figure 4). A summary of results to date has also been given to the Polish Mushroom Industry at a recent Mushroom Conferences.

MushTV Consortium

Grower Associations:

- Commercial Mushroom Producers Cooperative Society Ltd. (CMP) - Ireland
- Agriculture and Horticulture Development Board (AHDB) - United Kingdom
- Coöperatie Funghi UA (Funghi) - Netherlands
- Stowarzyszenie Brany Grzybów Uprawnych (SBGU) - Poland
- Vereniging van Onafhankelijke Champignonkwekers (VOC) - Belgium
- CNC Grondstoffen B.V. (CNC) - Netherlands

Industry Partners:

- Custom Compost - Ireland
- Monaghan Mushrooms Ltd - Ireland
- Hooymans Compost BV - Netherlands
- NV Karel Sterckx - Belgium
- International Mushrooms Ltd. Trading as Sylvan Ireland - Ireland
- The CIRCA Group Europe Ltd. - Ireland

Research Partners:

- Teagasc – Agriculture and Food Development Authority (Co-ordinator) - Ireland
- Stichting Dienst Landbouwkundig Onderzoek (PRI) - Netherlands
- East Malling Research (EMR) - United Kingdom
- Agri-Food & Biosciences Institute (AFBI) - United Kingdom
- PROVINCIAAL EXTERN VERZELFSTANDIGD AGENTSCHAP IN PRIVAATRECHTELIJKE VORM VZW (Inagro) - Belgium

Acknowledgements

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 286836 - MushTV. Further details of the MushTV project can be found at www.mushtv.eu and by visiting the stand in the Trade Show today.

Crop Yield Prediction Solution

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Features in Brief

- Simple to use
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- Simple on screen overview of individual crop yields
- Simple reporting on screen or to spreadsheet
- Allocate yields to product categories if required
- Software As A Service (SAAS) sales model.

Benefits

- Grower, producer group and / or marketing company can match predicted yield with sales
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- No large upfront costs.

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Harvesting For Quality

Colm Feely

Regional Manager, Monaghan Mushrooms Ltd.

Monaghan Mushrooms has eight growing sites throughout the UK and Ireland. Since 2005 we have worked to standardise our work practices throughout the farms and as a result of this we have seen large improvements in both yield and quality.

Producing quality mushrooms starts with the composting and growing. Compost needs to be consistent to allow blueprint growing. The filling/casing operation and growing function are very important and that the correct number of pins on the beds will lead to ease of harvesting. Over-pinned beds, inconsistencies within houses and deep pinned top shelves will restrict the harvester's ability to harvest quality mushrooms.

All farms within the Monaghan Mushroom group put a large focus on the harvesting, handling and cooling of our product. Harvesters influence the shelf life of the product as they handle each mushroom; poorly harvested mushrooms will quickly discolour and mark. We put all our harvesters through an intensive 12 week training program with the aim of achieving a FETAC qualification. Harvesters are taught how to graze harvest, the one touch harvesting technique and how to identify the correct mushroom to harvest in any pass. Double handling and rolling of the mushrooms in hands is not permitted. The challenge is to maintain these techniques and standards; the harvesting management team and supervisors are the most important group of persons on any farm. We provide training and coaching for our team with the aid of our training and development department. The company has recently rolled out standard operating procedures on all our sites which allow for all work practices to be audited against the standard way of carrying out the task.

We have dedicated collection teams on every farm who are responsible for collecting product at regular intervals from the harvesters. All our mushrooms are chilled within 30 minutes of harvesting. We have invested significantly in cooling on every farm over the past number of years which has given us the ability to prolong the shelf life of our mushrooms.

Picking to Optimise Profit

Leslie Codd

Codd Mushrooms Ltd
Email: leslie@coddmushrooms.ie

From August 2013 both Codd Mushrooms and Barrettstown farm commenced a study on harvesting methods with the view to maximise yield and quality off all crops.

The first part of this project would involve examining closely what is happening at picker level and seeing how improvements can be gained. The following outlines a four week trial. In this trial the crop was picked as normal but one supervisor picked 10% of the house. The results are as follows:

Week 1 Experiment			
	Picker	Supervisor Equiv	% Incr.
Day 1	3,163	4,912	55%
Day 2	8,909	9,792	10%
Day 3	3,813	3,992	5%
Day 4	1,500	1,000	-33%
	17,385	**19,696**	**13%**

Week 2 Experiment			
	Picker	Supervisor Equiv	% Incr.
Day 1	1,184	2,576	118%
Day 2	5,707	8,988	57%
Day 3	10,482	9,329	-11%
Day 4	2,393	1,494	-38%
	19,766	**22,387**	**13%**

Week 3 Experiment			
	Picker	Supervisor Equiv	% Incr.
Day 1	1,120	1,018	-9%
Day 2	906	1,743	92%
Day 3	5,199	6,893	33%
Day 4	5,304	4,524	-15%
	12,529	**14,178**	**13%**

Week 4 Experiment			
	Picker	Supervisor Equiv	% Incr.
Day 1	241	137	-43%
Day 2	3,687	4,955	34%
Day 3	7,946	9,145	15%
Day 4	4,866	4,641	-5%
	16,740	**18,878**	**13%**

NB: Supervisor equivalent is the volunme achieved if the whole flush was picked to the same standard as the supervisor.

After one month it was obvious to see that controlled picking was yielding a 13% increase on average in each flush. This would be equivalent to about 100 lbs per tonne of an increase.

The next step was to see what spread is being achieved from the highest yielding to the lowest yielding picker. On week 1 it was recorded but the girls were not informed that we were monitoring them. Eighteen pickers were selected for the sample and they picked exactly the same area for three weeks. After week 1 the girls were shown their results and as you can see, the spread between pickers reduced from 36 to 20 as weeks went on.

Picker No.	Week 1	Week 2	Week 3
1	1.01	0.99	1.03
2	0.98	0.96	0.99
3	1.07	1.02	1.04
4	1.02	0.9	0.98
5	1.03	1.07	1.04
6	1.05	1.1	1.06
7	1.17	1.09	1.07
8	0.99	0.98	1.1
9	1.09	1.04	1.06
10	0.96	1.08	1.04
11	1.15	0.99	1.11
12	1.03	0.9	1.02
13	0.81	0.93	0.91
14	0.86	0.83	0.95
15	1.03	1.08	1.05
16	0.96	1.08	1.06
17	1.09	1.05	1.03
18	1.01	0.99	1.02
Max. Diff	**36**	**26**	**20**

Implementation of New Picking Procedure
Now that it was ascertained that the potential for increasing yield was achievable we had to work out how this could be incorporated through the farm.

We were dealing with 105 pickers so we decided to split them into three groups. Each supervisor would manage 35 pickers and three floor men (runners). Each group would pick exactly the same amount of flushes each week. At the end of each week all information would be gathered. The supervisors would be scored against each other on the following points:

1. Kilos picked
2. Pick rate average per group
3. % rejections and downgrades
4. Hours worked by the three runners.
5. Disease count

When all of these parameters are correlated we will sit down with the three supervisors and discuss their performance. All things being equal the results should be very similar between each group. The highest scoring supervisor will receive a bonus each week.

Raise your game – production targets

Tom Kellegher

Horticultural Development Officer, Teagasc, Monaghan
Email: tom.kellegher@teagasc.ie

For years now many growers speak of yield in "yield per tonne of compost", normally expressed as "lbs per tonne". This is still the measure of yield for most growers. But is it the correct measure? Is there a better more representative measure particularly for the shelf production system?

In Europe, a discussion on yield will normally refer to kg of mushrooms per m^2. This measure is creeping into the mind set of leading Irish production units. The reason is because it is the best measure of performance.

Firstly, consider the shelf production system. There has been much debate re kg of compost to fill per m^2 for optimum production. A number of factors need to be considered.

- Can the climate control system, handle increased fill weights which will generate more activity?
- How much supplement is being used?
- Consider winter growing versus summer growing.
- Will the tunnel hold 25 tonne, 50 tonne, 75 tonne or even 100 tonne?
- Capacity of the compost delivery lorry is an important consideration

Fill rate

Fill rate and yield are interlinked. This is best explained by a worked example.
A growing unit yielding at 780 lbs per tonne (equivalent to 354 kg/tonne) is considered to be performing well. What exactly does this mean? Consider this on a typical farm with 3 Row 3 Level shelving, or 324 m^2 of bed area per tunnel.

Tunnel: 3 Row 3 Level shelving:

		Yield			
Compost Fill Rate	**Tonnes compost**	**lbs/t**	**Total lbs**	**Total kgs**	**kgs/m^2**
78	25.27	780	19,712	8,944	27.60
83	26.89	780	20,976	9,517	29.37
88	28.51	780	22,239	10,090	31.14

The yield is 780 lbs/tonne (or 354 kg/tonne). At a fill rate of 78 kg/m^2, this means a total compost fill weight of 25.27 tonnes. Total mushroom production at this yield is 19,712 lbs (8,944 kgs). When calculated as kg per m^2, the yield is 27.6 kg/m^2.

At a compost fill rate of 88 kg/m^2, a total compost fill weight of 28.51 tonnes is possible. Total mushroom production at this yield is 22,239 lbs (10,090 kgs). When calculated as kg per m^2, the yield is 31.14 kg/m^2.

Therefore, at a yield of 780 lbs/tonne (354 kg), this tunnel can produce between 19,712 lbs (8,944 kgs) and 22,239 lbs (10,090 kgs), a difference of 2,527lbs (1,148Kgs), depending on the compost fill rate. Bear in mind, this is per week across a farm, 52 weeks a year on only 324 m^2 crop area per tunnel. In one year, this adds up to 131,404 lbs (59,729 kg) of mushrooms. Given that more or less all the costs with the exception of picking and packaging and the additional tonnes of compost are covered in any case, this level of additional production is essential for any grower.

Tunnel: 3 Row 3 Level shelving:

Staying with the same scenario, a 3 Row 3 Level arrangement, and given we know from above that at a fill rate of 88 kg/m^2, each crop will produce 22,239 lbs (10,090 kgs), what is the equivalent yield in lbs per tonne required to produce the same weekly volume of mushrooms? The table below shows the comparison.

		Yield			
Compost Fill Rate	**Tonnes compost**	**kgs/m^2**	**Total lbs**	**Total kgs**	**lbs/tonne equivalent**
78	25.27	31.14	22,239	10,090	880
83	26.89	31.14	22,239	10,090	827
88	28.51	31.14	22,239	10,090	780

Considering again the 3 fill rates and maintaining our good yield of 780 lbs/tonne (354 kg), we have established that we can produce 22,239 lbs (10,090 kgs) per tunnel. At a fill rate of only 78 kg/m^2, you must yield at 880 lbs/tonne (399 kg/tonne) to produce the same volume of mushrooms.

In summary, a yield of 780 lbs/tonne (354 kg/tonne) on a fill rate of 88 kg/m^2 is equivalent to a yield of 880 lbs/tonne (399 Kg/tonne) on a fill rate of 78 kg/m^2.

Then there is a quality benefit from growing on a deeper bed of compost, more nutrition etc to be factored in.

Additional compost:

Growers may now get the option of buying additional compost per compost delivery, if composters can remove some of the heavy equipment attached to the back of compost delivery trucks. This may even reduce the compost cost per tonne to the grower when 27/28 tonne of compost is delivered instead of 25 tonne. An investment will be required by the grower to handle this type of compost delivery – in a compost hopper for example. This may well be a very worthwhile investment, leading to a reduction in cost per tonne of compost and possibilities to increase fill rate per M^2 if this is right for your farm.

Consider the 324 m^2 tunnel used earlier. Let's assume the farm has 6 of these tunnels on a 6 week schedule.

		Yield			
Compost Fill Rate	**Tonnes compost**	**lbs/t**	**Total lbs**	**Total kgs**	**kgs/m^2**
78	25.27	780	19,712	8,944	27.60
80	25.92	780	20,218	9,173	28.31
82	26.57	780	20,723	9,402	29.02

Consider filling just an additional 2 kg/m^2 due to more compost availability, and maintaining yield at 780 lbs/tonne (354 kg/tonne). Moving from 78 kg to 80 kg fill rate, will produce and extra 506 lbs (230 kg) per week – 26,312 lbs (11,960 kg) per annum. Moving from 78 kg to 82 kg compost fill rate, will increase mushroom production by 52,572 lbs/annum (23,896 kg). The only additional cost will be compost, picking and packaging. The compost may be cheaper (@ €2/tonne cheaper, equals €2,763/annum saving), and the payback on a hopper if required will be 1 – 3 years. This depends on grants *etc*.

Financial Benefit Summary

Considering all the data mentioned above, and applying the figures into a cost and returns spreadsheet, if a grower moves from filling 25 tonne per week to 28 tonne per week, the farm will generate an increased profit of **€28,100** per annum. This assumes a compost price discount of just €2 per tonne, based on a delivery of 28 tonne per load versus 25 tonne. Bear in mind, this is only for a 6 tunnel farm with 3 Row 3 Level shelving or 324 m^2 per tunnel. Future unit upgrades should plan for multiples of 27/28 tonnes per delivery, and growers should consider optimum filling rate for their farm, based on equipment capabilities, but if possible moving towards 88 kg/m^2.

Back to Basics for *Verticillium* and Cobweb Control

Dr. Helen Grogan

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Email: helen.grogan@teagasc.ie

The two diseases that tend to cause mushroom growers the most problems are Dry Bubble, caused by the fungus *Lecanicillium (Verticillium) fungicola* and Cobweb caused, in the main, by *Cladobotryum (Dactylium) mycophilum*. This presentation will focus on the basic control measures needed to minimise the impact of these diseases.

Dry bubble is by far the most common mushroom disease in the mushroom growing world and can easily account for crop losses of up to 5%, or more, on a regular basis. It is a sophisticated parasite and needs to penetrate into the living tissue of mushroom in order to grow and survive – it cannot grow on mushroom compost or casing. This makes it a difficult pathogen to control because the organism lives within the mushroom itself. It distorts the mushroom from the inside. The only time it manifests itself is when the infected mushrooms become deformed due to the presence of the *Verticillium*, and when it starts to produce masses of sticky spores (conidia) and it is these sticky spores that enable the disease to spread around farms and get into new crops. A considerable amount is now known about how dry bubble disease becomes established in a crop and how disease levels can get out of control. Teagasc and HDC have produced a factsheet entitled "Identification and control of Dry Bubble Disease of mushrooms" and the key elements of how to tackle this troublesome disease on farms are presented. The factsheet will be available during the conference.

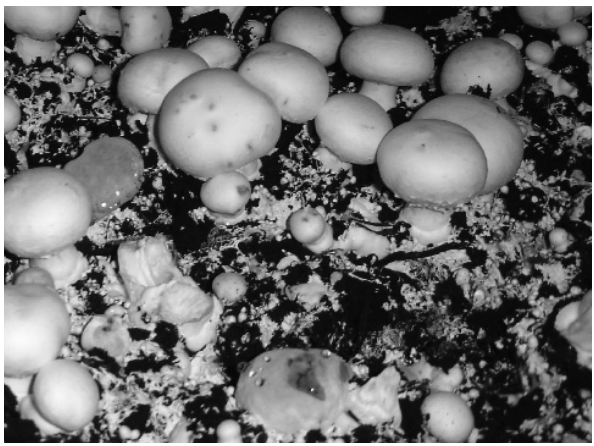

Figure 1 Dry Bubble infection causing crop loss and spoilage

Cobweb (also commonly called *Dactylium*) is another disease that gets out of control easily, leading to significant crop losses as well as loss of quality through spotting of mushrooms. This mould is also a parasite as it too requires mushroom tissue to grow. But, unlike *Verticillium*, it does not need to live within the mushroom. It is attracted to mushroom tissue and grows over the casing until it reaches one and then proceeds to attack it from the outside. This should make it easier to control however *Dactylium* has a strategy of producing masses of dry spores and that makes it much more difficult to control. The masses of dry spores are very easily dispersed into the air when disturbed - either by watering or when diseased mushrooms are handled - and the air circulation systems inside growing rooms effectively distribute them throughout the growing room. Again, Teagasc and HDC have produced a factsheet entitled “Identification and control of Cobweb Disease on mushrooms” and the key elements of how to tackle this troublesome disease on farms are presented. The factsheet will be available during the conference.

Figure 2 Cobweb spreading over casing and crop

Biomass and Energy Update

Brendan Burns
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The number of growers who are using biomass as a heat source has increased from 13 to 24 since the last conference in 2011. The Renewable Heat Incentive (RHI) scheme commenced in Northern Ireland in 2013 and eight growers have availed of this scheme installing 18 boilers of 100 kWh.

The cost of installing a 100 kWh pellet/ wood chip boiler is between £30,000 and £50,000 and with the RHI the payback will be less than 3 years on a 50t/week farm.

Figure 1 Frolling 99 kWh pellet boiler

Figure 2 99 kWh Chinese pellet boiler

Figure 3 Wood Pellet Bin Store.

In addition, 5 growers have installed wood pellet steam boilers which will approximately half the cost of "cooking out" a mushroom tunnel. The investment cost of the pellet steam boiler is approx €20,000 and this would give a payback time on a 50t/week farm of less than 2 years.

The price of woodchip and pellet has increased in the 2 years since the last conference. Quality of wood chip has varied from season to season and there have been problems with high wood chip moisture contents of 35-40% when wood that has not been seasoned long enough, is chipped. This increases the energy cost and is also a problem for the small boilers of 100 kWh which

struggle to generate enough output if the wood chip is high in moisture. Recycled wood has also caused problems with metal pieces damaging augers *etc*.

Despite these problems, the general experience of biomass is positive with the growers reducing their heating costs on the farm by 40-70%.

Cost of Biomass

	Cost/Ton Euros 2011	Cost/Ton Euros 2013	c/kWh 2011	c/kWh 2013
Wood pellet 10% moisture	165	205	3.5	4.4
Wood chip 25% moisture	60 - 100	80 - 120	1.6 - 2.6	2.1 - 3.2
Recycled wood	60 - 70	60 - 70	1.7 - 2	1.7 - 2
***Miscanthus* *harvested on site**	20	20	0.6	0.6
Marked gas oil	80 c/lt	80 c/lt	7.5	7.5

RHI Northern Ireland

Size of Boiler	Tariff
20 – 100 kWth	6.1p
100 – 1000 kWth	1.5p

RHI Britain

Size of Boiler	Tariff	
Less than 200 kWth	Tier 1	8.6p
	Tier 2	2.2p
200 – 1000 kWth	Tier 1	5.0p
	Tier 2	2.1p

Electricity Use

LED lighting is now available for Mushroom tunnels and can reduce the electricity use by over 60%. All new tunnels should use the new LED lights and converting existing lights to LED gives a payback time of between 5 - 6 years.

Using 1.2 m^2 heating and cooling radiators and an 800 mm air distribution duct offers much higher performance from the axial flow fans. There is as much as 60% more air volume for the same power consumption compared with the 1 m^2 radiators and 600 mm air distribution duct. As fans are running almost constantly, this offers a potential saving of €400 /growing room. In the case of new builds or upgrading existing tunnels it makes sense to go for the bigger radiators and ducts.

Reducing electricity costs in the mushroom unit

David Trimble

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Email: david.trimble@dardni.gov.uk

Energy inputs on a mushroom unit are high, amounting to nearly 10% of the total costs of production. Electricity accounts for around half of the energy costs. Ways of reducing the electricity bills include:

1. Negotiate your tariff

A customer now can choose from a range of electricity suppliers. This opens up the possibility of negotiating the electricity price and the larger the usage, the greater the bargaining power. It should be a regular practice to review your electricity tariff and aim to cut the cost of each unit purchased.

Negotiate. Negotiate. Negotiate.

2. Consider voltage management/optimisers

There are a range of devices that can reduce the voltage of the supply coming into your premises. These devices are able to reduce electricity bills when used in the right circumstances. They work with electrical equipment that is “voltage dependent.” This is a device where the power consumption varies with the voltage being supplied to it. Two examples are fluorescent lamps with ballast (i.e. switch start) and electric motors, especially those that are oversized for the job and operate much of the time at a partial load.

Before investing in a voltage optimisation device, a survey should be carried out to determine the voltage drop between the incoming supply point and the electrical equipment being supplied. The size of this voltage drop along with the type of equipment used will influence the investment decision. In some instances, it may be more economical to replace voltage dependent lighting with newer high efficiency bulbs or install variable speed drive motors.

3. Invest in wind generation

The economics of an investment in wind power will depend greatly on your wind speed. The power output of a wind turbine is related to the cube of the wind speed. An average wind speed of 5 metres/ sec will give 125 units of power, whereas an average wind speed

of 6 metres/sec will give 216 units of power, almost twice as much. If the wind speed on your site is not satisfactory then don't invest in this renewable energy option.

4. **Invest in photovoltaic panels (PV)**

Photovoltaic panels produce electricity when sunlight falls on them. With a reduction in installation costs and good financial support measures in GB and N Ireland, they are becoming more common on homes and businesses.

The payback will depend on:

• the value of the electricity produced

• the level of financial support per unit (kWh) generated.

Figure 1 Free standing PV array in Co Fermanagh

Figure 2 PV on pig house roof

Payback times in Northern Ireland

The daytime price of Farm Nightsaver electricity is over 16 pence/kWh and electricity sold to the grid under 6 pence/kWh. The support from Renewable Obligation Certificates (ROCs) for all electricity produced is around 17.6 pence/kWh for systems under 50 kW capacity.

A simple payback calculation gives:

a payback time of around 5 years if all the electricity is used on the unit
a payback time of 7 years if it is all sold to the grid.

However this does not take into account the cost of borrowing money for the installation of the system or any improved payback from an increase in electricity prices.

Payback times in Great Britain

In GB, a typical electricity price for a small commercial unit will be 11.5 pence/kWh and the Feed in Tariff support system gives around 12.5 pence/kWh for a system between 10 kW and 50 kW capacity. This gives a simple payback time of around 6.8 years, if all the electricity is used on the unit.

Payback times in the Republic of Ireland

There is no ongoing market support for commercial PV installations, though there is the fiscal incentive of a full tax write-off in 12 months, if desired. This means that the payback times depend on the savings due to reduced electricity purchases. If electricity is 18 cents/kWh this will give a payback time of around 10.7 years.

For further information contact David Trimble at david.trimble@dardni.gov.uk or by phone (028) 9442 6682

There will be an opportunity to learn about the full range of renewable energy options at the **Practical On-farm Renewable Energy** event at Greenmount Campus, Antrim on Tuesday 29th October from 11.00 am to 8.30 pm.

Why Does Traceability Matter?

Alice McGlynn

Development Marketing Executive – Quality Division
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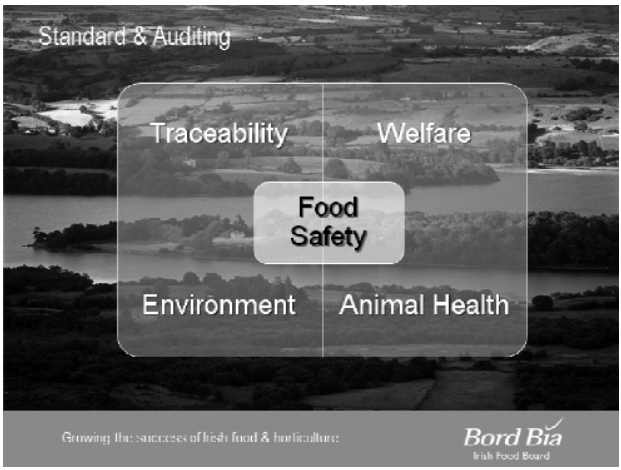
Essential to any food business' quality management system is the ability to track and trace all the individual elements of a product through every stage of production and distribution. The pressure on the food industry for fully reliable documented systems to trace all ingredients has never been stronger. Traceability is a legal requirement and has always been a cornerstone of all Bord Bia standards.



Bord Bia requires full traceability at all stages and during all processes along the supply chain. REGULATION (EC) No 178/2002[1] explicitly states that the Food Business Operator (FBO) is responsible for supplying the market with safe food. In direct relation to 'Traceability', the legislation states:

> *(28) It is therefore necessary to establish a comprehensive system of traceability within food and feed businesses so that targeted and accurate withdrawals can be undertaken or information given to consumers or control officials, thereby avoiding the potential for unnecessary wider disruption in the event of food safety problems.*

[1] REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 January2002: laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety

> *(29) It is necessary to ensure that a food or feed business including an importer can identify at least the business from which the food, feed, animal or substance that may be incorporated into a food or feed has been supplied, to ensure that on investigation, traceability can be assured at all stages.*

Article 19 of the legislation goes on to say:

> *If a food business operator considers or has reason to believe that a food which it has imported, produced, processed, manufactured or distributed is not in compliance with the food safety requirements, it shall immediately initiate procedures to withdraw the food in question from the market…. and inform the competent authorities.*

It is therefore incumbent on the FBO to have in place a traceability system that guarantees, at a minimum, the ability to identify the source of any ingredient and the destination of all final product. This is known as, 'one step forward and one step back' traceability.

Over the recent past several high profile public cases have brought the word 'Traceability' into every day 'parlance'. The most notable, and one of the most recent, exposed a Europe-wide meat adulteration scandal where foods being sold as containing Beef were found to contain other meats such as horse and pork. In some cases, as much as 100% of the product was not beef. Other notable incidences, to name but a few, include: the dioxin crises in Irish Pig meat industry, *E. coli* contamination of fenugreek seeds from Egypt causing over 50 deaths, Listeria outbreak linked to cantaloupe in the US causing 29 deaths and the current outbreak, in the US and Europe, including Ireland, of Hepatitis A, linked to imported frozen soft fruit.

The mushroom industry in Ireland is noted for exemplary levels of professionalism especially in the areas of quality management, hygiene and traceability. The export nature of the sector has necessitated mushroom producers to undergo multiple audits including GlobalG.A.P, Bord Bia and Tesco Nurture for many years. Industry members are well aware that the consequences of a food safety or traceability incident on an individual company and the ramifications for the entire industry would be extremely damaging, even catastrophic. The Irish mushroom sector has succeeded in implementing effective systems to ensure the safety and traceability of the product. This said it is accepted that continued vigilance and a necessity to look critically at current systems is required to implement improvements, where possible, on an on-going basis.

Levels of a traceability system

- Internal Traceability
- Chain Traceability

Internal Traceability

An internal traceability system documents and tracks all the steps involved in the production and distribution of the product in such a way that an effective recall/withdrawal can be implemented where necessary and without difficulty. A traceability system may be designed to follow the production (process) flow or the other way around, where the business may introduce traceability friendly practices, and then design the production process around that. Such a traceability friendly practice may help to isolate contaminated items and recall these efficiently, and possibly reduce direct cost. In low risk operations designing the production system to make a user friendly traceability system may not prove to be the most cost effective approach and so a traceability system may need to follow the production path already in place.

Whatever the approach, an effective internal traceability system is key to managing any food quality issue that may arise.

It is essential that the traceability system in place answers the following questions:

- What items have been received from suppliers;
- What items have been used to produce the product;
- What items have been distributed and to whom;
- What items still remains in the facility.

The activities employed to implement an effective Traceability system include:

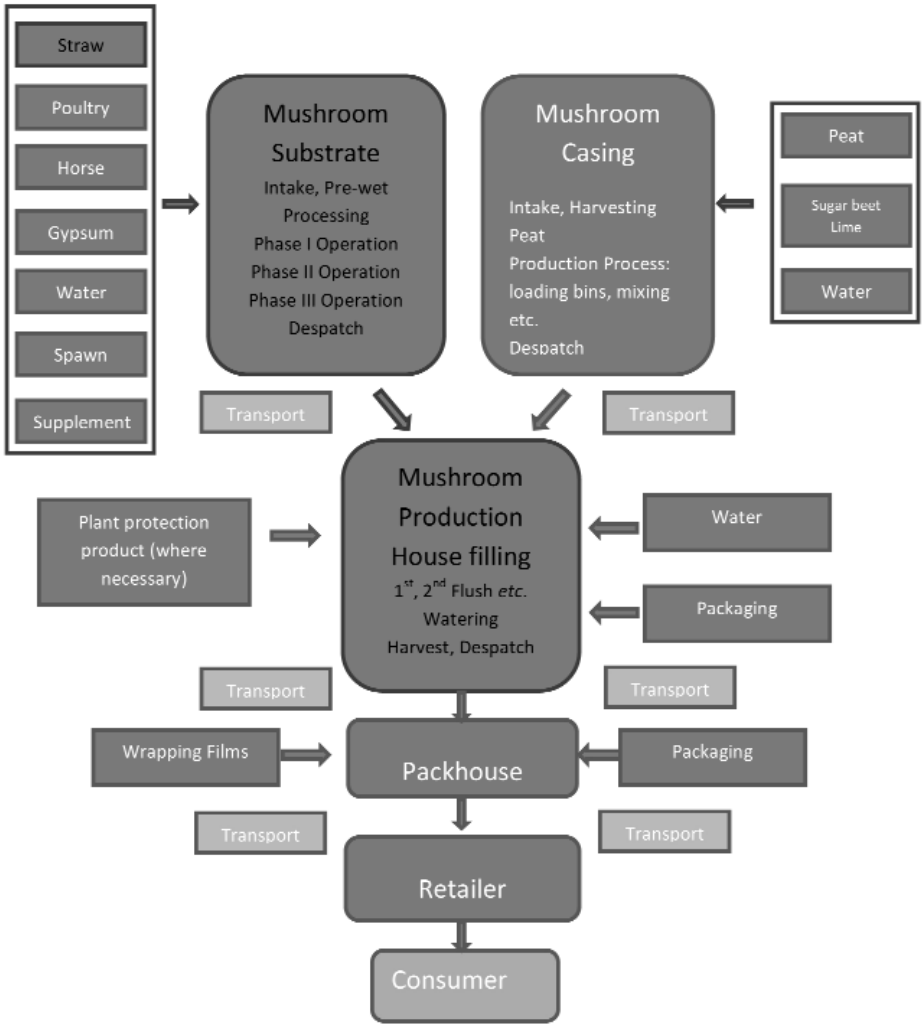
- Record keeping: recording of all activities relating to the production and handling of a product through to dispatch.
- Labelling: Product identification links the incoming and dispatched product with production activities and the ingredients, including timelines and complex mixes that might have taken place.
- Reconciliation and mass balance: confirming and locating the total number of units of a specific batch of product produced and distributed.
- Recall/Withdrawal: Activities a business puts in place to instigate a recall or withdrawal of product so as to prevent contaminated (or damaged) product from entering the food chain.

Chain Traceability

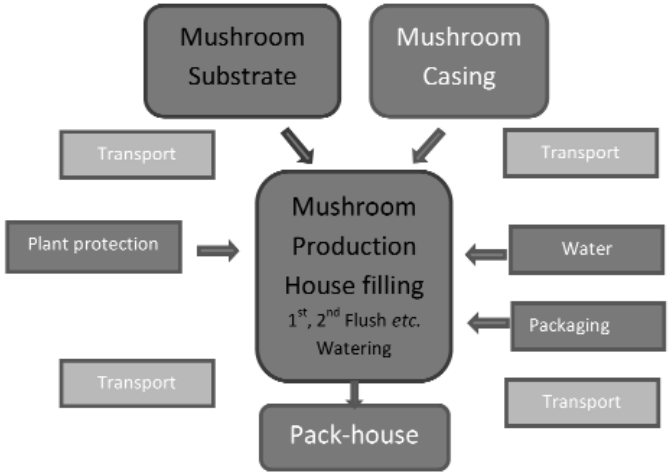
Like every chain, a supply chain is only as strong as its weakest link. Chain Traceability takes into account more than the ‘one step forward one step back’ concept; it considers every link along the chain. With rising globalisation tracing a product along a supply chain has become increasingly more complex. A pizza made in Ireland might have product coming from all over the globe before it is distributed from some central location to numerous other destinations. Although mushroom production may appear to be relatively uncomplicated it still has many components and in order to ensure an efficient and effective

traceability system thought must be given to each one of these. Following is an illustration of the steps in the supply chain for mushroom production.

The Mushroom Production Supply Chain



Internal Traceability: Mushroom Production



Mushroom Supply Chain Traceability Main Points

Substrate Production

Each ingredient going to make a batch of mushroom substrate must be traceable to its supplier and to a specific load.

This traceability to source must be maintained during the mixing/adding of ingredients. This can be difficult as one batch of final product may have more than one separate delivery of several ingredients. The supplier approval process must be robust enough to ensure that the correct controls are in place on the source site and that the supplier is aware of their obligation to provide traceability on all ingredients. They should also be made aware that the product they are supplying will be used in the production of a food product. The final tunnel in which the phase 3 production takes place must be recorded for traceability purposes.

Casing Production

Each batch of casing must be traceable to the site of extraction. The Sugar beet lime must be bought from reputable sources only. Materials are stored separately on site before mixing.

Each batch of casing must be tested for pathogenic microorganism to identify contaminants that may be present. All records for the production of a single batch of final product must be

maintained and presented for review during an audit. Positive release of final product is hindered due to the fact that some of the required tests can take up to 5 days to be completed by the laboratory. This makes it more important that an effective and efficient traceability system is in place in order to prevent mushrooms being released onto the market where a contaminant has been detected.

Mushroom Production

It is important that producers can trace product to specific growing houses and not only to their farm. Traceability to the farm only increases the risk of greater loss for the producer if a problem were to arise. In some standards traceability to a specific house is not a requirement however, it is likely that this step will be adopted as mandatory requirement in the near future. Producers linking the batches of both casing and substrate to houses must be able to link that house with the harvested product, otherwise traceability is lost. The intake date is often used to identify specific batches of casing and substrate down to the mushroom house i.e. linking the batch codes to the house number.

The delivery documentation for the casing and substrate must identify all the information required for full traceability for the product arriving on the producers unit. Laboratory information relating to the specific batch of casing or compost must also be linked to this information.

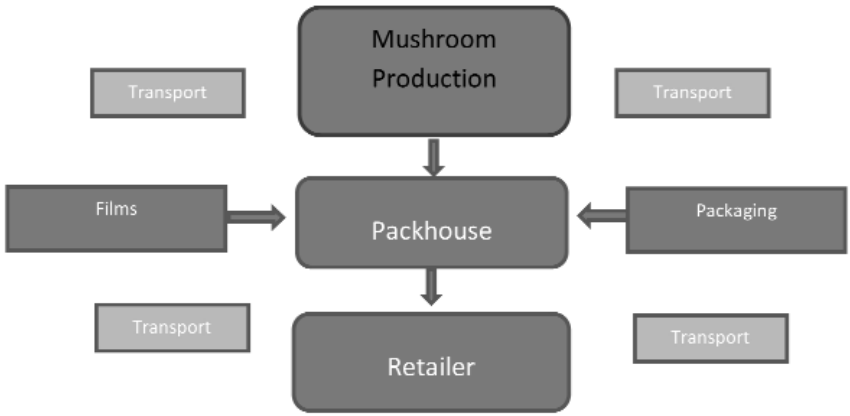
Detailed records must be kept for all activities relating to the production process of the mushrooms. These records are inspected during audits and must be kept for a minimum of 5 years, in the case of application of plant protection products, and 3 years for all others. The latest Bord Bia Standard which is to be launched at the beginning of 2014 includes a requirement for mushroom producers to source casing and substrate from only certified manufacturers.

Harvesting and Despatch

Where final packing is conducted off site each punnet is often marked with a producer number, or name, and a picker number to ensure traceability. This process must be checked regularly to ensure that the correct information has been recorded as it is a crucial link in the traceability chain. Checks are usually done, at a minimum, before and after use by the picker themselves.

Producers provide pallet cards or other delivery documentation identifying the product code, product type, quantities and producer name/code for each order. This information is essential for the packer receiving the delivery to maintain traceability and to perform reconciliation where required.

Pack-house Internal Traceability



The product arriving from approved suppliers must contain all the above information. Most likely traceability and stock management software is used to track the product from intake through the various stages of packing: grading, separation into orders, labelling and despatch. It is imperative that vigilance to traceability is maintained throughout the process. During an audit the auditor will take a product being despatched and will track it back through to intake to ensure the traceability system in place is effective. Traceability of all materials which come into contact with the product must also be maintained.

The 'Display Until Date' is often used as the link between the final product and the dispatch records from the packer.

Transport is also an important link in the chain and full traceability to specific vehicles at each step must be maintained.

This paper is a brief overview of the traceability system along the mushroom production supply chain. The importance of an effective and efficient system cannot be over emphasised for the food business operator. Having a thorough traceability system in place will significantly minimise the risk of the need for a total recall of mushrooms in the event of a food safety crises. This in turn will limit damage to consumer confidence and shorten the period required to re-establish market penetration.

Marketing and Promotion in the UK and Ireland

Michal Slawski

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1. An overview of production in Ireland and the UK
2. The retail market in the UK
3. The retail market in Ireland
4. Promotion update from the UK and Ireland

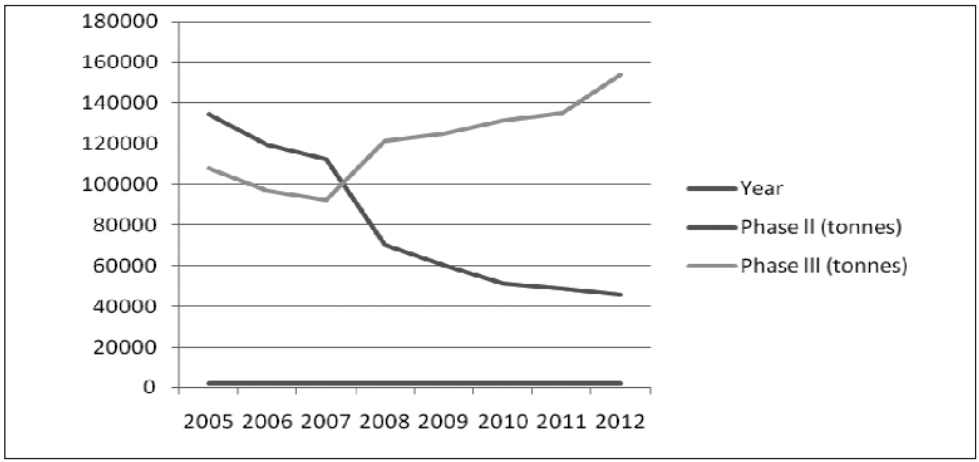
An overview of production in Ireland

The success of the Irish mushroom industry has been well documented over the last three decades. A low cost production system, satellite growing, centralised compost production and marketing and a well presented good quality product targeted at a growing market were a number of the reasons highlighted that contributed to this success. Mushroom output grew throughout the eighties and nineties until it represented one third of total horticultural output. There was mushroom production in virtually every county as grower numbers approached 1000.

In early 2000 the picture began to change. The industry was coming under pressure from a number of sources. Costs of production increased including labour, packaging and insurance *etc*. The market has become much more competitive. Overall market growth has levelled off in recent years. Other suppliers such as Dutch and Polish suppliers have come into the market place and they have gained market share. In addition, the ongoing aggressive competition between UK retailers for market share continues to put pressure on prices.

There has been large scale consolidation within the industry, with a drop in the number of growers from approximately 1000 All Ireland in the late 90's to currently 75 growers in the South and 37 in the North.

Mushroom compost production ROI



The upgrading of facilities, especially the installation of Dutch shelving to accommodate the use of Phase 3 compost is an ongoing process. Investment in on farm energy systems has continued, concentrating on the use of renewable energy sources including wind, wood pellets and geothermal heat systems, and well as energy efficient heat recovery systems.

The farm gate value of mushrooms produced in the South is €112 million, and £31 million in the North.

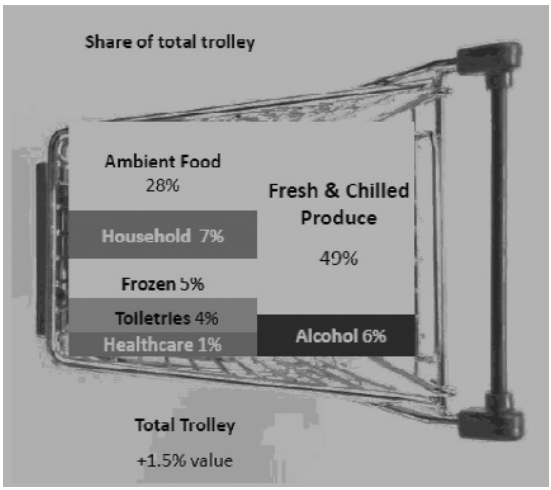
The UK market is supplied as follows:

Country	Production volume
Great Britain	62,000
N. Ireland	16,000
Rep of Ireland	47,000
Netherlands	29,000
Poland	17,000
Others	7,000
Total	**178, 000**

Source: DEFRA Import Figures and Industry sources

In the UK, a DEFRA paper on mushroom production up to 2010 shows some interesting statistics. They found that the production area of mushrooms has decreased since 2007 from 126 to 86 hectares and that there has been a steady declining trend in the area of mushrooms since 2004 due to a reduction in the number of mushroom growers as they have struggled to compete with other countries. Usage of compost dropped from 191000 tonnes in 2004 to 91 000 in 2010. The paper also notes that the quantity of mushrooms imported into the UK almost doubled between 2001 and 2005, which would explain the reduction in the number of English mushroom growers. The survey shows there are 82 growers left in the UK. A production survey is underway again in 2013, and is likely to show an increase in production as there has been a number of planning applications for production units in the last few years.

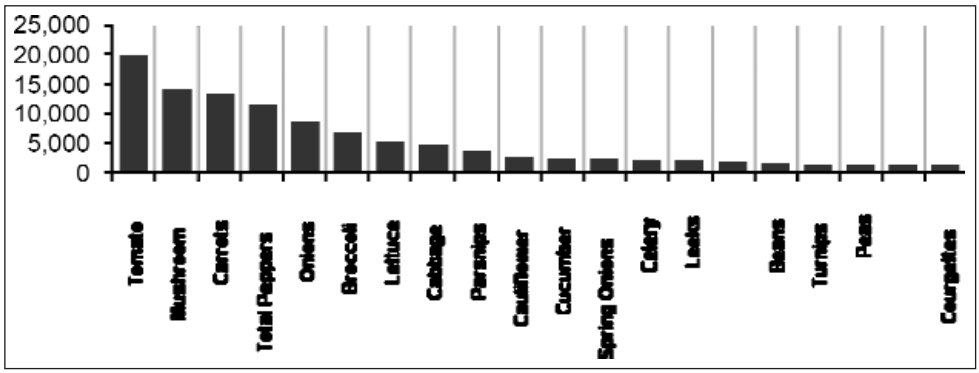
The retail market in Ireland



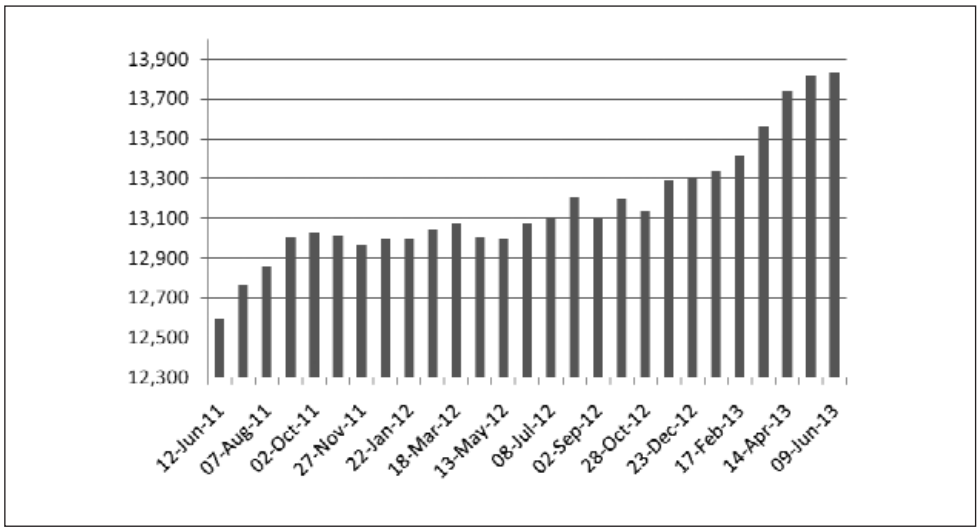
The Republic of Ireland has a population of 4.6 million, which is forecast to grow to 5.07 million by 2021.GDP has declined from €189 billion to €156 billion in 2010, representing the effects of the recession and the collapse of the construction industry. However, the economy is recovering to some extent, growing in 2011 and again in 2012 to $164 billion. Ireland's grocery retail market is rated at 16th in Western Europe.

To put mushroom sales in context, it's interesting to see how they fit into grocery sales in general – they form part of fresh and chilled produce which make up nearly half of the value of grocery sales.

Within fresh produce, mushrooms are the second biggest vegetable in sales by value, behind tomatoes

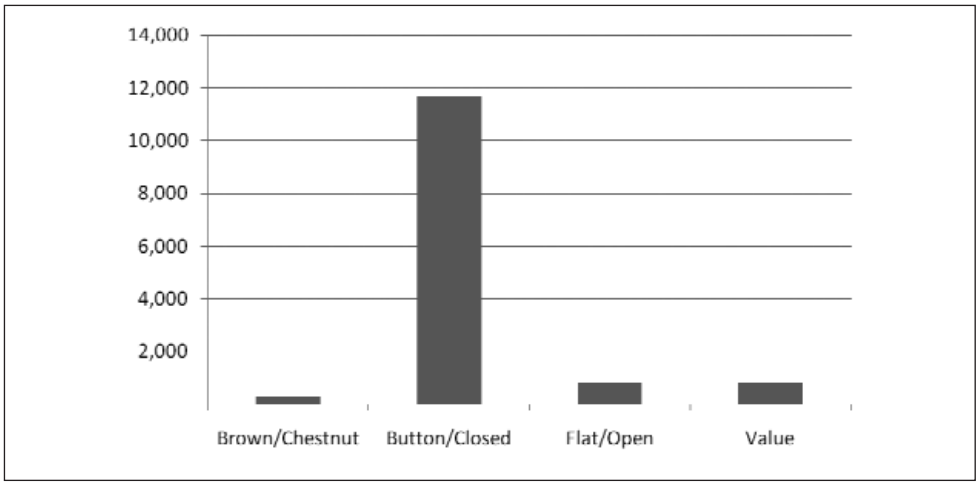


12 weekly sales of vegetables to the 20th of June 2013 (Source: Kantar)



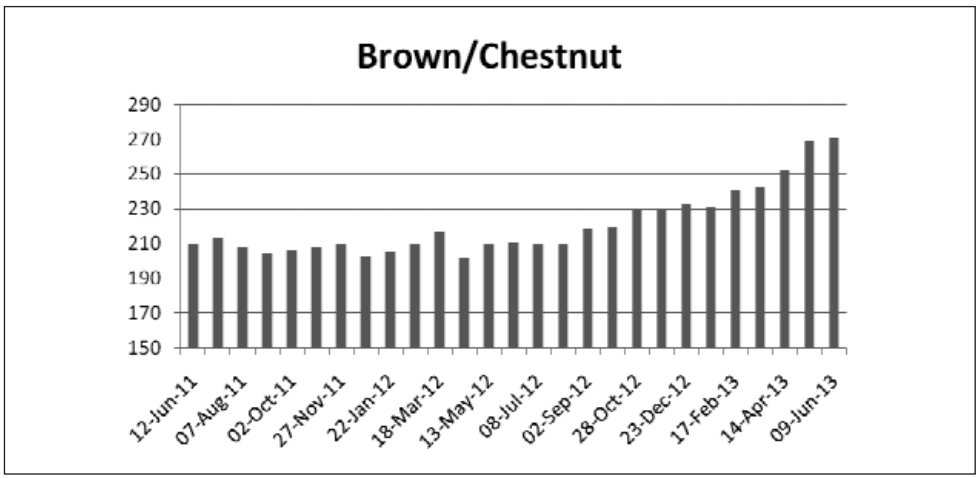
Total Retail Mushroom Sales in Ireland in Tonnes
(Source: Kantar)

Retail mushroom sales have grown steadily in the last two years. The majority of sales are of closed cup mushrooms.



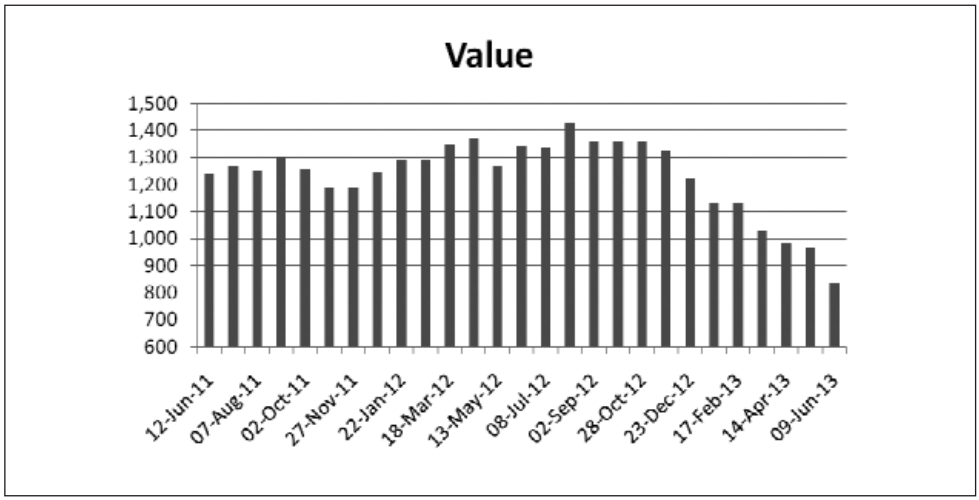
Total Retail Mushroom Sales in Ireland in Tonnes
(Source: Kantar)

Brown mushrooms are an area of growth in Ireland – they come off a small base, but follow an interational trend in the rise in popularity of brown mushrooms.



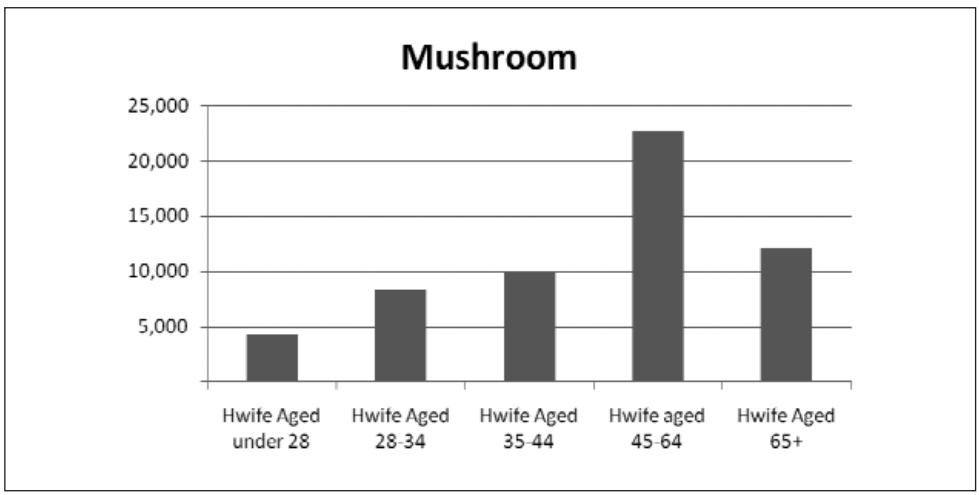
Brown Mushroom Retail Sales in Ireland in Tonnes
(Source: Kantar)

The sales of value mushrooms in Ireland have been in decline for nearly a year.



Value Mushroom Retail Sales in Ireland in Tonnes
(Source: Kantar)

The demographics of mushroom purchasing show that the older age groups dominate purchasing, but it hoped that the new 3 year mushroom campaign will help address this.

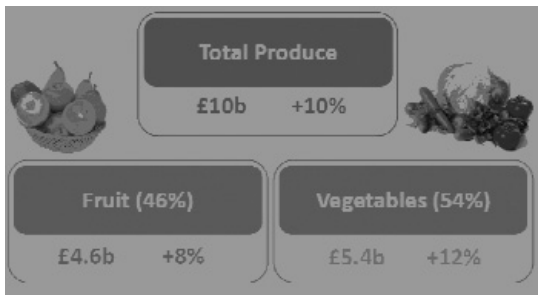


Demographics Mushroom Retail Sales in Ireland in €
(Source: Kantar)

The retail market in the UK

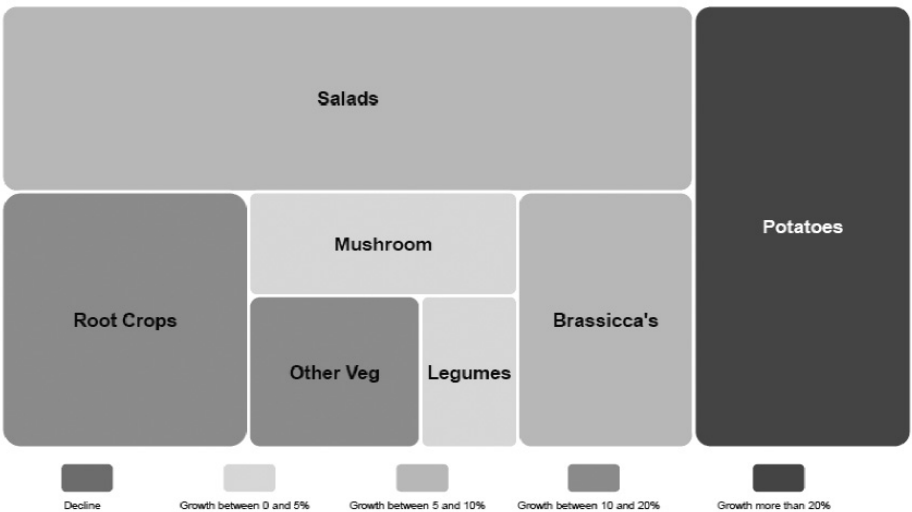
Current trends in retailing

There are currently 62 million consumers in the UK, which is forecast to grow to 65 million in 2021 and to 67 million by 2031. The UK has the third largest grocery market in Western Europe, valued at €162 billion, nearly on a par with Germany. Globally, their market is ranked 9th. In per capita terms, despite the recession, grocery spending has increased by 11% to £2248 since 2007, but has levelled off since 2009. This per capita grocery spending is one of the highest in Europe.

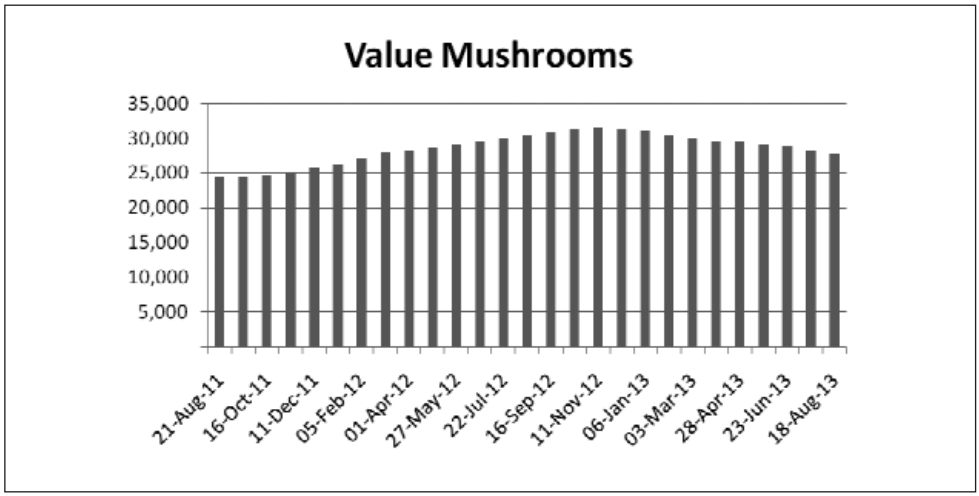


The retail value of fresh produce in the UK is £10 billion. Vegetables make up £5.4 billion of this, and grew in value by 12% in the last year, although most of this increase has been driven by price inflation.

Mushrooms make up 7% of the vegetable market by value, and grew by 3% in the last year, although unlike the rest of the market, most of this increase was driven by volume rather than by price.

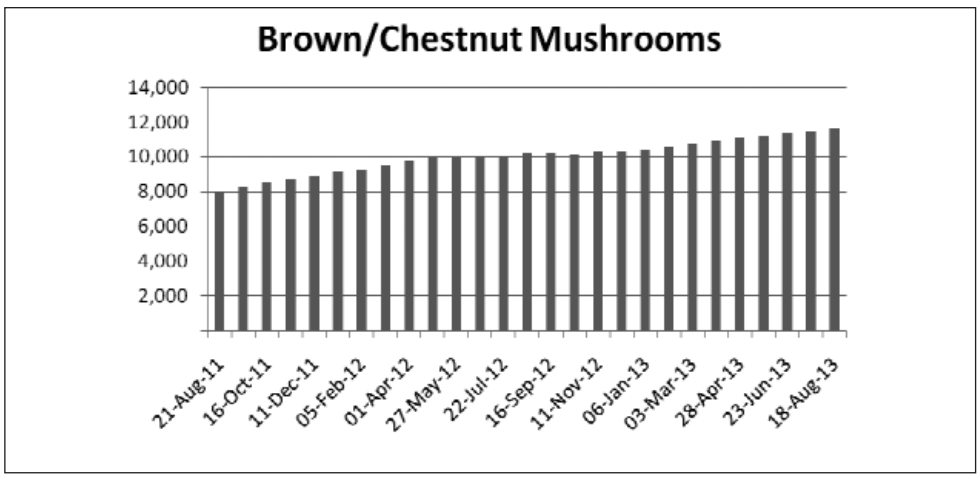


A summary of the various sectors shows that value and brown have gained share at the expense of white closed cup mushrooms. It seems that value mushrooms may have reached their peak.



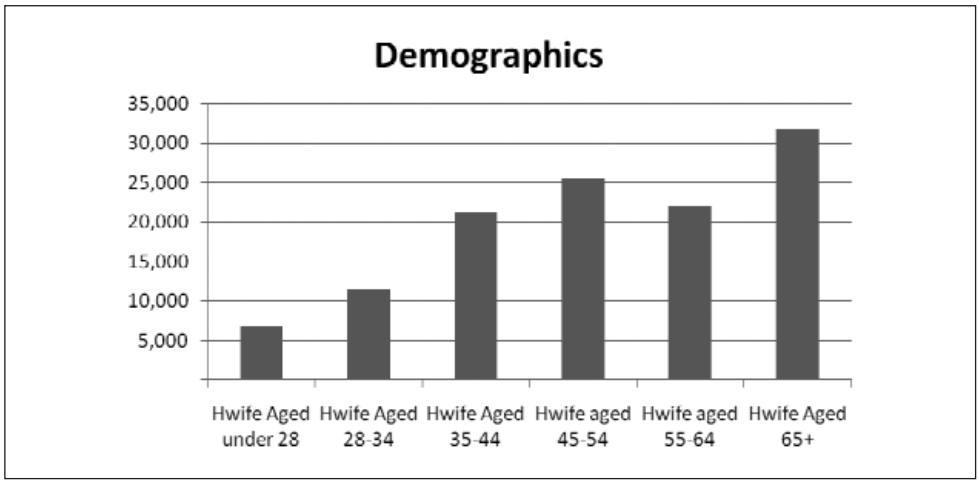
Volume sales of value mushrooms in the UK (Tonnes) (Source: Kantar)

Closed and Flat mushrooms have grown by attracting more shoppers, while brown grows through shoppers buying more often. In the last 5 years, mushrooms are attracting older, more affluent and smaller households than they were previously.



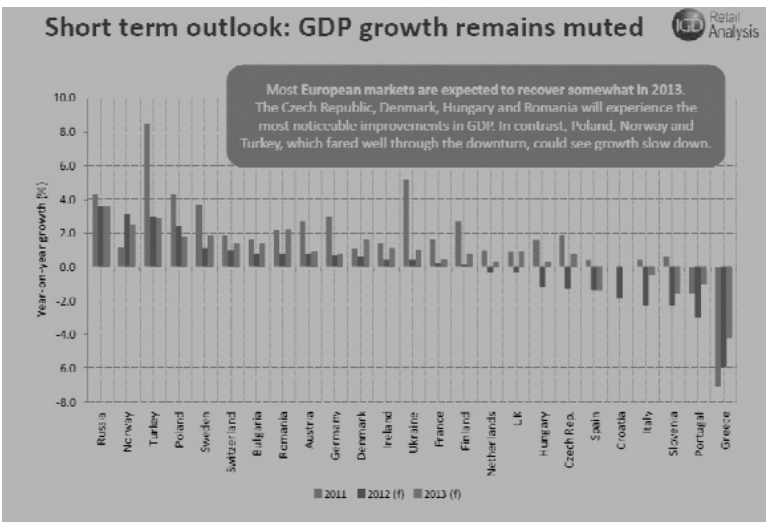
Volume sales of brown mushrooms in the UK (Tonnes) (Source: Kantar)

Brown mushrooms have grown their share of the market by value from 6.9% to 12.2 % in the last four years. An indication of where brown sales are going may come from a mature market like the USA, where last year brown mushrooms accounted for 17 percent of the total mushroom volume sold and 21 percent of the value.



Volume sales of mushrooms in the UK (Tonnes) (Source: Kantar)

In general, across Europe the short term outlook is for modest GDP growth, with several countries in negative territory.



(Source: GDP)

More to Mushrooms promotion in the UK

In June 2010, Bord Bia, working with the industry, successfully obtained EU approval for €1.2million in funding towards the three year €2.4 million 'More to Mushrooms' promotion in the UK. The balance of the funds was supplied by production and marketing companies in Ireland and the UK. Promotional activities started in early 2011, and concluded in September of this year.

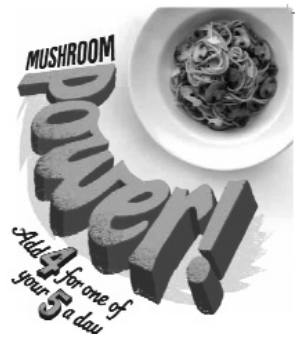
The More to Mushrooms Programme focused primarily on consumers, specifically female shoppers in the 25-45 year old age group, to address the under consumption of mushrooms in this age group. Print and online advertising were the main focus for advertising. Caterers and health professionals were also addressed, and a significant strand of public relations work completed the programme.

For the first two years of the campaign the promotion concentrated on a health message. Other healthy fruit and vegetables took on the iconic shape of a mushroom, to create a healthy association with mushrooms in consumers' minds.

For the last year of the campaign, the taste credentials of mushrooms were brought to the fore, as well as the simple message that only four mushrooms make up one of your five a day.

The eye catching ads were featured in top women's publications including Hello, Cosmopolitan and supermarket titles and astute media buying meant that insertion targets were exceeded in each year.

Digital advertising in particular was very successful with targets for clicks and impressions exceeded by on average 400% to date. Celebrity names like James Martin, the Fabulous Baker Boys and Catherine Tyldesley were used by the PR team to great effect, with press releases, and dedicated Twitter and Facebook accounts highlighting their use of mushrooms.



A million health leaflets were distributed to 6000 doctors and nutritionists surgeries over the three years.

The most effective measure of the success of the programme is with the increase in the size of the market. The programme

had a target of increasing consumption by over 23,800 tonnes over three years in the UK market, which to the end of July 2013, was estimated to be well on target to be met. As well as this, the fastest growing segment of the market is now the under 35's, starting a long term trend that will only benefit the industry in the long run.

Just Add Mushrooms in the UK and Ireland

On the back of the back of the success of the "More to Mushrooms" campaign, more funding was sought and obtained from the industry for another three year campaign. The Irish market was brought into the campaign, to help the market grow and to broaden the appeal of the programme to the EU.

The funds were applied for in September 2012, and final notification of the success of the application was given in April 2013. Since then, a new agency, Kindred, has been appointed to run the campaign after a tendering process was undertaken.

The campaign is worth €2.7 million over three years and is co-funded by the EU and producers and marketers in Ireland and the UK. Promotional activity in this campaign takes place in both the UK and Ireland.

The aim of the campaign is to increase the sales of mushrooms, in particular amongst younger female consumers. It concentrates on the inherent characteristics of mushrooms – taste, versatility, nutrition and value for money.

As with "More to Mushrooms", the main activity will be press and digital advertising, alongside public relations. The main thrust of the new campaign is to harness the power of celebrity to help raise the profile of mushrooms. Activity is planned to commence in October 2013.