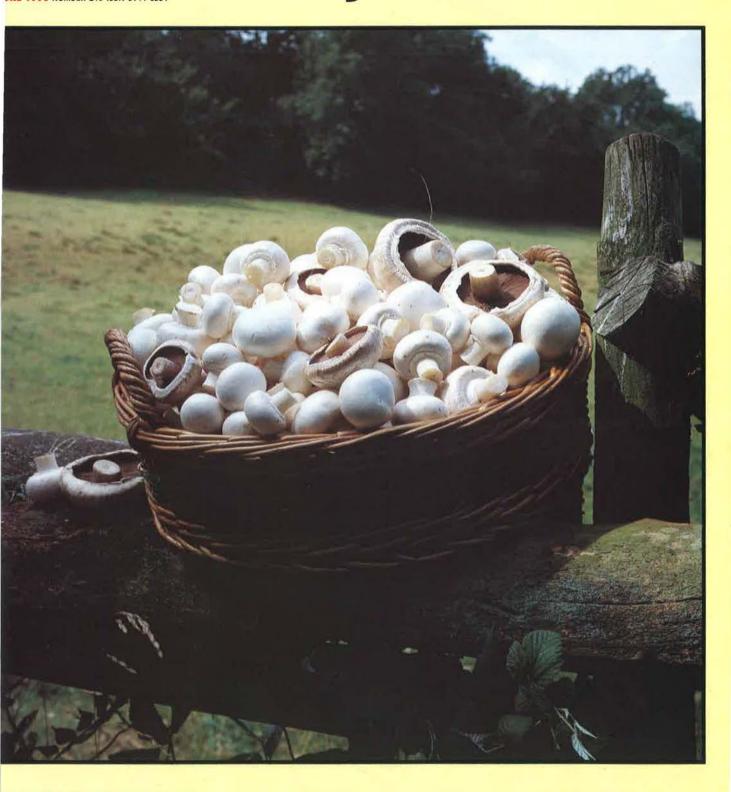
## Mushroom

FFICIAL JOURNAL OF THE MUSHROOM GROWERS' ASSOCIATION UNE 1990 NUMBER 210 ISSN 0144-0551



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ticles for consideration e welcome; also letters r publication which ould make a point rongly and as briefly as essible. They may be xed or posted and should addressed to the Editor.

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## Mushroom

June 1990 No 210

## EDITORIAL

It is not the job of this journal to act as an adviser. Therefore for this 'harvesting' number we feel our job has been done if we present the facts involved in each possible consideration and then leave you to draw your own conclusions and make your decision.

In this issue we have expressed the pros and cons of mechanical harvesting in both partial and impartial ways so that enough incentive is provided to pursue further inquiries or pan the development with the time-honoured 'seen it all before' sentiment.

But no one has made the case for the hand harvester. And here you will note that we do not use the common term 'picker' because in our book that word seems to denote a common action which can be compared with 'potato picker' the name for an operation which can be performed almost on sight by any person with sufficient arms and fingers to scoop them from the row and two legs to straddle it. The fact that these 'pickers' have largely now been superseded by machines is evidence in itself of the lack of finer expertise required.

Mushroom gathering by hand is different. We cannot express too strongly our feelings that this skilled operation should: first, be called universally 'hand harvesting' and those who perform the task 'hand harvesters' and, second, this method of gathering our crops should be a main plank in our promotion. This latter point would seem to be very important in an age when the 'natural', the craft, the farm and the country are very emotive words and seem to be pre-

It has that air about it, true or not, that like all hand crafted and hand selected goods, 'hand harvested' mushrooms by their very nature sound as though they reveal their superior quality.

We would even go further and suggest that our 'hand harvesters' are our front line troops and of all the operations on the farm it is they to whom the supermarket buyer, the quality controller speak, not to the composting man, the waterer, the office manager or the operator of a £40,000 front loader, important as these activities are.

So how do we keep them happy.

ferred to factory and mechanisation.

In an age when we seem to be moving as a society from a time of production into one of service industries we must try to match the conditions provided for staff by those new businesses. How can we portray that hand harvesting mushrooms is superior to sitting at a supermarket check-out with its constant stream of tired,

Turn to next page ▶

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ISSN 0144-0551

#### **EDITORIAL**

irritable, over-burdened customers?

The problem has been tackled well in Denmark. There they have created facilities which surpass the superb to attract their staff. In return for very short periods of work, rota-ed to suit the convenience of the worker they provide creches and other amenities finding that in return for childcare for an hour or two mothers are only too keen to work.

Perhaps, indeed, if we changed the names of some of our farms from 'nurseries' to 'nursery' the lady hand harvesters would

flock in!

Our new-look Journal seems to have thrown up discussion on its role.

The Journal's principal functions are:

- 1. to communicate scientific and technical information
- to act as a forum for members' opinions
   to act as a marketplace for the trade and grower
- members
  4. to inform members of relevant legislation, and of the topics under review by the Association's Executive Committee and its relevant sub-committees.

These intents have probably never changed since the magazine's inception. But what has changed is the size and global importance of the mushroom industry.

A revision of the Journal was undertaken in order to reflect that growth by an improvement in presentation. Such a move is designed to make it more visually appealing both to readers and to advertisers, to create more space to make it more easily readable, to attract more readers, customers if you like.

News from around the mushroom world is welcome every month closing date end of the first week in each month send yours <u>now</u>!

## THE WORLD O

t gets up our nose a bit the way the Northern Irish Journal called 'Mushroom People' lifts copyright material from our columns without so much as an acknowledgement. Therefore it is good to see them stumble a bit when they report on some aspects of the business. For example they took the survey conducted by MBA of Wigan and interpreted a straightforward report on the business as indicating the great profitability of the industry. They even headed it 'Mushroom Profits'. One might have expected such treatment from a paper which had no technical or inside knowledge of the industry but how can they publish such material and still call themselves 'Mushroom People'?

ushrooms continue to figure in the great food debate. In a recent article in SHE magazine the weight of evidence for dietary prevention of cancers is examined and one of the substances pinpointed is selenium. This, they say is 'a component of an enzyme which mops up free radicals'. It is a trace element and works with vitamin E.

Cancer patients, says the article, have comparatively low levels of selenium but 'whether the cancer causes the levels to drop, or a deficiency helps to bring on the illness is not clear'.

But it is recommended in one's diet. And what is one of the principal sources? Why mushrooms, of course. Isn't it time we listed all these beneficial aspects and used them in our promotion?

ushrooms featured strongly on the NFU stand at Chelsea show. Large baskets were used for their display and, as usual, the stand received a gold medal

#### MGA exhibits at teachers' exhibition in Belfast

The MGA took a stand at the HERE (Home Economics Resources in Education) exhibition, held at Jordonstown University, Belfast, on 27th and 28th April.

More than two hundred and fifty teachers attended this two day exhibition; this represented over 60% of home economics teachers in the province.

Every teacher was given copies of the MGA's children's leaflet, "Growing Cultivated Mushrooms," the nutrition card for senior school children and colleg students, and teacher's notes.

The MGA exhibited fresh mushrooms – loose and

The MGA exhibited fresh mushrooms – loose and prepack – and Victoria Lloyd-Davies, PR consultant to the MGA, supported by Kernans and Safe Marketing, talked to the teachers about the mushroom industry.

The MGA stand generated much interest in fresh mushrooms and it is hoped that mushroom teaching projects will be set up in schools and colleges in Northern Ireland. Today's students are tomorrow's consumers, so it is important that they should learn about the purchasing, handling, and cooking of fresh mushrooms.

ewly appointed managing director of Middlebrook Mushrooms Ltd is B J Dver who was made deputy m.d. last year. Since he joined Booker about twenty years ago Mr Dyer has spent most of his time abroad mainly in sugar. After five years as field superintendent, then nucleus estate manager, in Kenya he returned to London head office from where he undertook consultancy assignments in Java, Sumatra, Australia, Papua New Guinea. Swaziland, South Africa, Ethiopia, Madagascar and Kenya. Then his service was in Papua New Guinea where he became agricultural manager of a new sugar project until 1986 when he was appointed general manager of Ramu Sugar in that country. This vast organisation supplies all the country's requirements of sugar. It incorporates a distillery converting the molasses by-product to ethanol for use as a fuel extender and includes a 50,000 acre cattle ranch running 15,000 head of cattle. It employs 2,500 people and supports a community of 6,000 people. Mr Dyer has been active in the Institute of British Management and in various commercial

organisations in Papua New Guinea. He is expected to take an even keener interes in the MGA.

t was good to see AMI president Jamie Ciarrocchi at the Dutch Mushroom Exhibition. Now I is married he was chaperoned by father, Charles Ciarrocchi! They are very pleased with the reorganisation of the AMI. A Jamie put it in an earlier edition of Mushroom News -The AMI has transformed itself into a truly national organisation, that will have a positive impact on the industry for years to come." We wish him and the American industry all success.

We look forward to Jamie North American conference San Antonio next February. With a theme, "Pursuing Perfection", it must be good

verheard at a mushroom discussion – "COSSH is a bobby's truncheon!" If we don't comply, growers may well feel the force of the law

## **USHROOMS**

#### **led faces department**

Our hiccups connected with the move continue, infortunately spreading over into the Journal.

The article last month on The Manager and Management Trainee, which has caused much nterest, was, of course, written by Richard Neave of Management Development Services. Although many eaders recognised this, we should like to apologise

o Richard for any embarrassment.

His organisation was established in 1986 to handle the recruitment and training of highly motivated young people for a consortium of companies in agriculture and horticulture to meet the changing demands occurring over the next decade and beyond. It was considered that broad training in managerial skills was required, which could not always be achieved within the resources of many businesses.

MDS has a membership of 21 leading companies (including two mushroom businesses) and has broadened its base into amenity horticulture and food processing. The policy is to continue expansion by bringing into membership top quality businesses, thus widening the variety of secondments. As existing management teams can be complemented by MDS trainees during busy period, small and large organisations are able to benefit from membership.

Our apologies also go to Tony Davey, senior Training Adviser to the National Institute of fresh produce for transposing his name with that of Richard Neave. His article on Recuiting and Retaining Staff for the Future has also caused wide comment, in particular his assessment of the investment value in

staff.

The National Institute has, of course, done so much valuable work in the fresh produce industry by raising standards and methods of operation.

new Spawn Company is about be launched in the UK next onth. The Company ternational Mushrooms Ltd. an Irish owned Company th a Technology Acquisition reement with America's dest spawn producer L. F. imbert. This co-operation ves the Company access to wide range of spawn ains, and a vast reserve of perience in all aspects of ushroom production. Their ost popular strain 501 has eady taken a significant

percentage of the Irish Market. Brown strains and a range of exotics can also be produced by the Company.

rom the speech of Danny Dempster, Executive Vice President of the Canadian Horticultural Council, to the AGM of the CMGA: "The dilemma we face as producers? On one hand we have perhaps the most stringent pesticide registration system in the world and can hide behind it

### ropical display at IHR, Littlehampton this

After two to three years of negotiation it now seems as hough the Institute and the AGC have reached greement to introduce the tropical Agaricus strain on o the UK market. It was grown as an 'open day' lisplay at IHR Littlehampton on JUNE 22 this year.

when attacked by those who wish to criticise our use of pesticides. On the other hand, our producers cannot assess chemical technology available to producers in other countries, thus placing us at a competitive disadvantage."

We can all identify with those sentiments.

Other points from the CMGA annual meeting, held on 4 April:

Congratulations to Pat Lord on his election as President for 1990. His report commented - "While the demand for mushrooms continues to increase, the price received for our produce has remained at relatively the same level over the past five years and will likely remain at this level in the foreseeable future." (Substitute 10 years for 5, and he could have been speaking at our AGM!)

Comment from Mr M. Snobelen, chairman of the research committee: "... our research efforts must look to the future because if we don't, we won't have a

future.

The meeting agreed to trials on CMGA members' farms, of the spawn strain, AG.95, to decide whether it has commercial value. Initial spawn multiplications will be done by Spawnline Inc.

The CMGA promotion campaign for 1990, under Keith Potter's chairmanship, will concentrate on recipes to the consumer and the handling of mushrooms by both the consumer and the retailer.

Some of our members think that a handling campaign

#### **Tunnel blocked**

Jim's blocker has arrived! Deliveries of spawned compost blocks from Tunnel Tech North will begin in early July. Phone 0302 719532.

would not come amiss in the

n excellent video produced by FNCC, to promote the French processed mushroom industry has a copy in English. Who says that the French never stray from their mother tongue!

ring back Monty Mushroom", was the plea from the South West area meeting to the publicity committee. They believe that Monty is still our best weapon to attract younger dietconscious consumers.

atest contributions to the Marketing and Promotion Video Fund are as follows: Blue Prince Mushrooms £100 David Cover and Son Ltd£100 J. Williams Group £100 Dolphin Packaging Materials £1,000

#### The launch of the British Society for Horticultural Research

Mushroom growers now have a vital interest in the newly launched British Society for Horticultural Research, for, through the Horticulture Development Council, the industry will be paying part of the costs of research. At the exhibition, when the Society was launched, the work at Littlehampton on wild and tropical species was being demonstrated. This is an area for potential development, and from discussions with IHR staff it would seem that there could be more news in the not too distant future.

A note has been prepared by the team at Littlehampton setting out some of the background to their work on novel mushroom strains.

# Picking a winner

ou wouldn't put your money on a three-legged horse,

so why risk everything on also-rans?

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strains available, backed by the latest growing technology

- you can pin your shirt on it.





## **.ETTERS**

#### jor contribution from BSHR

e Haves Interview with Dr W (Joe) Hussey, OBE ushroom Journal, April 90), was an interesting niniscence of Joe's long d productive career. Dr issey mentioned that in the ven years since he retired, had had only minimal ntact with the mushroom dustry. From some of the vinions he expressed about e current work here at ttlehampton, I feel that he av likewise be a little out of uch with the present state of esearch and Development. ay I correct a few of the ain points?

Dr Hussey suggested, from e IHR 1988 Annual Report, at we have only three incipal scientists, working n three projects concerning ushrooms. Our Annual eport covers a selection of ghlights and recent evelopments, but does not tempt to cover every oject. For an Institute which overs the whole range of otected crops, fruit, egetables, ornamentals and rm woodlands trees, this ould be prohibitively spensive; the information is vailable in other forms. We o have a large number of rojects on mushroom ology, involving 12 principal searchers plus their support aff. The Littlehampton lushroom R&D group is one the largest in the world, nd certainly has 'critical lass'

Dr Hussey laments the lissipation ... of a cadre of xperience' which had been uilt up in his day. It is ertainly true that many eople who have made ternationally recognised ontributions to mushroom &D have left. This has rgely been due to retirement even mushroom esearchers grow old -Ithough cuts in funding have adly caused a few dundancies in the past. But would be unfair to the

present team to ignore the vigorous new blood that has been brought in, the way that these younger people are applying the most up-to-date techniques in their research, and the willingness of everyone to respond to new challenges. The group has particularly active links with a number of universities and overseas research institutes, and a thriving community of young postgraduate students.

Finally, Dr Hussey notes the need for unification of the mushroom work of AFRC and ADAS. It is appropriate to mark how much has already been achieved. With the closure of the Lea Valley EHS, the ADAS mushroom scientists moved to Littlehampton one year ago. AFRC showed its commitment to a joint programme of research by providing capital funding for two controlled environment composting tunnels, largely for their work. The ADAS National Mushroom Specialist has been located at Littlehampton for many years. The most important parts of the integration which Joe calls for have already been achieved. Indeed, the scientific staff (and dare I say management) involved in mushroom R&D have served as pioneers for the wider changes to come in the unification of ADAS-EHS and IHR work in the new British Society for Horticultural Research.

Much work is still required, so that the full benefits of this unification for R&D and for the horticultural industry can be achieved. But for the mushroom industry in particular, there should be no doubt that the integrated team at Littlehampton can provide relevant and broadly based R&D, and that given a mix of Government and levy funding, can continue to make a major contribution to the industry's well-being.

R S S Fraser PhD DSc FI Hort Head of Station, BSHR Littlehampton

#### Same old prejudice

In all the time we have been concerned with mushrooms we've refrained from responding to the Journal on the occasion of criticism of our organisation or colleagues. In this instance we're forced to break our rule.

We don't intend to pick through it for the truths, the half-truths and the sheer naked prejudice, a euphemism for something much blunter. Let us just quote you one piece and ask for a simple question.

"To an impartial (is this humorous piece?) commentator the position at present seems simple.

The time has come, surely, to put all historical bitterness and acrimony on one side and devote all energy possible to the application of the HDC levy in the best possible way".

We would add, incidentally, and the considerably larger MAFF (not MoA) funds.

The simple question is why, if you really are trying to enlist industry support and enthusiasm, not to mention that of the R & D workers, preface such a laudable aim with all the same old bitterness, acrimony and prejudice.

If this is going to be the level of he New Mushroom Journal, the official journal of the MGA, then we don't really think we wish to read it.

RH. Gaze National Mushroom Specialist

T.J. Elliott Commodity Co-ordinator for Mushrooms, IHR (L).

#### We must reduce supply

With reference to the problems of over-loading mushrooms at wholesale markets, particularly Gateshead which is our local market.

The main culprit is obviously the Irish growers who seem to have no idea that their presence can create such a wide variance in price. Vast over-production has resulted in supply greatly

outstripping demand, hence ridiculously low prices. Prices which can range from 30p to £1 per pound, depending on the amount of mushrooms which are 'dumped' on the market. At the moment our average wholesale price is 40p to 45p per pound. Ten years ago it was 70p to 80p per pound simply because supply was less than demand.

The answer to this crazy situation is at least to stop any expansion of the mushroom industry to allow demand to catch up with supply. This will take some time considering the amount of over-production involved. Better still, immediate decrease in production, which would get us all back to a profit-making situation in a matter of weeks.

We all have heavy and light days of cropping regardless of the size of our farms, but sensible rationing would create a more stable price which would benefit us all.

Imagine doing half of the work, and spending half of the money involved on production, whilst increasing one's returns per pound. Who in their right mind would say no to such a proposition. Unless we can all act sensibly when it comes to marketing, we shall never realise a fair price for our product.

Maybe it would be useful to raise some of these issues with the marketing committee at your next meeting.

Michael W Turner

A K Turner & Sons, Stannington, Morpeth, Northumberland

#### Congratulations

Let me congratulate you on the revised format for The Mushroom Journal. The magazine is now more readable and has a much greater visual impact. As you say, it must help in improving communications within the industry.

B. J. Dyer Managing Director, Middlebrook Mushrooms

## The Complete Service



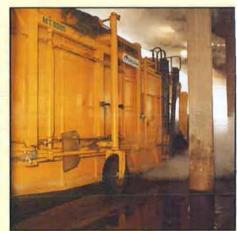




















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### DIRECTOR'S NOTES

e May Executive meeting was the first chaired by Gerry rker in his year of office. It proved to be long and allenging, for all recognised the important issues facing

r industry.

available.

The M&P committee was asked to consider again the ssibility of including all suppliers to the UK market in a publicity fund. With imports of processed mushrooms creasing to 15,000 tonnes, or 9% of total mushrooms ailable in 1989, the committee will examine a campaign inch may embrace all mushroom consumption. Important work by the Health & Safety Executive 1 dust and spore problems, will soon be ready for ablication. The MGA has already been involved in scussions on the issues raised, for they have aplications for every mushroom grower in Europe. The Executive gave authority to use one of the top secialists in this field, to ensure that good advice

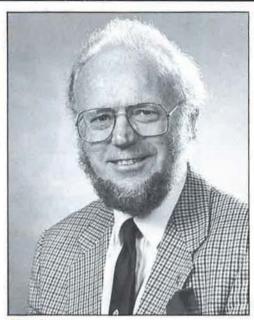
larket problems

a lengthy and inconclusive discussion on the way to ckle the problems of the market place and pricing, Ferd ensby pointed to the USA and the co-operation that cists there between growers and wholesalers. Past nairman, Frank Stewart-Wood suggested that the MGA nould arrange an industry meeting to assess what real iterest there is in any concerted action. In the past 20 ears there has been much discussion, but no effective ction.

The Australian workshop proposal – to set up a small leeting in September to increase world wide ollaboration on some aspects of research – received upport. Geoff Ganney, who was present in Australia, ommented that it was a good workshop, and set the asis for scientists and growers to co-ordinate and work legether on important projects.

ongratulations

arlier in May I gained my first "Dutch Mushroom Days xperience" – reported on elsewhere. To attract such



Ken James

numbers from the world industry and offer something of value for everybody, deserves congratulations from all of us. Of course it is geared to the cohesive Dutch industry, but to be part of a dynamic organisation for a day or two, inspires serious thought by every individual who took part. Significantly there were over 400 East European visitors.

During the visits, talk of new classrooms for the mushroom school, paying for laboratories from spawn royalties and work on added value mushrooms – as well as the very urgent compost work – added to the atmosphere of an industry which is determined to face the 1990's with confidence.

28 May 1990

### DIARY DATES

you would like your event featured free in this column please notify us as far ahead as possible t MGA.

une 26 - Marketing and Publicity Meeting

uly 4 - Northern Farm Walk

uly 11 - South West Area Meeting - Farm Walk

uly 17 - South East 1 Area Meeting - Farm Walk

ugust 2 - Research and Development Meeting

ugust 27-September 1 - 23rd International Horticultural ongress, Firenze, Italy.

ugust 28-September 3 - Fourth International Mycological ongress, Regensburg, West Germany.

eptember 4 - South East 2 Area Meeting 10.30am Beansfield

eptember 5 - Finance and General Purposes Committee leeting

eptember 6 - Executive Meeting 10.30am Stamford

eptember 10 - Pub Caterer Prizegiving

eptember 11-17 - Fifth International Congress of Mycolgy and Eighth International Congress of Bacteriology, Osaka, apan. **September 11 -** East and West Midlands Area Meeting - to be confirmed

**September 27 -** Education and Training meeting - venue Stoneleigh

November 7-10 - UK Mushroom Growers Association Conference, Bournemouth, UK.

November 21 - Finances and General Purposes Meeting

November 22 - Executive Committee Meeting

November 29 - Northern Area Meeting

December 4 - SW Area Meeting

December 11 - South East 1 Meeting

1991

**February 17-21** – Ninth N American Mushroom Conference, San Antonio, Texas, USA.

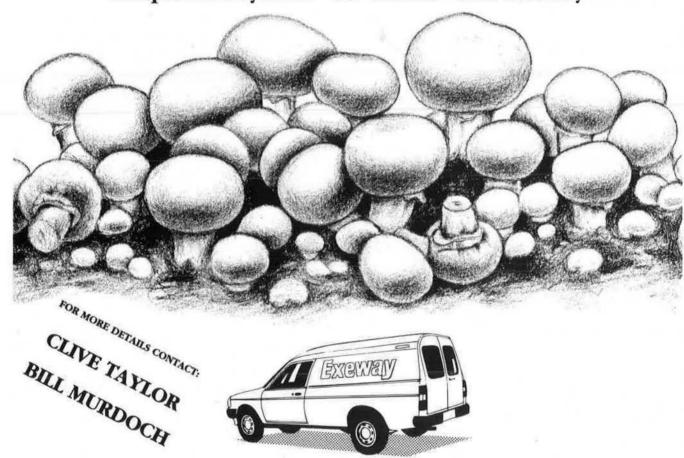
May 13-18 - Genetics and Breeding of Cultivated Mushrooms, Eindhoven/Venlo, Holland.

**September 1-8** - Thirteenth International Mushroom Congress, Dublin, Ireland.

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## DUTCH EXHIBITION

s trade exhibition is held very two ars at CVV auction, and is the major e for suppliers of machinery and other ducts to the mushroom industry in Eue. There were 101 trade stands; new velopments are discussed under the owing headings.

achinery

e main new developments were an tomatic mushroom picker for trays, m Traymaster, and a mushroom conyor for picking by hand on the shelf stem from J. Kuhlmann (Germany). e Traymaster automatic picker relied trays being taken from the growing use with an automatic forklift and ssed through a machine which could lect and pick individual mushrooms. ne machine is claimed to be capable of king up to 150 kg mushrooms per our, suitable for the fresh market. A deo of the system in operation indiited a slower operating speed.

The picking conveyor for the shelf sysm consisted of a chain of plastic cups, ach capable of holding an individual ushroom. Three different sizes and colirs of unit are available in the chain for fferent grades of mushroom. The coneyor is attached to the sides of the nelves, where it can be raised and lowed. On it mushrooms could be taken om the growing house to the packing

The firm Inbar from Israel had develbed a new growing tray made of fibre ass, claimed to have a longer life and asier to clean than wooden trays. Cost nd durability would be important in etermining its viability.

helves and Shelf quipment

nelves and the machinery for this sysm was on display from a number of utch manufacturers, notably Thilot, hristiaens, Kepser, Muncko, Madexao and Alcoa. A new shelf grating was divertised by Thielco. The new grating as a 40 mm air gap in the grating and a astic cloth on the underside which is aimed to improve insulation and temerature control.

omputer Control Systems ght Dutch computer systems were on splay at the exhibition. All were capable controlling the environment, i.e. ventition, temperature, relative humidity, O2 & O2, from pasteurization through to opping. Cost and servicing would be ajor factors in selecting a system in the

A new product for smaller farms was e Sohm 'baby' computer. The system onsists of individual control boxes in ach growing shed, connected to a cenal information system. The system is apable only of controlling air temperure and relative humidity.

## The Dutch Exhibition at Grubbenvorst

Richard Gaze, ADAS National Mushroom specialist, reports:-



MGA Chairman, Gerry Parker, wife Pam and Martin Dewhurst, wonder if Pleurotus has any place in their mushroom future.



Executive member, Dennis Watkins, busy with the Somycel

#### Ammonia Scrubbers

A new development is the ammonia scrubber for use on pasteurization tunnels, to remove ammonia which normally escapes to the atmosphere. The air from the tunnel is passed through a tank containing sulphuric acid. This eventually forms a solution of ammonium sulphate which can be used in the preparation of raw compost. The equipment is being manufactured by Dofra.



American Mushroom Institute president, Jamie Ciarrocchi and his father, pause for a picture, during their visit to the Experimental Station's exhibit.

Compost Additives and Supplements

A number of newer supplements were on display. Calliope S.A. were advertising Compostzyme, an additive for use with the raw compost ingredients, and Calprozyme, a supplement for use at spawning and at casing. Compostzyme is a mixture cellulolytic and hemicellulolytic enzymes and Calprozyme is a mixture of proteins, amino acids and enzymes. The

#### **DUTCH EXHIBITION**



Mr J W M Backus, demonstrates the use of the knowledge-based support system for growers, developed at the Experiemental Station, in combination with LaserVision, cultivation problems posed by growers are stored on software. Growers can call up information on a user-friendly system, with a combination of images, video, or textual information.

precise ingredients were not disclosed.

The supplement Champlus, marketed by Cebeson, is based on hydrolysed feathermeal (see Technical Topics, page 217). The controlled hydrolysis is claimed to produce better results than previous feathermeal supplements.

#### **Casing Materials**

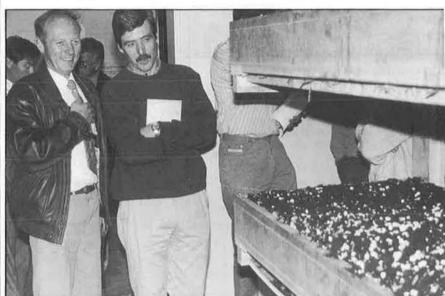
Formerly, most casing in the Netherlands was supplied by the CNC and Euroveen. Other independent suppliers are now also producing ready mixed casing: Interterra, Nooyen and Sterckx (Belgium). The basic ingredients are 'black' and 'white' peats with sugar beet lime or Carbochalk (sugar beet lime with more sugar extracted). High water holding capacity appears to be a high priority.

#### Pest and Disease Control

Few products were on display. The only chemical being advertised which was not approved for mushrooms use in the UK was Topsin (Thiophanate-Methyl). The manufacturers, Duphen claim that this material gives control of *Verticillium, Trichoderma* and Cobweb disease, but no data was presented.



## Visit to Mushroom Experimental Station, Horst



Lancashire growers, John Abram (James Rothwell) and George Foreshaw seem to approve of the crop in one of the larger experimental travs.



Above: The Farmers Automatic stand of Josef Kuhlmann, West Germany, was a centre of interest. The continuous belt at the side of th shelf, with three sized cups, transport handpicked mushrooms to the automatic stem cutting mechanism. Klaus Terstegge, their general manager, considered that the system can reduce picking costs by up to 60%.

Left: Barry Woodcok and Tony Russell alongside the Traymaster video demonstration of their automatic picking machine at the show.



he experimental station is 50% governnent and 50% grower funded, with growrs' contributions being based on bed rea. With the exception of indoor comosting facilities, the experimental station ad not expanded in recent years. Prouction facilities consisted of 8 small and 8 large growing rooms, of which only one was suitable for full mechanisation including mechanical harvesting.

Compost (J. Gerrits)

The main area of work was the production of indoor compost under controlled



Above: Dennis Watkins and Douglas Miller taking a tour of the laboratories very seriously.

Left: The mini bulks, which old four compost bins, needed close inspection by Ceiran Highes and Colin Sturgeon (Chesswood).

environment conditions, without a conventional phase I. It is claimed that the phase I windrow stage of compost production results in 80% of the odour problem. Facilities for producing controlled environment compost consisted of a larger bulk tunnel into which four smaller containers for compost could be fitted. Each of the containers could contain different compost treatments. A possible problem with this arrangement would be the effect of one compost treatment on

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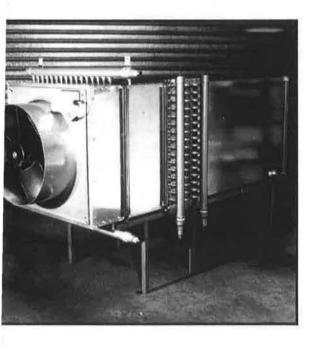
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the other treatments in the tunnel, e.g. evolution of ammonia, effect on airflow through the treatments. Current work is examining different moisture contents in the compost. The compost appeared to be a mixture of chopped straw, chicken manure and molasses.

#### Mushroom Strains, Alternative Fungi

(G. Fritsche)

No further work on the cultivation of alternative fungi is planned, although work on Lentinus (Shii-take), Pleurotus (Oyster mushroom), and Cantharellus (Chante-relle) has been conducted. Work on strain selection of Agaricus species (bisporus and arvensis) is continuing.

Microbiology (G. Straatsma) The role of thermophilic fungi in producing compost which is selective to Agaricus has been studied. Using growth tubes, it had been found that mushroom mycelium more readily colonizes compost which has thermophilic fungi present.

The use of electrophoresis for spawn strain identification and virus detection is being studied.

#### Pest and Disease Control

The main areas of work are the control of mushroom flies with parasitic nematodes and the control of bacterial blotch with antagonistic bacteria.

#### Environment

In conjunction with the Institute of Agricultural Engineering, the relationship between CO<sub>2</sub> production in the growing room and the production of mushrooms is being studied.

#### CNC Compost Centre Milsbeek

The CNC told us that they provide compost to more than 80% of the Dutch mushroom growers. About tonnes of compost are produced each week, of which half is raw phase I and half spawned phase II. A major problem with the current site is pollution; about 1000 tonnes of ammonia are discharged into the atmosphere each year. The CNC has been under pressure from the Dutch government to reduce pollution before 1994. The CNC is therefore investing in a new site near Rotterdam, where compost will be produced indoors. It is planned to produce compost using the conventional method; ammonia and other gaseous pollutants will be removed by filtration and scrubbers. It is planned to build 160 pasteurization tunnels on the new site. On the site there appeared to be no new investments in recent years, although the quantity of compost produced had risen from 10,000 tonnes/week in 1986. To make up grower requirements CNC buy in, especially from Belgium.

Colin Sturgeon, project engineering manager at Chesswood, reports ...

## Quality best so far

I would suggest that anyone using the Dover ferries should allow themselves both time and patience to sort out reasonable parking facilities and not arrive in Dover as I did with only minutes to embark and a car with no home. However, after a frantic search I managed to get some 'heavily financed' parking facilities and got onto the jet foil with about three minutes to spare.

The journey from then on was fast, smooth and relaxing and the conversations on the coach were most stimulating and interesting particularly Ken James' futuristic ideas for the MGA.

On arrival at our destination there was ample time to shower and change before meeting many old friends at dinner where the main topic of conversation was the industry in general and in particular the lack of finance available for investment in the UK.

Thursday morning saw a bright and early start at the exhibition centre and I was very encouraged to see that the major suppliers of the Dutch environmental control systems have come up with one that now covers all growing requirements and is probably as sophisticated as it needs to be. We must all remember the people who have got to operate these systems and to bear in mind that man is the controller of the system and not vice versa. Out of the several being exhibited there were two or three that were particularly outstanding and appeared to meet all requirements.

Moving on to the equipment the quality of the filling and emptying machinery has improved, as my feelings have been in the past - with the exception of maybe one or two suppliers - that imported machinery from Holland has been underengineered and the Dutch suppliers have not fully understood the requirements of UK growers. We do not have the tolerance in our programmes that the Dutch programmes allow for and there was a need to improve quality for the UK ma

A great deal of interest was shown the new picking system exhibited by or of the companies. The concept of tl system from what was shown on a vide was very interesting but my feelings a similar to those of my colleagues, th this machine has still got a long way to before it is ready for launch in the mark place. More detail is required and mai questions remain unanswered.

A battery-operated picking platfor that travels not only up and down th shelves but also along the picking are was on show. There was provision on the platforms for both tray and punnet pac aging to be situated for ease of access t

the picker.

This seems to be a good idea that ma be worth pursuing.

I thought that the quality of the show with the obvious increase in exhibitor was the best so far.

At the evening meal with the trade ex hibitors and visitors all present the obv ous theme to the conversations was th exhibition itself.

We were off to a good start on day tw and the planned visit to the experimenta centre was very interesting and still very popular part of the tour. The follow ing week was the Mushroom Growers course and this we learned was booke to capacity.

One interesting feature was the trial with plastic 'paper' between the net an compost to contain moisture and the ap parent good results that were recorded.

At the laboratories it was interesting t see that there has been a lot of inves ment in this area.

On arrival at the CNC we were give lunch prior to our tour of the compos preparation area. In my opinion nothin had altered over the past six years There have been no major changes a though we understood that they wer hoping to put the whole operation under cover but were having problems in ge ting building permission. It appears the the same government authority that demanded they meet the clean air a some two years ago, is the same bod which gives planning permission. Th reason for putting the compost area ur der cover was part of the exercise t meet this act and therefore the whol thing appears to have ground to a halt.

Summarising, I feel that after havin been on these tours several times, it noticeable that the advanced ideas th Dutch had a few years ago have no become commonplace in the UK an there is now very little difference betwee Dutch and UK technology.

In general they had nothing new t show but had improved on old systems.

### eoff Ganney's

## ROWING PAINS



#### 1st May

Arrived home from a round the world trip via the Australian AGMA/ISMS workshop on Agaricus Compost and finding it none too easy to get back into the work routine. Read through the re-launched Journal which being so different made one give it a "doubletake" but generally felt pleased with the impact. No doubt others may or may not give it a "double take" and surely John Bloom and Ken James will receive a verdict. Extremely gratifying to find a new flush of journalists appearing and Miles Middlebrook's games master's tale holds out much promise for his future reviews!!

#### 2nd May

Decided to reduce the compost density at spawning by 10% for the summer months now having reflections as if it was right to do so. Debated this topic over many years, is it is better to reduce compost density or keep it the same and come down from 5 trays high to 4 high? Never really have come to a conclusion. The same as, is it better to supplement at the same compost density or to reduce density and supplement? Basically it probably comes back to the equipment you have or can afford and the quality of mushroom you require.

#### 3rd May

Watering tree nozzles have gradually come out of alignment and the holes have increased in size due to regular acid cleaning treatments. Having preached many times before about the need to have a proper testing "jig" to monitor the spread and flow of water, it was long overdue that we made one. Like, all things in mushroom growing "critical analysis systems" are essential to gain complete repeatability.

#### 4th May

MAFF press notice announces the formation of B.S.H.R. (British Society for Horticulture Research) a single unified organisation for horticultural research. A thought suggested by the M.G.A. for mushroom research over 20 years ago! The look on the faces of those in power at that time was one of absolute incredibility by both the opposing sides. A.R.C. and M.A.F.F. Maybe things ARE changing, hopefully not too late.

#### 6th May

It is estimated that livestock farming in England and Wales produces 200 million tonnes of animal excreta and 36 million tonnes of liquor from silage. There are over 100 different chemicals including pesticides, fertilizers, oil and veterinary products, regularly in use and stored on farms. The N.R.A. (National River Authority) report in 1987 19% of total pollutions were from farms while 37% were industrial. Prosecutions totalled 337 of which 29% were industrial and 67% agricultural. Very strange balance of figures ......

Noted that the National Westminster Bank's Venture Cash Initiative award that one recipient, **Greg Bramford** was awarded for researching into **Shiitake Mushrooms**. Could it be another conference or journal paper?

#### 7th May

Reflecting on discussions with A.M.G.A. General Manager (used to call him secretary!) John Miller at the organisation's own office in Windsor, which apparently is an ex-church and greatly assists in working miracles in the publicity world. Every Australian publication I picked up seemed to have photographs of mushrooms in some shape or form so the doubling of consumption in under 10 years is understandably reflective of the association's activities in publicity. With a strong market place it appears money has been well invested. But John's explanations of grower's money, in conjunction with Horticultural Research and Development Corporation,

being invested into research convinced me that their investment in this field would also pay dividends. Just consider two of their listed projects:- "Investigation into Water Relationships in casing and compost materials for the improvement of commercial quality and yield." "Analysis of Biochemical and Microbiological factors Contributing to the Nutritional Value of **Environmentally Controlled** Compost in Mushroom Production." There are several more and their 1989 budget is around £100,000 from an industry producing 20 million kg. a year. Good luck my friends!

#### 8th May

New pesticide code of practice (H.M.S.O. at a cost of £5) introduced by the M.A.F.F. which again makes me think about "Biological Control" system, possibly an ideal first subject for an International Co-operation project.

#### 9th May

Considering the heat pumps we use on the Marigold Farm and how the economics measure up with today's energy charges? Yet another calculation to be made. The way we control them with timers these days and the relationship of greatly reduced air movement for the off white hybids strains the figures should be, hopefully reasonable. But again comparisons are not easy to make in relation to direct quality of buildings, compost energy and harvesting methods. Put 30 pickers in a room and the "zoom" factor suddenly leaps uncontrollably forward. Clive Taylor's article in the May Journal gives a good update on systemology and our experience in producing a quality product, when this system is learnt, has been remarkably consistent. Maybe I shouldn't have said that!

#### 10th May

Why is it when trading in a

used machine the market is flat, there is no demand, models have changed, systems are improved and you might as well give it away ....? Reminds me of the Catfield flow line that reached the dizzy heights of £1,000 in Auction and subsequently took six men two weeks to cut it up and many lorry loads to remove it!! Must have been well built or rather rebuilt.

#### 11th May

Jim and Guy back from the Dutch trip with many ideas for future mushrooming and as Jim said of the exhibition it is now a "world wide arena." Thoughts on trimming and picking machines conjured up elaborate changes in biological aspects of production and necessary customer requirement modification. "You wouldn't let anyone loose with a "cheque book" was Jim's final thought on what sounded a rewarding trip.

#### 13th May

A Sunday overview revealed the very usual **creeping complacency syndrome** with potential time bombs revealed around every single corner. Monday should prove to be a "**lifting experience!!**"

#### 14th May

Analysis results revealing high pH at spawning up to 7.8 which we never normally see. Ammonia levels .40 to .52 at filling but down to .01 at spawning with nose (a good pifter!) detectable levels clearing 48 hours after pasteurisation. Variable chicken analysis is becoming more of a problem, with Nitrogen levels of 4.5 - 7.2 in the same day's deliveries. We have not been able to mix loads as previously planned. Why can't we mix them? Due to problems of getting regular timed deliveries. The essence of good compost making has to start with material quality control. In a way that bears out a passing comment by Pat Walsh at the A.D.A.S. Harrogate conference context of in the future composting needing to

be done in not less than weekly 500 ton units in order to achieve economic production and homogeneity. Being able to economically justify modern mixing and blending equipment is part of the total finance package based on unit size. Another kind of philosophy for the future modern grower to have to consider in the event of a total Environmentally Friendly Production System.

#### 15th May

"Straw Disposal After Big Ban" presented by Stephen Scholar from the East of England Agricultural Society indicated mushroom growing accounted for 300,000 tonnes of baled straw from an estimated 5 million tonnes U.K. total. Suggestions for natural biological breakdown by ploughing and mechanical working will result in necessary changes in the biology of wheat production. Changes with any inferior cropping system may affect straw quality. Such implications from production methods and chemical usage are yet unknown. His comments on straw baling are well summarised in this paragraph.

"The straw baling season is limited by the 20 per cent maximum moisture content of the bale, a big Hesston baler may need to bale nearly 3,000 tonnes a season to cover its costs. If straw is to find new markets, price is only one of the considerations customers will make. Quality will be fundamental - this may mean undercover storage. For the straw merchant, the acreage of straw available, yield of crop, type of combine, condition of swath, tramline depth, stacksite and access will be important considerations. At worst contractors may have to be paid to remove straw from fields come 1990?

#### 16th May

Considering how it can be a fact that so many accidents of one type or another happen around a small mushroom business?
Quote from a paper at the workshop, "world competition today requires

repetitive guaranteed high level results." Our only guarantee seems to be more accidents....

#### 17th May

Pinning first breaks has for some reason been getting more difficult and we have had to resort to the use of secondary fans. This is fine but the danger of going the other way and overpinning. particularly if too dry, is a balancing act. But as the mycelium seems to be in a vegetative state for some days after venting and the pin formation is spasmodic we have to seek other options. I suppose air conditionina would be helpful as opposed to pulleys, flaps and strings!

#### 18th May

Considering the June pay award makes for dismal reading in relation to all the other cost increases. There is ever increasing demand (at a cost) for improved quality produce and falling prices. Decided to go to the pub!

#### 20th May

Continuing drought has certainly stunted the local wheat growth and we can look out for some hard waxy straw for the next compost season. Well maybe it won't be so strange?

#### 21st May

Louise, our grower from Marigold arrived back from the Dutch Course and I asked her what major impressions she had gained? Perhaps an unfair question but some replies were different to those I had imagined.

"Compost availability seems to be restricted due to government controls on expansion of the Co-operative yard and the future need to produce environmentally clean compost. No, we did not see or gather information on the new enclosed system."

"Yes growers seemed keen to want to speed up their throughput of crops by using phase III product which will no doubt be available when environmentally clean compost is available through the Co-operative. No, I didn't

think to question if industrial growers would be able to emit ammonia via the phase II rooms?"

"Certainly the course was very comprehensive and came over in a more "punchy" fast flowing way than when I attended some years ago. Maybe with more experience it was easier to follow the discussion."

"Mushroom quality was similar to ours but it was noticeable how heavy each mushroom was and maybe that is to do with casing, moisture levels or strains. Certainly it will be worth trying to increase the amount of water in our casing layer."

"It was most noticeable in the growing sheds how still the air was. Unlike the gales we have through our tray system. Perhaps we should look into modifying our air system?"

"Well it has made me think about the skills required to grow good crops and the need to be an anticipator!"

Now Louise can we expect more mushrooms ...?

#### 22nd May

Problems once again with the availability of "Casing Supplement Pellets" which I suppose is only symptomatic of more being used in the European Industry and those "closest" getting "mostest". Good job it is not a case of supplying the multiples!!

#### 23rd May

Press reports from the Chelsea Flower Show indicate that confidence abounds that coconut husks are an acceptable alternative to peat which coupled with human sewage, composted straw both giving good results on pot plants; so reports the Daily Telegraph Some local councils have planned voluntary bans on peat usage for landscaping, mulching and park work in favour of what they call plentiful supplies of bark and mushroom compost. Is this a marketing opportunity? Will the mushroom industry decimate the world's coconut plantations ....

#### 24th May

Busy Executive meeting in London with what seems to be an ever increasing variety of items to discuss and sometimes you question wha is the modern role of the M.G.A.? But there you go, a European scene of an over supplied product with the need for total sales business bias. Having read my copy o Mushroom Magic- the broke spell, a report on the U.K. industry by Laurence Gould Consultants Ltd I am definitely going into coconut production!

#### 25th May

Lack of flies on any farm makes me ask the question, "Is the meagre control method we use that good, or are we just, "Killing Dead Indians." Recalling Jim Sinden's thoughts on the latter we decided to eliminate all fly control procedures. Yes that didn't take long as we only had one ...

#### 27th May

Noted some pre-first flush mushroom coming up "Blonde." In an "off-white" hybrid flush but definitely "French Blonde" mushrooms Mixed spawn? Strain throwback? Just mushroom? But you are the only grower who has reported such an occurence.

#### Spring Bank Holiday

Oh for that picking machine.

#### 29th May

Principles of management discussion in harvesting mushrooms are sometimes either not understood, or forgotten or never learnt. No doubt each company has its own procedures, as do we. But let there be no deviation to agreed principles lest no one knows where they be.

#### 30th May

Do casing wetting agents do what is claimed and do they have any untoward effect on mushrooms? No doubt numerous conventionally controlled trials will have bee undertaken by the relative bodies and will be well supported by M.A.F.F. trial



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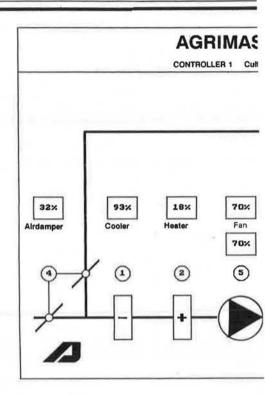
improved continuously, adapted to the increasing wishes of the growers who have learnt to handle the AGRICONTROLLER and have come to appreciate it

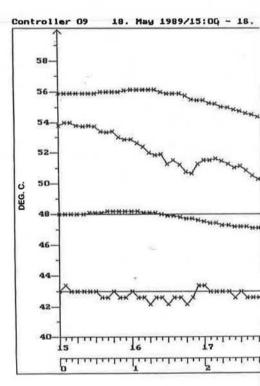
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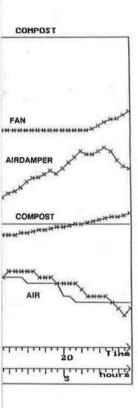




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## HARVESTING

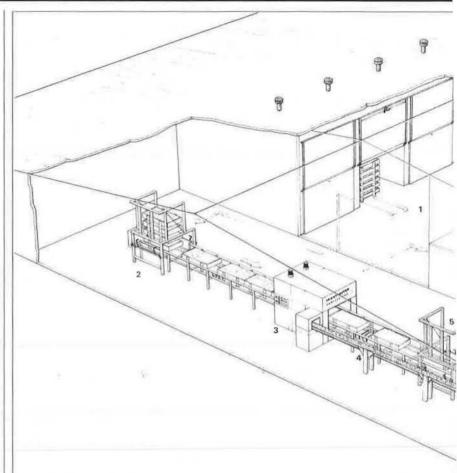
In this month's special feature we look at harvesting, one of the most vital operations on the farm. It is especially emphasised just now because of the launch of Traymaster's mechanical harvester which is certain to re-open the debate on this subject. The endless discussions on pickers, too, continually surface as we point out in our comment. We would stress once again that we welcome all types of comment on this - and any other subject. The more we enter the debate the more rational our thinking on important matters should become.

## Picking 24 hours a day, seven days a week, 52 weeks a year

#### by Barry Woodcock of Traymaster.

A machine for automatic picking, trimming, grading, weighing, chilling and packing of grade one mushrooms for the fresh market - able to operate up to 24 hours a day, 7 days a week, 52 weeks a year - sounds like a mushroom grower's dream machine .

But TRAYMASTER have developed



1. corridar between growing cells

1. corridar between growing cens
2. destacking unit
3. automatic harvester
4. transport mushrooms by conveyor to packing area
5. stacking unit
6. transport to and from growing cells

TRAYMASTER AGRISYSTEMS /

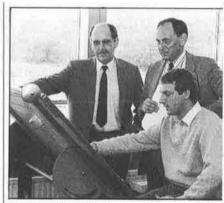
such a dream machine, and have patented it worldwide.

Proven technology in the form of a computerised camera, has been combined with a newly developed picking head to give a precise and very fast (but gentle), individual mushroom picking

The camera scans a bed of mushrooms and accurately measures the diameter, shape, and colour of individual mushrooms, and their positions relative to an x-y axis. This information is processed by a computer to decide which mushrooms to pick and in what order by size, position or shape.

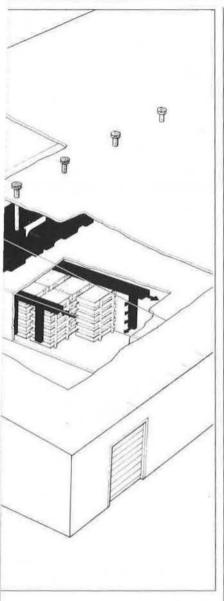
This information is then passed to the individual mushroom picking heads, up to 12 of which can be controlled from one camera/computer system, to pick the mushrooms.

The individual picker heads and the positional control systems, have been the subject of literally years of work and have now been refined to the point that the quality of the machine picked mushroom, is better than that by human hand.



Left to right, directors Tony Russell and Peter Sargeant look at drawings for the automatic picker with design office supervisor Stephen Thouness.

After picking from the bed, the individ ual mushroom is passed at high speed t the packing position without leaving th picking head. An adjustable height blad trims the stalk to the requested lengt and the mushroom is placed accuratel





Barry Woodcock. sales & marketing director of Traymaster, looks at the map of the world which plots his numerous travels.



Geoff Wheeler (right) and Lee Russell put the final touches to the demonstration automatic mushroom picker.

weight. This is made possible not just by 24 hour picking, but by the total information available from the camera/computer combination.

Combining the total concept of the

automatic picker with automatic guidance vehicles (eliminating fork-lifts and their drivers) and the new indoor composting system, could perhaps lead to mushroom growing becoming an industrial process taking place on any factory estate in any large city!

Currently the automatic mushroom picker is being tested on a tray farm using a simple picking line concept, and it is expected to be commercially available for tray farms late 1990 early 1991. Planning has taken place for a shelf farm version, involving some adaptation to the present shelf configuration and this machine is expected to be available in

Distributorships and agency representation worldwide are being concluded and interested parties and individual mushroom farms are being shortlisted.

A breakthrough in mushroom growing

n the position required. This may be pread evenly in a basket or placed exactly in a small pre-pack.

The accuracy of the picking operation s simply applied to the packing oper-

At the packing position the mushrooms an be weighed automatically in baskets or pre-packs and discharged by conreyor, or can be positioned individually on a special conveyor to pass through a mall low energy "individual mushroom hiller" then packed and weighed.

A picking rate of up to 1000lb/hour rom a 12 head machine is the present output target. The computer programme allows the grower to specify the size or sizes of mushrooms to be picked, stalk ength required and how the mushroom

vill be packed.

The original object of the automatic picker was to drastically reduce the numper of pickers on a mushroom farm, and his it does. But a far greater advantage has been realised as the machine has peen developed - the ability to harvest nushrooms at their best quality and

## The Kinsealy semi-automatic mushroom harvester

Part 1 by Cathal MacCanna. Managing Director, Carbury Mushrooms.

#### Introduction

The cost of harvesting mushrooms by hand in Northern Europe varies from approximately 8p per lb (Ireland) to 16p (The Netherlands) - up to 25% of the grower's selling price. The cost does not vary greatly between good quality high value mushrooms and low quality ones. Poor quality harvesting or failure to harvest in time adds a further cost as high priced product deteriorates to the lower

There is no automatic or semi-automatic harvesting system for quality fresh market mushrooms at present. All fresh market mushrooms are harvested by hand using teams of mainly female pickers. One of the most demanding tasks on a mushroom farm is to recruit, train, supervise and control the picking teams. The larger the farm the more difficult it tends to be to have picking at the right costs and standards.

The harvesting problem is particularly unsettling for the many capital and technology rich companies which have invested in mushroom growing. These



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#### **HARVESTING**

ght reasonably have hoped that a solun would be found by now. It is these mpanies in particular who support search and development on the subtof harvesting and who stand to gain ost from a successful approach. One ch company, John Labatt Ltd., funded research team led by the author which time lead to the development of the nsealy Mushroom Harvester described this paper.

#### ackground

ne mechanical harvesting of mushoms non selectively does not present ajor problems in a modern mushroom owing system. Simple vibrating knife or now-bar" type machines can rapidly move mushrooms en mass off the opping surface. The bruising, irregular itting and the necessity to allow the ushrooms to develop to an overmature age results in a product unfit for the harnessing market. By esh this oproach however, the Dutch mushroom dustry has developed a large competve mushroom processing industry.

For the fresh market, selective haresting is required to ensure that mushoms are harvested at the correct stage size and maturity. Manual harvesting the only system at present which lows the selectivity required. Furtherore only manual harvesting allows ushrooms to be picked and graded

ithout damage or deterioration.

The basic objective of any harvesting achine for fresh market mushrooms erefore must be to harvest mushrooms

electively without damage.

#### roblems

he nature of growth in a mushroom crop resents many difficulties for mechanical arvesting on a selective basis. The main fficulties are:

1. Cropping occurs in flushes which ave a 3-5 day duration. During the flush hly a proportion of the mushrooms are the proper stage of maturity for harasting at any one time.

 Within one cropping house or one ection of a cropping house there can be ariations in the stage of development of flush due to raw material or environ-

ental variations.

3. Even within a small area of cropping urface irregular growth due to clumping other factors causes significant variations in the mushroom size and the agree to which the mushroom stipe is clined from the perpendicular. This latter factor can frustrate any attempts to se a horizontally orientated cutter.

#### pproaches

ew Developments – several techniques nd trends emerging over the past few scades have eased some of the difficuls facing the development of a selective arvester. These are:

1. A substantial reduction in the

amount of clumping by the use of such techniques as "spawned casing" or "ruffling". It is difficult to envisage any selective harvester that could cope with the extreme variation in size, maturity and orientation of mushrooms in clumps. With the new techniques clumping is much reduced in the first flush and virtually eliminated in subsequent flushes.

2. A considerable improvement in the evenness of cropping due to consistent filling and casing operations by more sophisticated equipment. Similarly more expensive use of full air conditioning combined with a better understanding of the factors involved in fruit body initiation has led to more even cropping. In general any technique which leads to more even and predictable cropping will facilitate harvesting.

Unfortunately, counterbalancing the factors favouring the development of a selective harvester are developments at consumer level where presentation standards of mushrooms are continually rising. A substantial part of the modern market demands blemish free, size graded, well presented mushrooms to a level not likely to be achieved by a machine.

#### Requirements for a harvesting machine

A successful harvesting machine must:

 Select the mushrooms to be harvested taking into consideration their size and stage of maturity.

Remove the selected mushrooms without damage to themselves or to adja-

cent mushrooms.

3. Trim, grade, place and present the mushrooms in the appropriate market container.

This is in fact the action of manual harvesting. The eye identifies the mushrooms to be picked, the picking and placement is performed by the harvester's hands in coordination.

#### **Alternative Approaches**

Analysis of the alternative approaches to mechanical harvesting of mushrooms for fresh market identifies three main approaches:

Mass harvesting of precision grown crops

In this approach a simple cutting device severs the stipes of mushrooms which are grown to be at the same stage of size and maturity at the one time. A mushroom conveying device removes the severed mushrooms and places them gently in the market container.

The mechanics of such a system are relatively easy to develop. The requirement for precision grown mushrooms presents substantial difficulties however. Even crops grown on the most modern well equipped farms have substantial within crop variation of maturity rate. Only second flushes which are more even than any of the others approach the degree of evenness required.

At the present time there is no indication that new technology is on the way which will lead to even stands of individually spaced mushrooms. Until this problem is solved mass harvesting will remain non-selective and suitable only for harvesting overmature mushrooms for processing.

Selective harvesting using imagising and robotics

Developments with computer technology have allowed rapid progress to be made in the field of imagising and robotics. Applying this technology, a camera acting as an eye can see the mushrooms; a computer acting as a brain converts the visual image into a form where it can be fitted into a set of instructions; a robot arm receives the instructions and carries them out by harvesting the mushroom and placing it in a container.

This approach can be made to work easily for individual mushrooms standing separately on a bed. The situation becomes much more complex under normal flushing conditions. A simple camera cannot assess properly which mushrooms are ready for picking when mushrooms are dense and touching on a bed. Similarly it is difficult to envisage how a picking arm can access the mushrooms for harvesting on a dense bed without damaging the surrounding ones.

It is likely that the sophisticated imaging and robotics approach therefore depends on major developments in growing technology to give even individually standing mushrooms. While it is understood that considerable resources have gone into this approach in The Netherlands, it is the author's view that a practical machine will not emerge in this decade.

3. A semi automatic approach

A machine capable of being manually directed to harvest selectively may present the most practical approach to mechanical harvesting at the present time. This is the approach adopted in the development of the Kinsealy Mushroom Harvester.

This harvester achieves its objectives by use of:

 A small cutting knife reciprocating rapidly which can be quickly and easily directed among the growing mushrooms to sever the stipes of those ready for harvesting.

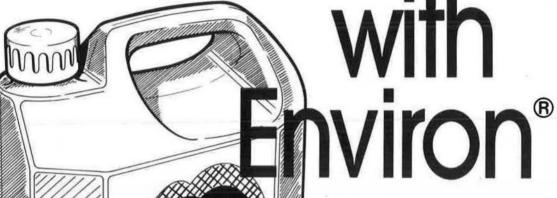
2. A vacuum operated lifting and transfer device which gently removes the mushrooms simultaneously with the cutting of stipe. The same mechanism places the mushrooms on a conveyor.

 A conveyor supported by a central stand receives the mushrooms from the lifting and transfer device and delivers to a collection basket at the conveyor end.

The harvester is shown diagrammatically in Figure 1.

Part 2 of this paper will be published in the August issue of the Journal.





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#### THE HAYES INTERVIEWS

#### m Rothwell in conversation ith Fred Hayes discusses, nong other things, echanical harvesting.

ate 17th April, 1990. Location: Little all Farm, Ormskirk, Lancashire.

red There is an announcement of a w development in the mechanical haristing of mushrooms. This takes us ack to the early 1970s when much citement was generated when a protope harvester was described at the ternational Congress in London. Since en we have seen a limited application machines in Holland adapted for use 1 shelf beds but the mushrooms harsted are processed. How do you as a accessful and progressive tray grower ew the prospect of mechanical harvestig, bearing in mind that here in Britain, is demand is for fresh mushrooms?

im I am sure it is technically possible to arvest mushrooms mechanically for the esh market even on tray farms. Today, ith all the technology that is available most anything is possible, but at the nd of the day it is the costs of mechanial harvesting compared with hand pickg which will decide its relevance taking to account the emphasis now being givn to quality and appearance. It may rove to be a viable option. Trays have n advantage because they are mobile nd offer the opportunity of using a peranently placed machine or robot in one osition, using several picking heads if ecessary to quickly harvest a growing ouse and give product volume in a short me. To my way of thinking this is a more ttractive proposition than having several botic machines being moved around ie farm from house to house as I susect, whatever the machine, it is likely to e sensitive to movement over rough urfaces, dust, dirt and also the high umidities which we have in our growing

red Are you suggesting that the picking ne and the so-called 'picking parlours' 'ill again emerge. As you will recall nese were not entirely successful when ney were tried on a few large farms ome 20 years ago?

im Yes, and I recognise there were roblems but I am sure that these can be vercome. Engineering and technology ave advanced so much in the meantime nd we now have much more control ver our cropping.

red I am really surprised that you see uch a future for picking lines. If we ssume that we have the machine to uccessfully harvest the mushrooms hich are suitable for the fresh market ow is it possible to overcome the risks of isease transmission with all the tray overment that is required with a centraled picking line?

Jim Perhaps I am fortunate, but we do not seem to have a disease problem on this farm. We must not be complacent with disease, so we take steps to avoid the occurrence of disease and we only crop for three flushes. We feel it is quite safe to extend cropping to four flushes before disease becomes a factor. We can comfortably achieve 4½b ft² on three flushes and probably 5lb ft² if we extend to four flushes. We are testing this as sometimes the quality of the 4th flush is not as good as the 2nd or 3rd flush.

**Fred** You mention the control you now have over cropping. This is clearly as important for hand picking as it will be for mechanical harvesting.

Jim It is crucial. We must supply the markets when they require them. Also we must time our crops to fit in with our picking capacity. In the old days we could pick mushrooms for two days in a week and forget the other days. This is not possible anymore – an even spread over the five days of a working week is essential with possibly peaks on Wednesdays and Thursdays.

**Fred** This must be difficult to achieve even with the sophisticated controls you have on your farm.

Jim We can achieve a great deal by the use of casing supplements, but of paramount importance is the control over temperature. The hybrid strains are so sensitive to temperature that very accurate control to within ½°C is required. Size and to an extent timing, is very dependent on temperature. Likewise carbon dioxide level is also important.

**Fred** The requirements of different strains and their reaction to such small fluctuations must be defined precisely. Do the spawn suppliers give such precise information on their strains?

Jim We tend to restrict the number of strains to those with comparable reactions to the environmental factors, temperature and carbon dioxide. The instructions given by the spawn producers can only be taken as a guideline for a given farm as the parameters given are determined under a given set of conditions

There are so many different variables we have to take into account, especially the compost. The rate of pinning is dependent on the potential of the compost. With a compost of high potential we find it is necessary to limit the pins forming on first break by raising the carbon dioxide levels, in order to get mushrooms of acceptable size. Compost is inherently variable a spring compost needs quite different environmental conditions than autumn compost for the control of size of flush and the general quality of the mushroom. In the same way the weight of compost per square foot is relevant.

**Fred** I wonder how many growers relate compost to environment control and to the management of the crop for quality and harvesting?

Jim Consistency in composting and

compost quality must also be part of the total control process and that is why we are considering moving to a more synthetic type compost, but the drier summer conditions also play a part. What I am certain about is that compost quality and consistency is as important as environmental control.

Fred Your reference to the term synthetic compost reminds me that, according to the ISMS working party recommendations, we should be using the term 'straw based' and not 'synthetic'. It is going to be difficult for all of us to switch to this new term but we must all try as, in this day and age, terminology appears to be important in conveying the preferred image.

Can we move on to aspects of personnel management. In this context I am referring to the 'pickers' or 'harvesters' as I prefer to call them. Peter Munns calls them his 'front line troops'.

Jim I agree with Peter Munns, they are a very important component on the farm. Here again we are fortunate. For many years now, we have not experienced any difficulties in employing pickers, probably because we are in an area of high unemployment. We have a low turn over of staff and I would also like to think that it is at least partly due to the style of management we adopt and the friendly atmosphere.

Fred I am sure management has much to do with this. I was intrigued with the terms you used to describe your approach to management when I last visited your farm in February. As I recall you referred to 'objective orientation' and 'task orientation' as alternative approaches to personnel and the work that has to be done on a farm. Picking appears to me to be the least interesting and most boring of all jobs on a mushroom farm. How do these terms apply to your picking staff?

Jim I am not sure when or where I heard of these terms, it may have been in a book or on TV but their meaning assists me a great deal in training my staff and it applies equally to my picking staff as to any other staff sector of the farm. They are terms which describe how people approach their work. When people are task orientated they merely go through a series of motions to complete the work with no consideration for the results of their efforts - whether it is good or bad, right or wrong. Objective orientation to work is where the objective of the task or work is defined and the task or work is only completed when the defined objective has been achieved irrespective of how it is done. I try to have everybody thinking of what they are doing in relation to what we are trying to achieve and to avoid giving arbitrary directives. This objective approach makes work more interesting and gives staff an incentive and a degree of satisfaction when they achieve the objective. With picking it is a very important approach to achieve the quality and picking rates that are being

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#### IARVESTING

#### THE HAYES INTERVIEWS

ked nowadays. Also it is important to vard work which achieves the objectes set.

ed Can you offer an explanation of the t that in England we invariably have nale pickers but hardly ever male as is case in some other countries I visit. so why the loud music?

m The finger dexterity factor is more ident in the female. Men can not match picking rates of women. We do not ject to the zaney Radio One music, is in fact helps, since it cuts out the initable chat with the neighbour and assis in focusing attention on the task of king.

**'ed** We have not by any means hausted the subject but this visit to

your farm convinces me that new technology will make growing less dependant on the human factor. In so doing it will change the character of our farms and growing will perhaps be less interesting. Personally, I have many reservations about the prospects of mchanical harvesting for the fresh market particularly since supermarkets are now setting such unreasonable and varied quality and grading standards. There is much pessimism circulating in the industry at present and many of us are looking for some kind of 'silver lining'. It is refreshing to see such a high degree of optimism here on your farm.

**Jim** Yes, I am optimistic and this is based mainly on the technical innovations which we can expect over the next

few years. On this farm we are well on the way to being able to manipulate our growing so as to give whatever product the market demands. At this time 'Quality is King' and our production plans are geared to producing the best possible consistently. irrespective whether we harvest by hand picking or by machine. Mechanical harvesting is in my view an inevitable innovation and from a production point of view we are in a position to consider it as an option. As with any new technique there will no doubt be problems but we are quite accustomed to solving such problems in mushroom growing. At the end of the day it is the bottom line that counts and the costs of mechanical harvesting relative to the returns will determine its future. I am looking forward to the challenge.

## Vhen we get to harvesting everyone backs off

e make no apologies for epeating this most teresting letter from ARIET VEDDER, first ublished by Geoff Ganney in ournal 200, August 1989.

After reading your 'Growing Pains' in e May issue of the *Mushroom Journal*, I, ould like to respond to what you have ritten about your experience of April 5th ad your philosophy about a picker's nife.

Indeed, I have studied the most impornt tool a mushroom picker has, peraps a little more closely than have most your readers.

First of all, I would like to explain why n so interested in what you wrote about arvesting in general and the cheap, but evertheless very important tool, the nife.

At the age of 14, I was already picking ushrooms to help out at the small farm my friend's parents in Horst. Since en I have spent a large part of my life in ushroom houses, picking mushrooms yself, training pickers on farms all over e globe and introducing new harvesting chniques and methods to improve the ficiency and also the quality of the oduct. We all know that mushroom owing is not that easy and more and ore is developing into a science. To aprove we organize conferences and burses, we write books and magazines nd sometimes we have open house to now off some good first breaks. There en is a kind of mushroom doctor, Geoff anney, specializing in Growing headches. It is amazing to me that at these con-

rences or in these books and maga-

nes, famous experts talk or write about

impost, supplementing, cac'ing, deep

scratching and the use of chlorine and the ideal CO₂ concentration and hybrids and virus and marketing, but so far ..... I have always missed harvesting.

It seems that when we get to this, in my opinion, most delicate and important part of the mushroom business, almost everybody is backing off, having no interest. Do the owners or manager of a mushroom farm forget that the pickers are eating away almost 60-70% of the labour pie?

Don't they realize that a picker can influence the quality of the product more than any other factor in growing?

We send our growers, area managers and composters on courses and to meetings, sometimes even overseas.

Do we have any serious training programme for the largest work force, the mushroom picker?

Are the mushroom growers dozing off? They have mechanized and computerized to the fullest extent, but most of them have overlooked in my opinion, one of the most important (and also expensive) areas.

It seems to be below the level of the designer-owner of a farm to discuss with the pickers how to create the best harvesting conditions.

We do the utmost to get the mushrooms on the beds and very little to get them off properly.

May I offer your readers a suggestion Geoff....?

The best way to recognise the daily problems in the harvesting area is to let the boss or manager pick mushrooms himself for half a day or more. Then he will figure out that indeed it's very unpleasant constantly to get a wet shoulder from that dripping plastic airduct, or a stiff neck as the result of the high air velocity in the aisle.

He will never before have realized that it isn't that much fun to sit on your knees or a cat-walk for hours on end to collect the white gold nor that indeed the distance between the two beds is so small and that the lowest bed is so close to the floor nor how frustrating it can be to pick just 12 kg an hour with hard work, because of mushrooms at 160 to a kilogram and most of them almost open al-

ready. All this while somebody is asking if that room will ever be finished.

The boss then will figure out that there's actually more light in his toilet than in the growing rooms where 15 or 25 people are working for so many hours.

A king-size bed may be wonderful during night time but for picking the mush-rooms at the centre of a bed, one should know that the maximum width should not exceed 140-145cm (4ft 9in).

By doing the picking himself he too will realize how unpleasant and itchy it is to have compost in your hair and down your neck because of poor construction of the sideboards or of sloppy filling. Perhaps he never before realised that there are so many spots in the room with puddles of water on the floor, bad for controlling blotch and very unpleasant to stay in too!

He will figure out that this stepladder is not as handy as he thought it was; that the space on the platform of the lorry is indeed very limited and that climbing on the trays goes far beyond his physical capability.

After that half day picking he perhaps will understand much better why many pickers are constantly looking for other jobs.

Sorry Geoff, I almost forgot to tell you more about the knife. In my opinion, and I've quite a bit of experience, the best mushroom picker's knife is made by:

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If the mushroom growers in the more developed countries want to continue their business in the future, they'll have to pay much more attention and spend quite a bit of money to improve the harvesting situation. Although the Dutch have developed a system for mechanized harvesting, we all know that for a high quality, fresh market product we still need human hands. For a little as about two German Marks at least we can put a good picker's knife in those hands.

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## Ninterpicking Parlour AD 1970



Hugh Barton interpick Mushrooms Ltd

arting a career in mushroom growing in ≥ late 1940s, I very quickly adopted a ilosophy about MOVEMENT. Never, ver pick up something twice if once will ffice — and apply the same rule with 1bs, arms, legs, fingers — the lot!

Some of us still remember the move m growing in shelves to growing in fish xes and ammunition boxes. We chose a latter because they appeared, and in it, proved to be, very much more bust. After all they were made to carry couple of shells, not a couple of cod! It — too light for two men to lift, and for me of us, too heavy for one, particuly with second-spit Mother-Earth casag. I still cringe whenever looking at a light-lifters. But, this is supposed to be out a picking line!

So, moving 20 years on, we have tered the mechanical handling era; k-lift trucks, compost turners, machine es, and for us with an expansion proamme to double production. And, of urse, the problem of how to reduce king costs — always about 40% of al labour costs — and as it transpired, w to obtain sufficient numbers of picks in an area of the S E with full employant. Already there were two buses

ching and carrying daily.
Supervising the infinitely variable ades of mushroom picking had always en a major problem – not to mention a difficulties of getting pickers to use the ps rather than climbing on the edges

of trays, leaving their imprints on the casing and littering the floor with chogs. Above all missing the odd spot of *Verticillium, Mycogone* and *Dactyllium* because of inferior lighting, carelessness or blindness — or all three.

Surely, with all this modern mechanisation and modern brains, we could in some way become more efficient with harvesting such a delicate and beautiful crop. After all, we had always thought a mushroom should be treated and handled like an EGG.

Other growers were thinking on the same LINES, and it was at this stage that we were invited to see a picking line at John Bradfield's farm in Norfolk. We were impressed — he was using 6ft x 4ft trays in stacks of four. They were offered up to a de-stacker at one end of the 'line' and re-stacked at the other. With trays full of mushrooms, and the right number of packers, the operation ran very smoothly and certainly looked a calm and efficient operation.

Returning to our farm there followed long meetings and debates plus sketches and 'line' layouts. We looked at everything: the concrete floors, the fork-lift trucks (diesel), the trays 4½ft x 4½ft, tray legs, pickers, pickers' legs — all the gear they had to carry. Decision-making was not easy. The fork-lift trucks had been adapted to carry an extra pair of forks, so that instead of the bottom tray of four having to take the stress of three trays, each pair was lifted. This certainly reduced the wear and tear on tray legs. Obviously if we could bring the trays to the pickers, this should clearly reduce the stress on theirs, not to mention the advantages of not having to carry all the gear and climb steps (or trays).

Eventually we reached the stage where discussion had to be followed by decision, so we listed the essential factors which had to be considered and found acceptable:-

 the position of parlour in relation to all cropping house and distance;

the quality and condition of concrete surfaces;

the amount of room available at or near the parlour to allow a whole row to be moved before picked trays could be returned to the house;

 the length of line required to accommodate the right numbers of pickers and keep a steady movement of flow;

 the ability to grow to a standard whereby a whole 'flush' could be picked and so avoid unnecessary movement;

the possible harmful effects of diesel fumes;

 the extra wear and tear on trays due to all the extra handling by fork-lift trucks;

 the attitude and reaction of pickers to a constant flow of trays, and our ability to set the right speed for 'X' number of pickers for optimum output,

Perhaps there were other factors that should have been given some attention, but these seemed, at the time, to be the most important. We felt that with experience we would be able to cope with these although we realised it would only be worthwhile picking the first and second flushes, and maybe a third on the line, and not moving trays to the line for later flushes. We realised we would still have to retain conventional picking for these.

The actual arithmetic involved in deciding the length of line and so on was worked out on the basis of moving up to 'X' number of trays from three houses in what was at that time a 5-hour picking period.

It was about this time that another decision had to be made. Up to now we had emptied the trays singly by fork-lift truck taking a stack of four out of the house and then picking each tray up and offering it at the back of the lorry where two men up-ended the tray. A slow and laborious operation in the open — whatever the weather! If we were to go for a picking line surely we could incorporate an emptying device?

Engineering Design Ltd were consulted and eventually submitted plans for a picking line/emptying line to be accommodated in a shed 'X' ft x 'X' ft, rather like a somewhat mishapen horseshoe at the open ends of which were the stacker and de-stacker, both outside the end wall, and with the emptying device midway. This tilted a tray contents on to an elevator taking the compost through the wall on to the lorry.

Any remaining doubts as to whether to go for a line dissolved, and the die was cast.

After the 'line' was installed and we had started using it for picking, many problems arose, most of which we had anticipated, but which we felt could be overcome with patience and experience. We ran it as a picking line for about 6 months, after which we went back to conventional picking. The main reason for doing so was the excessive and unacceptable wear and tear on trays, and our inability to achieve a smooth and efficient operation, both in the use of our picking staff and fork-lift driving staff. On the occasions when it worked well, it was an extremely satisfying spectacle to see trays being returned to the house, beautifully clean and watered ready for the next flush, but our performance was too inconsistent to justify its continued use, and the final 'straw' was the discovery of virus infection in the crops.

As an emptying line it was a huge success and continues to be so to this day, so I suppose we 'hedged our bet' and

Is there a 'future' for picking lines? In my view only if the whole farm is designed in the first place around the machinery to be used, right through from composting to packing the produce for market. this has been done successfully on the Continent, and WITHOUT the use of fork-lift trucks.

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#### RESEARCH AND

#### DEVELOPMENT

## Highly complex and delicately balanced



## Richard Gaze on R&D at area meetings

Objectives of R&D are cost reduction, quality improvement, and greater precision and consistency, as well as safety and environmental protection.

We need as an industry to have an opportunity for discussion in a rather complicated and rapidly changing situation. Discussion will ensure that we all have some degree of understanding and agreement on what can be achieved. Misunderstanding on the part of one side or another of the partnership will lead to waste, wrangling and disappointment. This may sound forbidding but it's meant to be a positive and optimistic objective.

A situation from which we must evolve, in the near future, is that we have considerably less money than we are used to for R&D.

Current changes at GCRI are ironically not being brought about by application of logic, but by the withdrawal of funding and subsequent need to rationalise.

Agricultural R&D, like many public funded endeavours, is being affected by a complex Government philosophy which can be over simplified by saying; If you halve the input you will get twice the output as a result of increased efficiency.

In addition to this there is a fundamental philosophical switch in Government funding. Agriculture was supported for the benefit of the tax payer. Now it is considered that R&D is largely for the benefit of the grower. Therefore he should pay

for it! There are exceptions to this. Ve fundamental work is still considered to I the responsibility of the DES. Work I the public good plus a little extra nonear-market work will be funded MAFF. All other R&D has to be funded I the mushroom industry itself.

We have a new organisation – BSH– made up of MAFF/AFRC at present Littlehampton, but soon to be moved Wellesbourne. At BSHR (W) we intend have the laboratory facilities and growing facilities needed to undertake wo across the spectrum. The cropping facilities will range from small experiment chambers to commercially credible proving houses.

For the future – there are some god things: a) We have finally got one cent for R&D and b) We have the opportuni finally to sink the "them-and-us" sy drome which at times has been a litt wasteful.

There is a school of thought which says there isn't such a thing as 'banews – only opportunities and challenges. So the challenges are: a) a shound age of funds (forgetting DES money for the moment). The funds are likely to the MAFF £485k and HDC £175k – a total £660k. That is probably half the spenditen years ago – not counting inflations b) If we are not going to have to start from scratch with people at Wellesbourne whave a major resource conservation is to do. These are the challenges then the weak an industry have to rise to if we at to get any benefit from R&D.

The way for me, being an eternal op mist, if not idealist, is to establish strengthen as fast as possible, a relatio ship of mutual trust and respect betwee R&D workers and the industry. A lack of results in stifled creativity on the or hand and disappointment and reluctance to pay on the other.

The present situation could be an lysed as a dangerous impasse. It's highly complex and delicately balance one. We have diverse, competitive indutry currently short of money. If we sper too little, meagrely, constraining the ski and innovativeness of R&D workers, the expenditure isn't cost effective. If on the other hand we can bring a bit of flaverve, and panache to bear we will regise that R&D is highly cost effective.

ise that R&D is highly cost effective.

There are plenty of precedents. If v can break the impasse positively, r source is no problem. Only 1% of cos on R&D would provide over £1 million.

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## NEXT MONTH

ily in all types of media the topic of the vironment gets more important, until now it can longer either be ignored or left to another day. f we had to pin-point subjects which will cause amatic changes in our businesses in future we full point without hesitation to environmental sues first and closely follow with employees' alth and welfare considerations.

xt month we shall consider problems and lutions regarding gaseous and liquid effluvia, the sposal of growing bags, COSSH and its effects. Impany public relations is important here and we all examine how organisations outside mushroom owing cope with the situation (e.g. we are told that in Huddersfield employs 32 people purely to restigate neighbour complaints). BUT we shall so look at the great benefits of mushroom litivation including the use of waste materials, use spent' compost, as well as looking at mushroom ms as highly efficient food production units.

ot an issue to be missed as it will include as well our regular features. Don't forget the Journal and its benefits comes only to members. Here's your ance to recruit.

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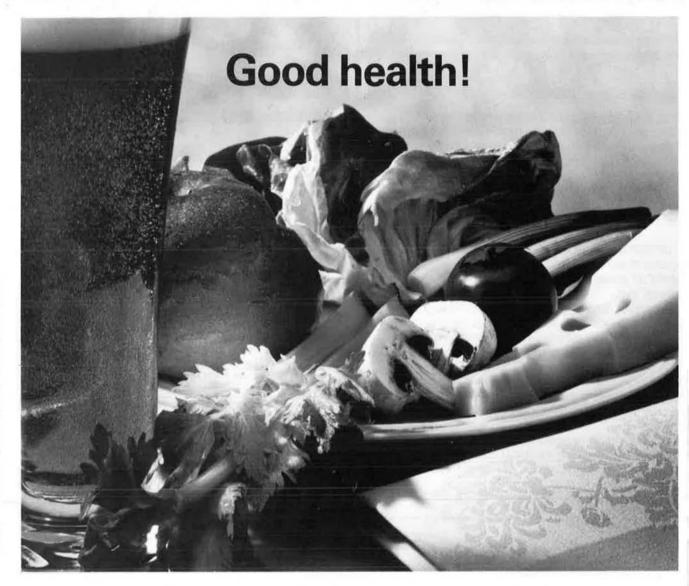
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## TECHNICAL TOPICS

# Senefits of compost supplements confirmed; new supplements under sest

## eter Flegg our technical editor reports on R & D in West anders.

ie mushroom experimental facilities at Research Centre, Beitem-Roeslare, elgium, are modern and well-appointed. account of work on mushrooms done ere between 1983 and 1988 has cently been published and it contains uch which could be of interest to mushom growers in the UK and further eld. The topics covered include, comst analysis, supplementation, spawn ains, casing materials, pests, disises, chemical residues and shelf life of ushrooms. Most of the work has been ne on the mushroom Agaricus bispos but Pleurotus spp, Coprinus, and ropharia, have also been the subject of me studies, The results are given in enty-seven chapters and each is well ovided with a wealth of tabulated data. oncise chapter summaries are provided an eight-page english summary wards the end of this three-hundred id forty-four page volume.\*

#### ossibilities for new upplements

a wide-ranging series of studies on pplements and supplementation, the neficial effects of supplementing comest at casing with such protein-rich marials as Millichamp were confirmed. It as also found that the prospects for pplementing composts prior to Phase were unfavourable and that dairy fat-lls, a fine granular fat used for feeding ws, reduced mushroom yields and couraged the growth of the green ould *Trichoderma viride* in the com-

However, in a search for new and ernative supplements in which empts to produce the "slow-release" ect by chemical or physical means, pplementing compost at casing with aize gluten, extruded to give it a gran-

ular character, resulted in mushroom yield increases of nearly 30%. Chemical treatment of the gluten gave no better yield results. In further trials, a commercially-produced maize gluten (Glutalys), when used as a supplement at casing, equalled Millichamp 3000 in performance, and both extruded maize gluten and extruded wheat gluten performed at least as well as the commercial supplement Millichamp 3000.

Supplementation at casing with some natural keratin proteins, such as feather meal, leather by-products and hornmeal, which are all slow to decompose, produced some interesting results. Chicken feather meal added at casing at the rate of 1% of the spawned compost weight resulted in an average mushroom yield increase of around 25%. Chemical treatments designed to increase the ease with which the keratin proteins would break down gave rise to no further increase in mushroom yields, however.

#### Alternatives to peat

Comparisons of several mixtures of peat, lime, clay, and the mineral vermiculite in casing mixtures showed, in cropping trials, that most of the mixtures used were good enough as alternatives to the standard casing mixture of, by volume 70% peat and 30% sugar beet lime. While it was found that vermiculite could take the place of peat in the casing mixture, its cost is too high compared with that of peat. This is a situation which may change. Environmental pressures are currently towards the conservation of peat stocks. While it may be comforting to know that vermiculite may be a possible replacement for peat in casing mixtures, experience at the old Mushroom Research Association Station, Yaxley, in the early 1950s was that, whether or not vermiculite was chemically and physically suitable as a casing medium, flakes of the mineral sometimes stuck to the mushrooms and could not be brushed off.

Reminiscent of work done at the now extinct Lee Valley Experimental Horticulture Station is the finding that composted tree bark, much resembling peat, when mixed in to the casing material in various proportions, had no adverse effect on cropping. This suggests another possible alternative to peat, but as the authors of the Belgian report warn, although there were no diseases observed in their experiment, it is doubtful if this material is always free of mushroom pests and diseases.

Attempts to improve the properties of the casing mixture were unsuccessful. Adding carboxymethylcellulose and polyacrylamide polymers to the casing mix to increase water holding capacities was found to have no influence on yield or quality of mushrooms.

#### Control of bacterial blotch

Of two chemicals which may be used to control bacterial blotch, it was found that calcium hypochlorite can be used at much higher concentrations than sodium hypochlorite without causing the mushroom caps to go brown. A solution of sodium hypochlorite containing 45 parts per million of available chlorine caused no discolouration of mushroom caps, whereas one containing 75 parts per million made the mushrooms turn slightly brown. On the other hand it was found that calcium hypochlorite can be used at 200 parts per million of available chlorine without discolouration of mushrooms.

It is of interest to note that, according to Fletcher, White and Gaze in "Mushrooms – pest and disease control," the recommended concentration for the use of available chlorine to control blotch is 150 parts per million, usually with a sodium hypochlorite preparation as the agent. Could it be that there are differences between spawn strains in the way they react to chlorine?

The maximum concentration of formalin (38% formaldehyde) that could be used on mushrooms without damage was found to be 3 millilitres per litre of water.

Attempts to compare the efficacy of a range of chemicals at controlling bacterial blotch artificially introduced to a mushroom crop were frustrated because the level of infection was too high. Some of the chemicals reduced the development of the disease but at the concentrations at which they were effective, they also caused discolouration of the mushrooms.

More successful was the use of chemicals on a crop of mushrooms in which

#### TECHNICAL TOPICS

bacterial blotch was induced by manipulation of the environment. Three chemicals, sodium hypochlorite, citric acid and formaldehyde were each watered on to the crop from one week before harvesting the first flush at the maximum concentration which did not cause damage to the mushroom caps. Sodium hypochlorite solution containing 45 parts per million of available chlorine was partially successful, citric acid and formaldehyde were not effective.

#### Healthy mushrooms and healthy consumers

It is most important that not only must the mushroom crop not be damaged by application of any substance intended to keep the crop free of disease, but also that the mushrooms are safe to eat. One difficulty in reporting on the results of experiments to test safe dosages and residue limits is that legislation on which chemicals may be used, their method of use and prescribed safe limits can vary from country to country.

The authors report studies on the use of prochloraz (Sporgon) alone, and in mixtures with chlorothalonil (Daconil) on mushrooms. Prochloraz was found to be

particularly persistent in the casing layer with a high proportion of the initial dose still being present at the end of cropping. It appears that applied at 3 grams of active ingredient per square metre, prochloraz, in the opinion of the authors, does not result in excessive residues in mushrooms. Application immediately after casing or before or after ruffling seem to be the preferred times of treatment.

Analysis of 66 samples of mushrooms collected from the auctions or from wholesalers showed traces of some phytosanitary substances, such as sodium pentachlorophenate, endosulfan and prochloraz. However, in all but a very few instances the levels of residues found were declared to be below the tolerance limits. The heavy metals cadmium and lead were also detected, but at 14.93 and 9.97 parts per billion respectively were regarded as at a safely low level.

Other work described in this report

Other work described in this report includes the beneficial effects on shelf like of covering mushroom containers with perforated transparent covers or with permeable film, the variation in relative yields obtained from spawns in variety trials and the compilation of data on the composition of composts delivered to the mushroom growers of West

#### International research projects

A minority of UK mushroom growers m be interested in the reports on growing trials with the oyster mushrooms at Coprinus comatus, but, hopefully, tl majority will appreciate the impressi amount of investigative work encorpassed by this report and realise the importance of being aware of mushroo R & D in progress around the world. TI costs of carrying out research and deve opment work on mushrooms are hig and increasing. It is prudent therefo that the best use is made of whatever r sources and manpower are available Duplication of effort must be minimise Proposals to set up international mus room research projects, as was me tioned during the discussion period at the AGM, are worth thinking about.

\*Champigronteelt,

Overzicht van het onderzoek 1983 ti 1988. A. Overstijns, L. Bockstaele an P. Lannoy.

Onderzoeken Voorlichtingscentruvoor Land-en Tuinbouw, Beiten Roeslare, (Rumbeke), West-Vlaandren, Belgium.

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### PROMOTIONAL ACTIVITY

#### **HIBITIONS VISITED** by Angela Lee in recent weeks:

st Food Show - Wembley - 1-3 y

lden Crumb - an associate of ssgiel Mushrooms – took a stand this ar for the first time. They had on play a range of their breaded shrooms as well as other new ducts - some of which are still being reloped. There was a great deal of erest in this new product elopment, and, during the day that I ped on the stand, a chorus of proval for the excellence of the duct. Golden Crumb use Mossgiel shrooms and coat them in a unique mb mixture after which they are deep zen and require only two minutes ep frying before serving. To eryone's delighted surprise the result n no way fatty or greasy – just icious and not even high in calories! Apart from Golden Crumb, shrooms were in evidence mainly as pings for pizzas (which dominated

The Fast Food Show this year) and included in items like casseroles. The sooner a way of providing the pizza industry with fresh ready-to-use mushrooms is developed the better!

Fresh Produce Fair - National Exhibition Centre - Birmingham

Greenacre Mushrooms took a stand for the first time and this co-operative group from Anglia, lead by Denis Watkins, is spearheading its way in mushroom marketing. The exhibition was not as busy as they had hoped but some useful contacts were made. The Chilled Food Fair in the nextdoor hall was very busy, but sadly the main mushroom content of most products was not fresh mushrooms. Rumour has it that next year the two exhibitions will not be run concurrently, which seems a shame since they are probably quite complementary and a more interesting attraction as a double act.

#### en James presented "Marketing in the 90s" t the Area Meetings

#### st and West Midlands

vid Brammer chaired this meeting n guest speakers Richard Gaze and n James.

Richard Gaze described the hooming move of IHR to ellesbourne and the reduction in vernment funding and implications of and the difficulties of focusing earch effectively given the different uirement of grower members. Sen James gave a presentation on proving production and marketing Is through collaboration and it was sowed by informal discussion. There is positive interest from those ending in what Ken had to say, but meeting was not as well attended as had hoped.

was suggested that perhaps the a should be redrawn and ographically hitched to its appropriate ghbour. It would be very helpful to w what growers and allied trades in area think of this, or would like us to ange in the future for the East and st Midlands. Within reason, we will in with your ideas – please tell us.

#### uth East

s meeting was attended by more n a dozen key growers – the allied les were not represented due to the lual trades versus growers golf tch! The meeting was chaired by in Orr.

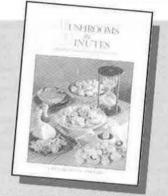
ten James talked about Marketing in 90s – highlighting the problems currently being encountered by most growers dealing with the wholesale trade. He suggested that the remedy was a joining together of expertise and management in order to achieve a degree of standardisation and price structure, thereby as a group, achieving some control of the wholesale market.

There was a productive discussion of the advantages and disadvantages of some form of co-operation between growers. The meeting, which was attended by MGA Chairman Gerry Parker, agreed that Ken James should prepare a brief for outline plans to obtain a better deal in the wholesale market.

Richard Gaze talked again about funding for research and the move to Wellesbourne.

#### **South West**

John Callow took the chair. Following the interest shown at the SE 1 meeting together with MGA Chairman Gerry Parker's enthusiasm for finding a solution to our marketing problems, Ken James discussed further the difficulties and the opportunities that exist to solve these problems. Again the growers present agreed that the answer lay in a degree of co-operation and seconded the SE 1 resolution that Ken James should prepare a brief for a planned effort to achieve better control in the wholesale arena. Andrew Swatton from ADAS gave an excellent talk about the interest in organic growing being shown throughout the agricultural industry.



#### **MUSHROOMS IN MINUTES**

A photograph from this new recipe leaflet appeared as the front cover of the April & May issue of the Journal. The leaflet has now been printed and is available to members.

Please use this leaflet and Midsummer Mushrooms to promote mushrooms this summer. Both leaflets contain excellent recipes for mushroom salads, pâtes, dips, marinades and barbecues.

Contact Angela Lee at the MGA office.

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done your pub?

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All entrants must have their mushroom dish on the menu each day in July and August. Make sure they have supplies of mushrooms.

## ALTON TOWERS - A THREE YEAR EXERCISE

Press Day for the Farm-A-Rama Exhibition at Alton Towers was June 5th. The MGA stand, used at the International Fresh Produce Fair last year, looks excellent. It is expected that 2.4 million people will visit Alton Towers this year. It is planned as a three year exhibition.

The MGA has provided information and literature to the press and for the Alton Towers education packs to schools.

Our thanks to David Brammer, Wood Farm, Staffordshire, who helped Alton Towers with the model mushroom display.

## Mushroom

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We would like to thank everybody who visited our stand during the Mushroom Exhibition on 9, 10 and 11 May in Holland.

It was nice to meet so many friends again.

At the same time we would like to apologize for the fact that we didn't maybe have enough time for others who would also have liked to meet us.

Nevertheless you are always welcome to contact us for good advice.

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