



# Mushroom Sector Development Plan to 2020



# **Mushroom Sector Development Plan to 2020**

**A Report Compiled by the  
Teagasc Mushroom Stakeholder Consultative Group**

**October 2013**



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## **FOREWORD**

This report has been compiled by a wide group that is broadly representative of Ireland's mushroom sector.

### **Purpose of the plan:**

- Investigate/Identify priorities for development of the sector from production and marketing perspectives.
- Ascertain current constraints to development of the sector and troubleshoot these constraints
- Identify structural requirements that will facilitate development of the sector.

### **Outcome:**

Development Plan for Mushrooms sector to 2020

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Jim O'Mahony Facilitator, Mushroom Stakeholders Group

## **SUMMARY**

The mushroom industry in Ireland is acknowledged to be one of the best in the world. It is the largest horticultural sector in Ireland with a farmgate value of €112 million, of which close on 75% is exported to the UK. It employs over 3,200 people with potential for a further 300+ jobs in production and distribution plus possibly another 100 in added value developments.

The success of the mushroom industry is largely attributed to the entrepreneurial spirit of the key stakeholders including marketeers, growers, compost suppliers, the Producer Organisation CMP with the support of state bodies such as Teagasc, Bord Bia, Department of Agriculture, Food and the Marine (DAFM), Department of Agriculture and Rural Development (DARD) and AFBI, Northern Ireland.

### **Market**

Bord Bia indicate that the UK market for mushrooms is growing steadily in recent years at about 2% per year. However, sales of mushrooms in Ireland have plateaued in recent years at around 13,000 tonnes. Button/Closed cup mushrooms continue to hold the lion share of the market followed by Flat/Breakfast mushrooms, value mushrooms and then sliced and exotic mushrooms. The “More to Mushrooms” campaign being run by Bord Bia over a three year period in the UK has contributed a 3.8% increase in consumption since 2010.

### **Production**

Production has stabilised at 64,000 tonnes with 65 growers producing *Agaricus* on about 75 production units.

Compost production and mushroom marketing are largely integrated in Ireland with a few companies dominating both areas. Phase 3 compost is an important driver of competitiveness in the industry as it boosts yields and quality. Casing standardisation and best practice guidelines could provide efficiencies in production up to 5 kg/m<sup>2</sup>. Labour is a very significant cost of production since retail mushrooms are hand picked. Picker training courses have contributed enormously to labour cost efficiencies with the added bonuses of better worker output, satisfaction and improved quality of product. Overall production efficiency can be improved by best practice picking regimes.

Energy efficiencies can be exploited.

### **Producer Organisations**

Producer Organisations play an important role in the mushroom sector. They provide a vehicle for growers to achieve concentration of supply in a competitive marketplace. They also play an important role in facilitating the drawing down of EU development aid. CMP is now the only mushroom PO in the Republic of Ireland despite their being 11 at peak in 2003. This rationalisation has contributed to the success of the sector. CMP supports approximately 50 member producers and provides a range of services including training and advice, investment and installation of equipment, analysis of markets and planning of production (quantity and quality), investment in R&D, promotion of mushrooms to consumers, marketing of CMP members' produce and increasing the range of products in order to maximise the returns from the mix of products produced by members. The

Department of Agriculture, Food and Marine is the competent authority for the implementation of the Producer Organisation regulations in Ireland. Like authorities in other member States, DAFM are very concerned at the level of penalties being imposed on Member States following audits of the scheme. The stakeholders are calling on the EU for simplification of the administration of the PO scheme.

### Support Services

The main state support services for the mushroom sector are provided by the Department of Agriculture Food and the Marine, Teagasc, Bord Bia, Enterprise Ireland and County Enterprise Boards – Bord Bia has compiled a guide on the various grant schemes & supports which is now available on the Bord Bia website <http://www.bordbia.ie/industryinfo/hort/pages/horticulturalgrantschemes.aspx>. In addition government bodies dealing with employment, social services and legislation also have an important role in setting the environment for business development.

Teagasc provides specialist technical and financial advice on mushrooms with information in a time critical manner. In addition training is provided to growers to enable them keep abreast of the best available technologies. Teagasc/CMP provide a highly successful Mushroom Harvester Training Programme which is estimated to increase picking rate by over 60% with improved mushroom quality and productivity. Teagasc play a major role in processing and implementing the NDP Grant Scheme contributing a gross €21 million investment in the sector since 2007. A Teagasc Advisor has a key development role with CMP.

The stakeholders indicated that research was needed to help to maintain a competitive edge within this highly competitive sector - priority areas for research include:-

- Compost innovations and casing quality and standards.
- Adding value to mushrooms and mushroom by-products – such as identify useful pharmaceutical actives in Spent Mushroom Substrate (SMS).
- Identify health promoting bioactive(s) in mushrooms and use this positive information to promote the consumption of mushrooms
- Identify biotic constraints on increasing mushroom productivity and quality and recommend appropriate control procedures.
- Establish economic, social, environmental and legal indicators at national level to support the industry's sustainability claims

Currently mushroom productivity is in the region of 30 kg mushrooms/m<sup>2</sup> of crop area. Stakeholders suggested that it was possible to increase this to 35 kg/m<sup>2</sup> on average but the leading 10% of growers must target yields close to 38 kg/m<sup>2</sup> where conditions are favourable.

**Recommendations:**

- ❑ Target to Improve Mushroom production to 35 kg/m<sup>2</sup> by 2020 from current 30 kg/m<sup>2</sup>.
- ❑ Research is needed:-
  - Improve quality of casing by establishing specification standards
  - Need to establish the health benefits of mushrooms and innovative methods of adding value
  - Establish a stakeholder group to prioritise mushroom research needs and guide implementation of same
  - Create a Mushroom Centre of Excellence to develop superior products that will ensure successful growth and exports of Irish mushrooms and mushroom related biotechnologies
- ❑ Teagasc and CMP will need to support growers by targeted training and advice to improve productivity, quality and competitiveness.
- ❑ Continue the “More to Mushrooms” promotion in the UK and Ireland- Strong points to emphasise include taste, versatility, health and sustainability.
- ❑ DAFM should continue to engage at EU level to try to improve and simplify the administration of the PO scheme and to investigate the issues concerning transnational POs.
- ❑ Legislation needs to be introduced to regulate unfair competition in the labour market and to establish codes of conduct agreed by all actors in the supply chain, backed by a legislative framework and overseen by a national adjudicator in each Member State.
- ❑ Spent mushroom substrate (SMS) needs to be categorised as a mushroom by-product and not a waste so that its true potential in the biotechnology sector can be exploited

**PLAN FOR DEVELOPMENT OF MUSHROOM SECTOR TO 2020**

The mushroom industry is one of the most dynamic sectors of Irish Agriculture with a farmgate value of €112 million, close on 75% of which is exported mainly to the UK. Mushrooms are produced from indigenous organic materials (including wheat straw, poultry litter and stable manure) which in the main have relatively few alternative uses.

Since the last Taskforce report in 2004, the Irish mushroom industry has been transformed into one of the best in world. This is due in part to major investment and development in bulk Phase 3 technology by Custom Compost and Monaghan Mushrooms and also to continued support for the sector by state bodies in areas of training, marketing, research and investment. The producer organisation CMP has also been integral to ensuring that Irish growers remain efficient and competitive.

The mushroom sector employs 2,200 people directly with at least 1,000 associated jobs. There is potential for a further 300+ jobs in production and distribution plus possibly another 100 in added value developments.

## **MARKET**

The UK is the main market for Irish mushrooms consuming 75% of production in 2012.

The UK market is supplied as follows:

Country	Production Volume (t)	Share
UK	57000	31%
Northern Ireland	23000	13%
Republic of Ireland	51000	28%
Netherlands	23000	13%
Poland	22500	12%
Other	7000	4%
Total	183500	100%

Source: DEFRA Import Figures and Industry sources from 2012

Bord Bia indicate that the market for mushrooms is growing steadily in recent years at about 2% per year. Button/Closed cup mushrooms make up close to 60% of the market followed by value mushrooms, Brown and Flat mushrooms. Brown, Exotic and value categories are increasing in demand.

Sales of mushrooms in Ireland have plateaued in recent years at around 13,000 tonnes. Button/Closed cup mushrooms continue to hold the lion share of the market followed by Flat/Breakfast mushroom, value mushrooms and then Sliced and Exotic mushrooms.

Demographically the older age groups are the big consumers of mushrooms while people under 35 years eat markedly less mushrooms in both the UK and Ireland.

The **More to Mushrooms** programme is being run by Bord Bia over a three year period. Promotional activities started in early 2011. In June 2010 Bord Bia successfully obtained EU approval for €1.2 million in funding towards a €2.4 million programme promoting mushrooms on the UK market. The programme is funded by the EU and by Irish and UK mushroom producers and traders. The campaign has contributed to a 3.8% increase in consumption. The programme has a target of increasing consumption by over 23,800 tonnes over three years in the UK market.

## **Actions Required**

1. Continue the "More to Mushrooms" promotion in the UK and Ireland- Strong points of emphasis include taste, versatility, health and sustainability. Get more young people eating mushrooms by investigating and promoting the health and wellness benefits of mushrooms. Implement innovative promotion campaigns and strategies to disseminate information on the health benefits of mushrooms and inform new generations of mushroom eaters of their value (via schools, teacher training colleges, Food Technology schools). This should be addressed through promotion campaigns involving mushroom producer organisations and Bord Bia

2. Take advantage of Origin Green brand. Implement a quality programme to establish that Irish mushrooms are the most compliant in the EU for labour and environmental regulations. Emphasise the credentials of Irish production- authentic and technically advanced.

## **MUSHROOM PRODUCTION**

Production has increased from 58,000 tonnes in 2011 to 64,000 tonnes in 2012. Production peaked at 69,000 tonnes in 2003 having increased from 41,000 tonnes in 1992. The UK market takes 75% with the balance absorbed by the home Irish market. The industry grew from a small number of large growers in the early 1980's to reach a peak of 566 growers in 1995 buoyed up by the use of family labour and the low investment levels required.

Consolidation and rationalisation of the sector has resulted in grower numbers declining rapidly since 2000 to approximately 65 larger farms at present. Mushroom price drops have reduced drastically the growing margin. Other reasons for the decline have been higher labour costs and the need for capital investment to increase competitiveness as well as opportunities outside farming in the "Tiger Economy".

The mushroom sector is concentrated in Cavan/ Monaghan with significant production also in Carlow, Kildare, Mayo, Meath, Westmeath and Tipperary.

	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2011</b>	<b>2012</b>
<b>Mushrooms '000Tonnes</b>	50.0	62.5	64.4	57.7	63.6
<b>Farm Gate Value €M</b>	-----	-----	112.6	100.2	111.9
<b>Number of Growers</b>	566	504	177	70	65

### *Compost and Casing*

Compost production and mushroom marketing are largely integrated in Ireland with a few companies dominating both areas. Phase 3 compost is an important driver of competitiveness as it boosts yields and quality. Both GoodBody 2003 and The Department of Agriculture Mushroom Task Force 2004 recommended increasing Phase 3 compost. Since 2000 Phase 3 compost has increased from 52,813 tonnes per year to 153,868 tonnes per year in 2012 (Nearly 200%). This rationalisation of Phase 2 to advanced Phase 3 facilities has been completed by Monaghan Mushrooms and Custom Compost.

Yields from Phase 3 compost increased from 226 kg/tonne in 2000 to 336 kg/tonne in 2012 (49%).

<b>Phase 2 and Phase 3 Compost Use – Tonnes/Year</b>					
<b>Compost</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
<b>Phase 3</b>	53,813	95,800	131,378	135,148	153,868
<b>Phase 2</b>	217,360	160,000	51,220	48,880	45,864

**Expansion and Employment Potential:** Custom Compost plan to have an extra 15,600 tonnes Phase 3 on stream in 2014 with an additional 15,600t in 2015. This provides potential for an extra 8,798 tonnes of mushrooms in the Republic of Ireland (ROI) giving an estimated 300 extra jobs.

The stakeholder group commented on the fact that “compost utilisation” by the mushroom could be improved to give increased yields, especially in the third flush. This requires research to study how mushrooms exploit compost and to see if that process can be manipulated to give higher yields. In addition research is needed to find strains that might be more efficient at exploiting mushroom compost or a biotechnology approach could be explored, focussing on solid substrate fermentation processes involving the lignocellulosic enzymes that break down compost.

Improvements in casing specifications and standardisation as well as best practice guidelines could provide efficiencies in production up to 5 kg per m<sup>2</sup>.

### *Cost of Production*

Labour is a very significant cost of production since mushrooms for the retail market are hand picked. Picker training courses have contributed enormously to labour cost efficiencies with the added bonuses of better worker output, satisfaction, improved quality of product and improved overall productivity. The stakeholders contend that the Joint Labour Committee (JLC) should be abolished and minimum labour rates be brought in line with key competitor countries.

Financial margins: mushroom growers operate on single digit % margins. Each farm must reduce production costs by analysing all input costs. Compost contributes about 35% of production and labour costs are about the same. Growers can improve on labour costs through investment and automation and by improving production.

Harvesting: harvester costs alone account for over 30% of the cost of production. There is enormous potential for improved harvester picking rates through training. Average rates currently are around 22 kg per hour. The best harvesters can achieve close on 30 kg per hour. This should be the target average pick rate. This requires growers to be more professional and to be able to present suitable layered crops to pickers on a consistent basis. Then Harvesters can be trained to achieve higher pick rates through graze picking for example. A skilled harvester can increase yield by 3-5 kg/ m<sup>2</sup>. Disease is still very costly on farms and ongoing training is required for farm managers and harvesters. Disease can cost 10 – 15% of yield on an ongoing basis when not managed correctly.

Energy efficiencies can be exploited: Energy contributes 5-6% of the cost of production per kg of mushrooms. The industry must be competitive in the UK market and to do so Irish growers must compete with British, Dutch and Polish producers. The Irish growers must become more efficient than competitors. Energy costs can be reduced by at least 50%. This requires investment in biomass in particular but there are several other emerging technologies that need evaluation – Photo Voltaic (PV) to reduce ESB costs, voltage optimisation, Power Factor Correction units, heat recovery possibilities and even burning SMS to generate energy. (Dutch aiming for energy neutral farms using PV and burning SMS).

Fifteen growers are using Biomass as an energy source accounting for 45% of the Phase3 compost being grown in ROI. This has given a reduction of over 50% in the heating costs.

### Spent Mushroom Substrate(SMS)

The Irish mushroom industry produces in the region of 200,000 tonnes of spent mushroom substrate (SMS) every year. Spent mushroom substrate is a valuable source of major and minor nutrients as well as organic matter. It contains Nitrogen, Phosphorous and Potassium (NPK) as well as other elements such as Magnesium, Calcium, Manganese, Copper, Zinc and Boron and as such is of major value to the agricultural sector for soil fertility. Furthermore, supplies of the key agricultural nutrients Phosphorus and Potassium are in decline as they are non renewable resources. Every effort should be made to ensure that SMS is not categorised as a “waste” product but as a valuable by-product. While SMS can be applied to soils, other uses of this by-product come under the “Waste Regulations” and hamper further exploitation of this valuable resource. There is scope to recover many valuable enzymes that are present in SMS as a by-product of the mushroom growing process, such as laccase, but it is essential that SMS is correctly classified as a by-product of the mushroom industry and not as a waste product with no value. This would open the way for mushroom growers to increase revenue through the sale of their SMS by-product into either agriculture or biotechnology

### **Actions Required**

1. Maintain quality of compost and increase use of Phase 3
2. Improve quality of casing and set specification standards. This will require investment and engagement of the casing suppliers
3. Target production of 35 kg mushrooms per m<sup>2</sup>.
4. Target harvest rates of 30 kg/hour
5. Target energy reduction costs of 50% through investment in and exploiting emerging efficient energy technologies
6. Evaluate emerging technologies in compost production and biotechnology associated with mushroom production.
7. Reclassify Spent Mushroom Substrate as a mushroom by-product so it can be further exploited as a potential revenue stream for growers

## **PRODUCER ORGANISATIONS IN THE MUSHROOM SECTOR**

The EU recognised that the increasing dominance of multiple retailers, particularly in the fresh food sector, posed a problem for farmers and growers. The imbalance in power between the producers on one hand and the multinational retailers on the other means that the suppliers of fresh food are at a disadvantage. The objective of the EU funded Producer Organisation(PO) scheme is to strengthen the position of producers in the market by concentrating supply in the face of the increasing concentration of demand and also to encourage market orientation and demand led production on the part of the producers. Once recognised by a Member State, a Producer Organisation implements a 3, 4 or 5 year programme which must have at least two of the following objectives; it must also include two environmental actions from the list in the National Environmental Framework:

- Planning of production
- Improvement of product quality
- Boosting the commercial value of products
- Promotion of the products, whether in a fresh or processed form
- Environmental measures and methods of production respecting the environment, including organic farming
- Crisis prevention and management

Commercial Mushroom Producers (CMP) is one of two POs in Ireland. CMP is now the only mushroom PO in the Republic of Ireland. It has 55 members who are responsible for the production of approximately 79% of all mushrooms produced in Ireland. Approximately 80% of Irish grown mushrooms are exported to the UK, principally by CMP.

The scale of investment undertaken by CMP and assisted by the EU Fruit and Vegetable PO Scheme has been important in transforming the industry since 2004 when the Mushroom Taskforce Report was published.

The assistance provided through the PO Scheme has undoubtedly contributed in the following ways to the Irish mushroom industry:

- Production costs are being reduced despite rising inputs costs.
- Market share is increasing despite intense competition.
- Product quality has increased and market demand is being met by CMP producers.

CMP have achieved this progress through consolidated marketing, planning of production, purchasing of inputs and technology as well as providing training and advice for its members. CMP's members in turn currently contribute to the Irish economy on the basis of a range of economic indicators including output, expenditure, employment and value-added. Despite the achievements evident to date, further progress is required to ensure that the industry can continue to compete successfully on international markets.

A recent European Parliament Report on the future of Europe's horticulture noted that the EU F&V Regime has helped growers become more market orientated, encouraged innovation and increased growers' competitiveness through the

provision of support to POs. However, after 15 years, more than half of all EU growers do not belong to a PO despite the European Commission objective of an average rate of 60% by 2013. The low rate of organisation has been partly caused by the suspension of POs within Member States which is a significant concern because it creates uncertainty amongst producers and results in a competitive disadvantage between those in the scheme and those outside it.

The EP report calls on the EU Commission, in its review of the F & V regime, to produce clearer practical rules about how POs should be designed and managed, and believes that in order to encourage more growers to join POs it is crucially important that the scheme adapts to fit the market structures that exist in Member States. Strengthening the position of growers through increased collaboration, better internal organisation and a more professional approach to management will help ensure that growers receive sufficient returns when negotiating contractual arrangements with major purchasers and retailers.

A frequent complaint made about the scheme concerns the administrative burden it imposes, both on POs and on competent authorities. This arises principally from the level of control required by the Commission on EU expenditure. The regulation envisages that the PO should run its own affairs and implement its own controls and the competent authority should check the compliance of the PO operation with the requirements of the regulation and take action where they fall short. In this regard it is important to remember that the PO is spending EU money and so is expected to conform to the norms of control for EU expenditure.

DAFM has a dual role with regard to the scheme – policy and regulatory. In its policy role the Department has encouraged participation in the PO scheme by producers but even in this role DAFM cannot ignore the financial risks for the exchequer in running the scheme. DAFM is required to check the operation of recognised POs to ensure their compliance with the regulation.

### **Actions Required**

1. The uncertainties associated over the PO future need to be removed.
2. DAFM should continue to engage at EU level to try to improve and simplify the administration of the PO scheme and to investigate the issues concerning transnational POs.

## **SUPPORT SERVICES FOR MUSHROOM SECTOR**

The main state support services for the mushroom sector are provided by the Department of Agriculture Food and the Marine, Teagasc, Bord Bia and Enterprise Ireland– Bord Bia has completed a guide on the various grant schemes & supports. This is now available on the Bord Bia website – see <http://www.bordbia.ie/industryinfo/hort/pages/horticulturalgrantschemes.aspx>. In addition legislation and government bodies dealing with employment and social services also have an important role in setting the environment for business development e.g. EPA.

### *Department of Agriculture Food and the Marine (DAFM)*

DAFM is responsible for implementing the NDP Scheme, Producer Organisations and Hygiene Regulations amongst other policy and regulations of relevance to the mushroom sector.

NDP Scheme - The Scheme of Investment Aid for the Development of the Commercial Horticulture Sector grant aids capital investments in specialized plant and equipment in the horticulture sector. The scheme's objectives are to: promote the diversification of on-farm activities; improve the quality of products; facilitate environmentally friendly practices and improve working conditions. The Scheme operates on the basis of annual calls. However Stakeholders have indicated that they need more time (preferably a 2 year time span) to make applications and implement plans under NDP type schemes.

The NDP scheme is due to end in 2014 but may be extended beyond this date.

New and possibly additional funding perhaps from EU through 'The European Innovation Partnership' (EIP) needs to be investigated.

Scheme Investments amounting to €11 million for NDP and €10 million for PO have been made in the mushroom sector over the past 5 years.

***Bord Bia supports available to the mushroom industry***Marketing Assistance Programme

Bord Bia provides marketing finance support to food, drink and horticulture companies to assist them in improving their marketing techniques and capabilities

Bord Bia Brand Forum Customised Services

Customised Services form part of Bord Bia's Brand Forum programme designed to assist clients with brand development and to engage in best practice branding by providing tools/products, services and information

Bord Bia Foresight4food Programme

Foresight4food encourages food drink and horticultural companies to be more consumer focused in their New Product Development by offering them access to research and innovation services

Quality programme

The Bord Bia quality programme is based on standards that have been developed and refined over a number of years in consultation with scientists, academics and independent experts on a broad range of issues. The quality department offers schemes for mushroom producers, and compost and casing manufacturers.

Marketing Fellowship

The marketing fellowship is an opportunity to reach out to the international marketplace and to work with some of Ireland's brightest business talent

Foodworks

Food Works is a programme looking for experienced, ambitious and driven entrepreneurs that want to be part of the growing Irish food industry.

General support

In addition to the services listed, Bord Bia has a network of offices outside Ireland to offer help and support in developing exports. The information office can provide statistics and insights into consumer behaviour, both in Ireland and abroad. Bord Bia facilitates and assists the industry in the application for funding and management of EU promotion campaigns. More information on all these programmes is available from Bord Bia.

## ***Enterprise Ireland***

### *EI's Financial Toolkit*

The EI financial supports available to Food companies (including Mushroom and Compost & Casing producers) are:

- Feasibility study: 50% funding
- R&D up to €650k (25-45% funding)
- Management Development (25-45% funding)
- Lean
  - START (€5k)
  - Plus (up to 50%)
  - Transform (up to 50%)
- Company expansion (tailored package)
- Going Global Support
- E-Business Support

### Our Research and Innovation supports include:

- Innovation vouchers (€5k & co-funded)
- Innovation Partnerships (25-80% funding)
- Technology Centres (where relevant)
- Business Partners programme (Spin Out Support)

However the following should be noted:

### *For Mushroom Growers*

In general, EU legislation restricts EI from giving capital and employment grants to undertakings producing (as distinct from processing) Annex 1 products. Annex 1 includes "live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage; edible vegetables and certain roots and tubers; edible fruit and nuts."

EU law would allow us to give training and R&D grants to horticulture companies but our national legislation, the Industrial Development Act, prohibits giving grants to such a company, unless the company's method of production is "something akin to an industrial process" or the product is produced by means of technological methods which could be regarded as "industrial". In other words the company must be producing an industrial product.

### *Compost and Casing Suppliers*

The above restriction does not apply to producers of Compost & Casings for the Mushroom industry, as this is deemed to involve a processing step.

### *Sales & Marketing Supports*

In addition, as Mushroom Growing (and Compost and Casing) falls into Horticulture, all Sales and Marketing supports must be sought via Bord Bia as opposed to the Sales and Marketing supports offered by Enterprise Ireland.

### *Non-Financial Supports*

In addition to the financial supports above, the Mushroom Industry can also benefit from the following non-financial supports:

- Market information
- Workshops and seminars
- Introduction to other companies
- Introduction to 3rd level researchers
- Networking opportunities

### ***Research and Knowledge Transfer***

**Teagasc** is main state agency involved in research, advice and training for mushroom growers in Ireland. Teagasc collaborates with industry stakeholders and AFBI in Northern Ireland as well as third level universities and institutes. Teagasc is also a key driver of EU collaboration via the EU FP7 project MushTV ([www.mushtv.eu](http://www.mushtv.eu)). Teagasc provides specialist technical and financial advice on mushrooms as well as market information in a time critical manner. In addition training is provided to growers to enable them keep abreast of the best available technologies. Teagasc/CMP have developed a highly successful Mushroom Harvester Training Programme leading to FETAC Level 4 Certification. Training is estimated to increase picking rate by over 60% with improved mushroom quality and productivity of the crop to the satisfaction of the pickers and growers. The Irish mushroom harvesting workforce is highly skilled and is among the best in the world. Teagasc play a major role in processing and implementing the NDP grant Scheme contributing a gross €21 million investment in the sector since 2007. A Teagasc Advisor has a key development role with CMP.

Teagasc has had a successful history of supporting the Irish mushroom industry through its applied and strategic **mushroom research** programme over the past 50 years, based at its horticultural research centre in Kinsealy in North Dublin. In 2012 it was decided to relocate mushroom and horticulture research to Teagasc Food Research Centre in Ashtown, West Dublin, where new state of the art mushroom growing rooms and glasshouses are scheduled to be built in 2014.

Since 2004, Teagasc has responded well to most of the recommendations set out in the Mushroom Taskforce report of that year. In particular Teagasc has been proactive in working and co-ordinating research projects with its sister organisation, AFBI, in Northern Ireland and third level universities and institutes in Ireland and UK. Teagasc has a memorandum of understanding with the Horticultural Development Company (HDC) in the UK, in the area of production research and there is a Teagasc representative on the HDC Mushroom Panel. Both Teagasc and AFBI have been successful in securing competitive funding for mushroom research from government funding schemes, such as STIMULUS, and in securing a regular supply of Teagasc Walsh Fellowships, thereby educating a new generation of scientists in mushroom technologies.

In 2012 Teagasc was successful in securing competitive funding for research from the EU worth €2.5 million for an applied research project entitled “MushTV. The project is co-ordinated and managed by Dr. Helen Grogan of Teagasc and consists of

a Consortium of 17 partners from the major mushroom businesses, producer groups and research organisations in five European countries. The MushTV Consortium provides a firm basis for building and maintaining collaborative links across Europe as well as maintaining research capacity in all major research areas. Research institutions across Europe have all experienced major reductions in state funding with consequential losses of experienced scientists and facilities. It is imperative therefore that the mushroom research community across Europe continues to foster close collaborative links so as to ensure that mushroom scientists are available to address ongoing research and development needs of the European mushroom industry.

The **private sector** has also invested in research to the advantage of the Irish mushroom sector. In recent years Monaghan Mushrooms have put a substantial research programme in place in areas of mushroom production and biotechnology. This will make a major contribution to development of the sector. Custom Compost and Sylvan Ireland also conduct their own research to improve and ensure the quality of their products.

## **RESEARCH NEEDS FOR MUSHROOM INDUSTRY – TO 2020**

The stakeholders identified a number of areas where research was needed to help support the Irish industry in maintaining a competitive edge within this highly competitive sector. Areas where further research is needed include:-

### **Casing quality and standards.**

Irish mushroom casing is composed of bulk peat extracted from peat bogs, amended with a neutralising agent such as ground limestone or sugar beet lime and it undergoes minimal characterisation and processing; this keeps the cost relatively low. Although the use of bulk extracted peat in Ireland in the 1990's led to significant improvements in casing structure around the world, continental casing suppliers offer a range of products to suit the requirements of different types of mushroom growing. They use a range of peat types from different sources and add in other ingredients with specific characteristics to achieve the desired mix. Mixes are characterised and standardised and perform consistently. Irish casing suppliers need to provide Irish growers with a **range of casings with known standardised characteristics that will perform consistently**. It will require both investment by casing companies and research providers to develop consistent casing mixes with standardised specifications suitable for mushroom growers in Ireland.

### **Increasing compost utilisation**

Considerable nutrients remain in mushroom compost when the crop is terminated after three flushes meaning the biological efficiency of the system is below optimum. More mushrooms could be harvested if crop duration was extended but this is not economically feasible as yields get progressively smaller with each subsequent flush. Increasing the biological efficiency of mushroom strains in compost over three flushes would increase mushroom output per tonne of compost, leading to greater efficiencies and profitability for the sector. However, mushroom compost is a complex biological system with its own unique microflora, which is extremely well adapted to standard composting conditions and therefore very difficult to manipulate and change. Commercial mushroom strains are also well adapted to utilising mushroom compost but third flush yields are usually well below those of the first and second flushes. There is potential for higher mushroom yields per tonne of compost by (a) manipulating the compost colonisation and utilisation process by mushroom strains and (b) identifying improved strains through breeding and development research. This will require significant research investment in strain development, compost microbiology and biotechnology.

### **Spent mushroom substrate - a valuable by product**

There is scope to recover many valuable compounds that are present in spent mushroom substrate (SMS) but, as mentioned earlier, SMS needs to be reclassified as a by-product of the mushroom growing process and not as a waste. SMS is rich in the enzyme laccase, which has uses in many biotechnological and environmental applications.

**Mushrooms – a source of health beneficial compounds**

There is increasing interest world wide in the many bioactive compounds and metabolites that are found in cultivated and wild fungi. Mushrooms contain significant quantities of the bioactive compounds, beta-glucan and chitin, which have anti-obesity, anti-diabetic and cholesterol-lowering effects. If anti-obesity, cardiovascular and other health claims can be demonstrated and promoted, this should lead to increased demand for mushrooms both as a horticultural crop, as well as a source of ingredients for added-value “functional-food” products for the Food sector, adding to the growth and sustainability of two important employment sectors in Ireland. Research is required to capitalise on the untapped anti-obesity and other health benefits of mushrooms as a “Food for Health”, especially the commercial mushroom *Agaricus bisporus* and this positive information should be used to promote the consumption of mushrooms.

**Integrated Pest Management (IPM)**

The Sustainable Use Directive (SUD) requires the Agricultural industry to implement integrated pest management systems into their production systems from 2014. While the Irish mushroom industry already practices IPM to a certain extent, there is a continuing need to increase IPM uptake and to develop new IPM strategies to tackle existing pests and diseases, as well as potential new pest and disease problems. The mushroom industry is in a strong position to demonstrate compliance in this area ensuring that no penalties are incurred by the sector, thereby creating a positive impression of the industry to both the public at large and state bodies.

Continuing research into pest and disease epidemiology and control underpins good IPM systems.

**Centre of Excellence**

The Stakeholders agreed that the Irish mushroom businesses and research personnel had all the elements needed to create a “Centre of Excellence” that could serve the interests of the Irish mushroom sector. Such a centre or innovation grouping could be part-financed by Enterprise Ireland but it would require Industry input and commitment. It will be important to clarify ownership of Intellectual Property (IP) if such a centre is to be successful, any superior products that are developed should to be retained for Irish industry – in order to provide better quality products for export such as mushrooms with the best flavour and taste; mushroom biotechnology spin-out companies based in Ireland.

## **Actions Required**

### **Incentives and grant schemes:**

1. A new NDP type scheme is required to enable the sector to remain competitive. Adequate time to apply and implement plans for the scheme is essential.
2. New STIMULUS and FIRM funding from DAFM specifically for the Horticulture/ mushroom sector, on an equal footing with other sectors, so as to reflect the importance of this valuable and important industry to the Irish economy.
3. EU funding for the sector through 'The European Innovation Partnership' (EIP) needs to be investigated.

### **Research and Development:**

1. Improvements in casing specifications to remove variability and increase performance.
2. Investment in compost utilisation research to ensure maximum productivity
3. Reclassification of spent mushroom substrate as a mushroom by-product in order to exploit its potential as an additional revenue stream for growers. Research is needed to exploit the potential of spent mushroom substrate as a source of bioactive compounds for the biotechnology industry
4. Exploitation of the health beneficial compounds in mushrooms from a pharmaceutical and functional-food perspective. This will require research to generate data to support health claims attributed to mushrooms and mushroom bioactive molecules (such as beta glucans, chitosan, minerals and vitamins)
5. Continued support for the industry to adopt Integrated Pest Management strategies to ensure compliance with the Sustainable Use Directive, and avoid penalties. *Verticillium* and sciarid fly control remain two persistent issues for the industry.
6. Improvements in mushroom harvesting skills and productivity through training and measurement of performance
7. Improvements in crop management and crop timing to ensure predictable harvesting schedules thereby minimising disruption to life/work balance of staff
8. Establish economic, social, environmental and legal indicators at national level to support the industry's sustainability claims
9. Create a Mushroom Centre of Excellence to develop superior products that will ensure successful growth and exports of Irish mushrooms and mushroom related biotechnologies

## **LEGISLATIVE AND POLICY ISSUES**

The disparity in labour costs between Ireland and the Netherlands is a serious concern for Irish growers. Allegedly the Dutch are using foreign labour at approximately €8-9 per hour compared to the national standard rate of €14 per hour for Netherlands and €13 per hour for Ireland.

Producers and marketers are concerned with the domineering power of the major retail groups-supermarkets. They request that legislation be introduced to regulate the multiples to adhere to a “Code of Practice for Designated Grocery Goods Undertakings”.

A Renewable Heat Incentive (RHI) Scheme was introduced in Northern Ireland by DETI in November 2012. The scheme provides generators of renewable heat with long-term financial incentive payments based on the levels of heat they can generate. It is expected to support a level of 10% renewable heat by 2020 and will assist in the realisation of a more secure, sustainable and diverse heating market in Northern Ireland. A similar scheme in the Republic of Ireland is highly desirable.

### **Actions Required**

- 1) E.U and Member State legislation needs to be introduced and implemented so that mushroom pickers in every member state are at least paid the minimum wage.
- 2) Competition laws should be enforced and a ban on below cost selling re-introduced. This would help to prevent large retailers forcing price reductions.
- 3) The functioning of the food chain and the internal market could be greatly improved by the introduction of codes of conduct agreed by all actors in the supply chain, backed by a legislative framework and overseen by a national adjudicator in each Member State.
- 4) The introduction of a Renewable Heat Incentive Scheme would stimulate significant levels of new economic activity in the mushroom sector as well as various ancillary economic and environmental benefits.
- 5) Spent Mushroom Substrate (SMS) is currently classified as a waste unless used as a fertiliser on agricultural land. SMS needs to be reclassified as a by-product to facilitate development of alternative uses from SMS.

## **RECOMMENDATIONS**

- ❑ Target to Improve Mushroom production to 35 kg/m<sup>2</sup> by 2020 from current 30 kg/m<sup>2</sup>.
- ❑ Research is needed:-
  - Improve quality of casing by establishing specification standards
  - Need to establish the health benefits of mushrooms and innovative methods of adding value
  - Establish a stakeholder group to prioritise mushroom research needs and guide implementation of same
  - Create a Mushroom Centre of Excellence to develop superior products that will ensure successful growth and exports of Irish mushrooms and mushroom related biotechnologies
- ❑ Teagasc and CMP will need to support growers by targeted training and advice to improve productivity, quality and competitiveness
- ❑ Continue the “More to Mushrooms” promotion in the UK and Ireland- Strong points to emphasise include taste, versatility, health and sustainability.
- ❑ DAFM should continue to engage at EU level to try to improve and simplify the administration of the PO scheme and to investigate the issues concerning transnational POs.
- ❑ Legislation needs to be introduced to regulate unfair competition in the labour market and to establish codes of conduct agreed by all actors in the supply chain, backed by a legislative framework and overseen by a national adjudicator in each Member State.
- ❑ Spent mushroom substrate (SMS) needs to be categorised as a mushroom by-product and not a waste so that its true potential in the biotechnology sector can be exploited.

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