

National Potato Conference Proceedings 2004

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Contents

Wireworm Control in Potatoes

Dr Bill Parker

Retailer Dominance and the Impact on Farmers: From Growing to Sustenance

Dr Martin Caraher

Potato Market Regulations

Jarlath Coleman

Placement of Fertilisers for Potatoes

Mark Law

Wireworm control on potato

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Wireworms are the larvae of click beetles and have long been recognised throughout the world as pests of potato. Wireworm damage to tubers (narrow tunnels bored into the tubers) can drastically reduce the quality of a potato crop, and even low populations can cause an economic level of damage.

High wireworm populations are usually associated with fields in long-term grassland, and thus are usually only a problem where potato crops follow long-term grass. However, in the last few years, wireworm damage has become an increasing problem for UK potato growers. Factors contributing to this increase probably include increasingly stringent quality demands from retailers, an increase in the use of old pasture as 'clean' potato land free of soil-borne skin finish diseases, and an apparent increase in wireworm damage in fields in all-arable rotations. This increase in so-called 'arable wireworm' problems has occurred in all the main potato growing areas in the UK. Both the extent and the reasons for this apparent shift in the pest status of wireworms are not entirely clear, and have focused research on the need to improve wireworm risk assessment techniques.

Life cycle

Wireworms are long-lived soil-dwelling insects. Eggs are laid in the summer, and hatch in the autumn. The larvae (the wireworms) then take a further four years to complete their development. In the first year of their life, wireworms are very small (less than 5 mm long) and cannot do much damage. However, from the second year onwards, they regularly increase in size and their damage potential rises. In their final year, they form a pupa in the soil in the autumn and emerge as an adult beetle the following spring.

Risk assessment

Assessing the level of wireworm risk in a particular field requires:

1. An assessment of site risk factors (grass history, damage history etc).
2. Making an assessment of wireworm populations in the soil. This can be done either by soil sampling or bait trapping. Both these techniques have their limitations, mainly relating to the errors inherent in soil sampling to determine soil pest populations. This means that finding no wireworms does not necessarily mean that none are present in the field.

To try and overcome the problems of sampling directly for wireworms, the focus of wireworm research in Europe over the last few years has been on the development of pheromone (sex attractant) traps for adult beetles. This work has shown that pheromone traps are much more sensitive at detecting low click beetle populations (and hence wireworm populations) than soil sampling methods. However, trapping has to be done from late April to early August, which means that it has to be used as an early warning system (i.e. around 9-12 months ahead of planting potatoes).

In general, using more than one technique at different times will improve the accuracy of identifying the true level of wireworm risk in any particular field.

Control

Chemical control of wireworms in the potato crop is at best only partially effective. This means that use of chemicals should be regarded as a last resort, and that full account needs to be taken of other cultural methods of control as well.

Avoidance: the best option is not to grow potatoes in a wireworm-infested field.

Cultivation: ploughing and discing will physically damage wireworms and expose them to predation by birds. On balance, it is probably better to plough an infested grass field close to planting rather than in the previous autumn as the decaying turf will act as an alternative food source for the wireworms. Note that wireworm damage is often worst in the 2nd and 3rd years out of grass.

Early lifting: wireworm damage tends to steadily increase from about mid-August onwards, so planting a variety that can be lifted as early as possible will help reduce the damage risk. There are no potato varieties with resistance to wireworm attack.

Insecticides: soil insecticides applied at planting (e.g. Mocap, Nemathroin) only *reduce* wireworm damage; they *never* eliminate it completely, and occasionally don't work at all. This is why they should only be used as the last line of defence.

Future research

New research is starting to look more closely at what factors govern the maintenance of wireworm populations in all-arable fields, as well as investigating the risks and possible controls in organic production systems. Because of the long-term nature of the wireworm life-cycle, this work will take three or four years to come to final fruition. Work will also be done looking at alternative controls for use in the potato crop, including the use of new insecticides and soil amendments.

Retailer Dominance and the Impact on Farmers: From Growing to Sustenance

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Introduction

Over the past number of years there have been numerous changes in the growing, production and consumption of food. Among the foods most effected are fruit and vegetables. There are a number of reasons for this. Key among them are:

- changes in food culture and habits/skills.
- concerns with health.
- the consumer.
- market forces including the power of the large retailers.

The following is an outline of what I will talk about, but the actual talk will be illustrated with diagrams and pictures.

Changes in food culture and habits

In general the consumption of potatoes and other staples is in decline. They are not seen as exotic to the modern consumer. In addition the demise of the traditional meal has dislodged some vegetables from the plate. At the moment potatoes hold their own as the centre of the plate and as a side vegetable. However this position is being challenged. The tradition meal was of the nature of main course and two vegetables (A+2B). With new dishes such as pizza and curries the place of side-vegetables is being challenged. In some recent work we done with young children we found that the children were attempting to combine the traditional with the new. So a slice of pizza with a potato as a side dish was one solution or a mixed vegetable pizza, but without potatoes!

In addition we have, at least in the UK, a population where food knowledge and skills are disappearing, the hand-on of cooking skills through the family is disappearing, the ability and experiencing of preparing foods from basics is no longer widespread. Many young people cannot now cook a potato from the raw state. See table 1 for an illustration of this.

Table 1: Young people's skills: 'Which of these things can you do yourself?'

Young people's skills: 'Which of these things can you do yourself?'

Skill	Percentage with these skills
Play computer games	93
Use a music centre or CD	77
Programme a video to record something on TV	61
Heat up a pizza in a microwave	60
Make a cake	54
Cook a jacket potato in the oven	38

Source: National Food Alliance / MORI 1993 (question 1)

Potatoes are also seen as low cuisine and occupy a role as staples but not exotics. Figure 1 shows the decline in potato consumption in the UK. At the same time the consumption of fruit has risen in the higher income groups in the UK (mainly sourced fro abroad as orchards have been grubbed in). A report from the Office for National Statistics (ONS) ⁱ paints found that those households where the head of household earned in excess of £640/week ate twice as much fruit as those households where in ⁱⁱ come was less than £160/week. This is not surprising and would seem to be in line with general opinion and beliefs but the figures for vegetable consumption show a more complicated picture emerging. Low earning households, pensioners and those with no earner ate more fresh potatoes and fresh green vegetables than high-income households. Households with one or more earners ate the same amount of vegetables regardless whether the head of households earned in excess of £640 or less than

£160/week. The low consumption of fruit among low-income groups may be a result of cultural and financial restraints. The storage of fruit and its short shelf life in the home are constraints for those on low incomes.

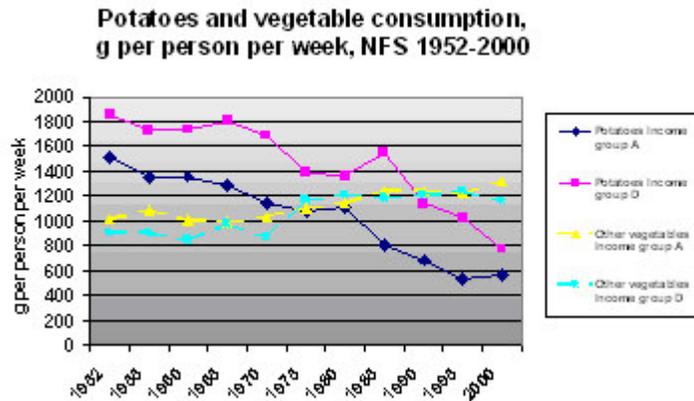


Figure 1: Potato and vegetable consumption trends in the UK 1952-2000 (Income group A >£3640/week, income group D <£165/week).

At the same time there has been an increase in processed potatoes such as frozen potato goods and crisps. A whole new range of crisps have been launched to take account of this. They are mainly designed to fill the ‘snacking’ in between meals behaviour. Walkers Crisps (an American owned company), a new and dominant entry to the Irish market are designing snacks to fill this niche market. The new ‘Sensations’ (see figure 2) from Walker Crisps has been designed to do this. The add-on cost to potatoes occurs when they leave the farm. Processing adds value, unfortunately not to the farmer but for the processor and retailer. Potatoes (or often not potatoes, they can be starch) in this ‘convenient’ form suit the lifestyles of the modern consumer.



Figure 2 Walkers Sensations based products

There is an argument that the issue of consumer choice is illusionary and the choices consumer make are driven by the retailers and producers by the foods they market, process and where they locate.

Concerns with health

Potato consumption in a general sense is recommended by health experts, but are excluded from the fruit and vegetable category by nutritionists (in spite of their vitamin C and potassium content). Potatoes are associated wrongly in the public mind as being fattening. Yet health concerns with body image, weight and obesity have led to the popularity of diets such as Atkins. This has led in some areas to carbohydrates such as potatoes being eschewed in favour of protein based foods.

The processing of potatoes in the form of chips is one area where the product might be considered unhealthy. With children the favourite snack is crisps with many choosing to spend their pocket money on bags of crisps as they leave the school environments.

The big drive for healthy eating is the consumption of more fruit and vegetables known as 5-a-day endorsed by the World Health Organisation and national governments. In the UK this has taken the form of the provision of free fruit and vegetables for all 4-7 year olds. As noted above potatoes are excluded from these categories It is interesting to speculate whether they would have been included in “5 a day” if they were a fashionable middle class staple.

There is a need to relocate or rebrand the health messages around potatoes. The 'nut industry has done this, from being previously seen as a source of high fats now nuts are healthy options in the diet due to the marketing which now emphasises that nuts can contribute to the lowering of serum cholesterol and heart disease. In addition there is the whole issue of what are called externalities, which we all pay for but do not cost. An economic case could be made for importing potatoes into the Irish market due to the cost of production. Another issue is the provision of out of season and foreign imports, this introduces food miles, cheaper goods (at a cost) from areas where labour and land are cheap. We will pick this up under the health and consumer headings. The issue of Irish grown potatoes has implications for what is called inward investment, the local multiplier/money flows, the stability of a home based farming sector, pollution, the keeping of external costs to a minimum and the continued sustainability of rural communities.

Market forces including the power of the large retailers, processors and fast food industry

In the UK the powers of the supermarkets threatens the livelihood of farmers. Figure 3 contains a recent headline (January 19, 2004) from the Guardian newspaper.

Supermarket price war threatens farmers
 British agriculture on the brink as stores prepare to do battle in newly consolidated marketplace, says government's farming adviser

Figure 3 Headline from Guardian Felicity Lawrence, consumer affairs correspondent, Monday January 19, 2004.

The Office of Fair Trading (OFT) in the UK has still not published its review of the code of practice between supermarkets and suppliers. This is a voluntary code, drawn up to curb what the Competition Commission called supermarkets' 'abusive and coercive practices' in their relations with suppliers, this has been a failure. This review was due at the end of last year, but has been delayed, according to the OFT, by the need to take the Safeway takeover into account. Delaying tactics yet again. There has been only one case heard under the code and this was withdrawn at an early stage in the process.

Robin Tapper, from the UK National Farmers Union, head of food and farming, said mergers and a smaller number buying desks among retailers had already led to 'severe pressure' on suppliers. Farmers are currently working near the cost of production with power to pass their costs on up the chain of production. Robin also predicted that profits would fall again, putting livelihoods at risk. This is due to the squeeze on growers to accept and absorb costs.

Packing costs, transport costs and wastage will have to be absorbed down the line. The recent mergers and acquisitions in the UK (Morrisons and Safeway) may result in new price war that could shatter the British farming industry, which is just recovering after a period of crises. Organic farmers say another supermarket price war will have devastating consequences for them as well. The director of the Soil Association (the organic body representing organic farmers and producers), warned that any further cuts would drive many farmers off the land. He said that *The supermarket buyers are putting relentless pressure on price. The downward slide of prices leads to a dilution of standards and scaling up to industrial production.*

The Groceries Order in Ireland limits the below cost selling of certain key stuffs such as bread and milk but potatoes are excluded from the order. The results of this can be seen in the recent advertisements from Dunnes and Tesco (Ireland) with potatoes being offered at below cost prices.

In addition to having to accept reductions in price farmers are having to accept losses due to cosmetic and aesthetic contract demands. This combined with the exclusiveness of contracts which may prohibit the grower selling off produce unacceptable to the supermarket is placing UK farmers in a invidious position. Bruce Carlisle an organic grower of potatoes noted that:

A new price war, coupled with the increasing competitiveness over cosmetic standards for organic produce, would be disastrous. We've already got waste levels that average 50%, because of small blemishes on potatoes or bent carrots.

In the UK increasing concentration has resulted in the top 5 soon to be four, with the Morrison Safeway merger, controlling 75% of the grocery market in the UK. In addition this power is spreading beyond food with the result that one of every eight pounds spent in the UK is now spent in Tesco's. See Figure 4 for a breakdown of market share in the UK.

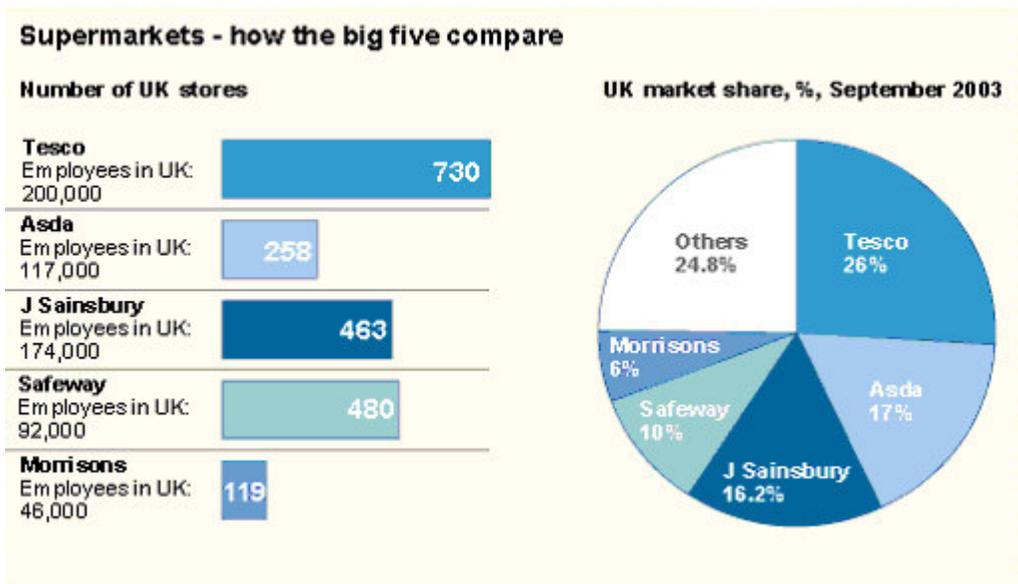


Figure 4 The Big five/four supermarkets in the UK

This power has implications for the farmer. What it results in is a concentration of buying power, with fewer buying desks and fewer outlets. Figure 5 below shows what is called the funnel effect for all foods grown in Europe. The buying desks of the large chains do not want to be dealing with a large number of small producers. This leads to a concentration of growing, an example from Idaho in the US, the premier potato growing state show what can happen:

- In Idaho the average potato farm is 400 acres.
- Before selling anything the grower is half a million dollars down.
- Profit is premised on potatoes selling for \$5/hunderweight.
- In 1996 prices fell t \$1.50, combined with cheap imports from Canada.
- Growing to specification for the fast food and major retailers leads to factory farming.
- Growers are reliant on one or two buyers for their produce (due to contract specification) thus leaving them vulnerable to price re-negotiations.

In Idaho in the past 25 years the number of potato growers has halved while in the same period land devoted to potato growing has grown. The results are pretty obvious the demise of small growers, the growth of corporate farms and the demise of local communities.

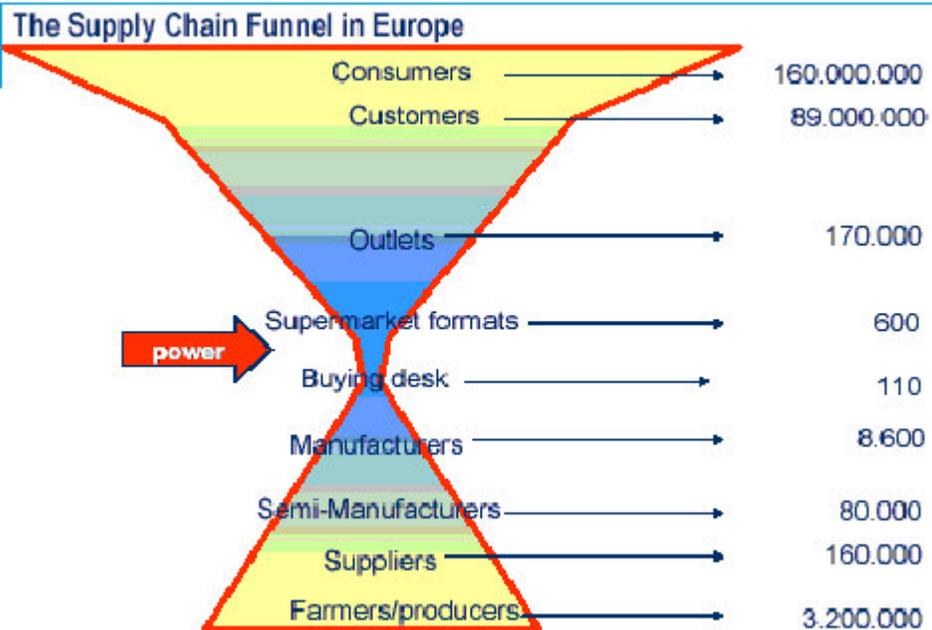


Figure 5: The supply chain funnel in Europe from farmers/producers to consumer.

This market power acts in tandem with the health and social changes that are occurring to give retailers power to dictate the agenda to growers. If potatoes are seen as a less healthy option and direct consumption is declining for social reasons then the power resides with them to demand price reductions and the absorption of costs by growers!

The consumer

The consumer is the last and important piece in the jigsaw. There has been assumption that the Irish consumer is a loyal consumer, loyal to local as in buy Irish and with a strong local brand identity. Some examples of this include:

- Barry's tea (Tesco's original foray into the Irish market)
- The 'Buy Irish' campaign.

A number of recent changes have challenged this 'truth', the portrayal of growers and retailers as part of the reason for high food prices and the entry of the hard discounters to the Irish market (Lidl and Aldi) where in very short space of time they have gained a percentage of the Irish market. More than they have gained in the UK market after 10m years there.

The psychology of the consumer is that value lies in more, there is a lack of an appreciable (Irish and UK) food culture which appreciates local and accepts that you pay a price for quality. Such social agendas are not important in buying decisions although they are aspirational. In the psychology of bulk it has been found that;

- In experiments in value the consumer choose more over value.
- Price and value triumph over taste and presentation- more for less.
- Heavy repeat users, come back more.
- They spend more, three for four encourages them to but a fourth.
- So more for less encourages people to buy more?!?!

Consumers say they buy on the issues of local, health and concern for the environment In reality the deciding issue is price. Issues such as local produce can be factors in a marketing campaign but they must compete with price and value. Niche markets can be useful in the first instance where high income consumers are prepared to pay a premium (as in the organic market in the UK).

The Future

The key to success in the future relies on combing all parts of the jigsaw. Growers have to stand together to resist the retailer demands to absorb costs. There is a need to run a parallel campaign to address the status of the 'humbl'ue potato among the public, to relocate the potato as a centrepiece of the meal and as an important part of a healthy diet. In addition processing should remain as local as possible to ensure benefits to local communities and local money flows.

Potato Marketing Regulations

Jarlath Coleman

Department of Agriculture & Food

Introduction

Unlike most other farm commodities, the potato sector is unique in that it functions outside the Common Agricultural Policy. There is no Common Organisation of the Market as for other crops where subsidies and/or market supports are in place. Accordingly, there are no specific EU marketing standards set down for potatoes and where such standards exist within the Community they are either national ones or international ones such as UNECE. The EU regulations that do apply to potatoes relate to plant health controls, seed certification and general labelling standards which are enforced across the whole Community.

Despite the absence of specific EU marketing legislation, the Irish potato sector is closely regulated through two Acts of the Oireachtas – The Food Standards Act 1974 and the Growers and Packers Act 1984- which ensure that high standards and marketing measures are in place for the benefit of growers and consumers. In addition, the onset of quality assurance programmes which provide independent guarantees that food products meet the highest standards of quality and safety has been an important development over the past decade or so. The Bord Glas Quality Programme fulfils that requirement in the potato and horticulture sectors. These programmes are being driven by the consumer who requires a quality product in terms of its visual appearance, the system within which it was produced, its safety and its traceability. The maintenance of consumer confidence in their product is a critical factor for all food producers and in this regard, clear labelling which enables consumers to exercise their rights in making choices in the supermarket or store is a key component.

The Regulations

There are five main pieces of legislation which govern the marketing of potatoes:

1. General Labelling Regulations (Council Directive 2000/13/EC)
2. Food Standards (Potatoes) Regulations 1977
3. Registration of Potato Growers and Potato Packers Act 1984
4. Plant Health/Seed Certification Regulations

1. General Labelling Regulations

It is instructive to look first at the general provisions that apply in EU law for the labelling, presentation and advertising of foodstuffs. These provisions come under Council Directive 2000/13/EC which is enforced by the Director of Consumer Affairs and the Regional Health Boards under a Service Contract with the Food Safety Authority of Ireland (FSAI). The Directive applies to all retail sales and supplies to the catering sector. The prime consideration of the Directive is the need to inform and protect the consumer. The information provided must therefore enable the consumer make a choice in the full knowledge of the facts. The information required on the label varies with the foodstuff. Processed foods have very detailed information compared to an unprocessed food such as the potato which has much less. The following general information applies to all foods and beverages (That which applies to fresh potatoes is in bold):

- **the name of the product**
- the list of ingredients (in descending order of weight at time of manufacture)
- **the name or business name and address of the manufacturer, packer or seller of the product established within the EU,**
- **the net quantity**
- the date of minimum durability/use by date and any special instructions for storage or conditions for use.
- **Particulars of the place of origin or provenance where failure to provide such**

information would be likely to mislead a consumer to a material degree as to the true origin of the foodstuff.

- Indication that the food has been irradiated
- Alcoholic strength
- Instructions for use when it would be impossible to make appropriate use of the foodstuff in the absence of such instructions
- The quantity of certain ingredients or categories of ingredients where the ingredient or category of ingredients appears in the name or where special emphasis is given to an ingredient or a category of ingredients in the marketing of a foodstuff.

Where the foodstuffs are intended for supply to mass caterers for preparation, processing, etc., the above particulars need only appear on the commercial documents accompanying the consignment. The sale of loose/over the counter food (when it is packaged on the premises from which it is to be sold) is also governed by the General Labelling Regulations but only to the extent that the name of the product must be stated.

2. Food Standards (Potatoes) Regulations

The specific rules governing the marketing of ware potatoes are governed by the Food Standards (Potatoes) Regulations 1977. These Regulations were introduced under the umbrella of the Food Standards Act 1974 in what was then a very unregulated ware market.

The Regulations prescribe the minimum quality and grading standards for ware potatoes sold for human consumption. Under these Regulations, the size of potatoes being marketed is regulated and the bag/label must show the size range and the variety of the potatoes. The legislation was amended in 1996 to provide for more detailed size ranges and in 2003 the Minister for Agriculture and Food introduced a further amendment to bring new potatoes under the regulations. Prior to 2003 the only legislation governing the marketing of new potatoes came under the General Labelling Directive (2000/13/EC). While this latter legislation still applies, as I have outlined above, all potatoes sold for consumption must now be labelled with the variety and size range and meet the minimum quality standards. The Food Standards (Potatoes) Regulations do not apply to potatoes for export or for further processing. The size ranges and standards which apply to the sale of ware potatoes are summarised as follows:

Size Ranges		Quality Standards
Minimum	25mm	Whole, clean, sound and wholesome Free from sprouts or having sprouts less than 5mm Free from foreign smell Free from external and internal defects Free from soil and other material Free from soft rots and dry rots Varieties cannot be mixed Tolerances: 5% for damage 2% for rots
Bands	35mm	
Maximum	none	
Tolerances	3% for size	

These standards are rigorously enforced by officers of the Horticulture and Plant Health Division who carry out inspections of potatoes in wholesale and retail premises in conjunction with their inspections under the EU Fruit and Vegetable Regulations. Breaches of the regulations are promptly dealt with and prosecutions may be taken in certain cases.

Arising from the Report of the Food Labelling Group (2002) which recommended that the Food Safety Authority (FSAI) should have overall responsibility for food labelling, the Food Standards (Potatoes) Regulations will now be included in a Service Contract between the Department of Agriculture and Food and the FSAI. The Food labelling Report also recommended that the FSAI should act as a one-stop-shop to deal with all enquiries and complaints on labelling. These new institutional arrangements will provide for a more cohesive approach between all the inspection agencies in the enforcement of labelling legislation and deal efficiently and effectively with any labelling issue affecting consumers or indeed any of the stakeholders involved in the supply chain.

3. The Registration of Potato Growers and Potato Packers Act, 1984.

Under the Potato Growers and Potato Packers Act 1984 any person who grows or packs ware potatoes for sale must be registered with the Department and the registration number must appear on the bag/label. Growers and packers

must maintain detailed records of quantities sold and purchased. The Act applies only to potatoes grown in the State.

The Register is maintained in the Crop Production and Safety Division of the Department in Maynooth. Under the Act any person growing or packing potatoes must, within thirty days after commencement, apply to the Department to be registered and enclose a registration fee of €19. Each applicant is then assigned a Registration Number i.e. a grower number, a packer number or a grower/packer number. The Minister may suspend the Registration Number where a grower or a packer is convicted of breaches of the Act.

With regard to the Registration Number put on the label or package, Section 3 of the Act provides for the following:

- Potatoes being sold in a package must have been grown by a registered grower and packed by a registered packer.
- If the seller is a registered packer or both a registered grower and packer the packers registration number must be shown on the package.
- If the seller is not a registered grower or a registered packer or a seller by retail (i.e. is wholesaler), the package must show the registration number of either the grower or packer.

Under the second condition above there is an obligation to put the packer number on the bag or label while under the third condition, there is a choice of grower and packer.

Under section 5 of the Act the Minister can make Regulations for the implementation of the Act. These Regulations, which were amended in 2001 to provide additional information on seed potatoes in pursuance of the EU Plant Health Directive 2000/29, prescribe the following records to be retained by growers and packers:

Growers

- a. the date, quantity and variety of each lot acquired for planting
- b. the class, the growers number and country of production displayed on the official label accompanying the lot
- c. the varieties of the potatoes planted by the registered grower and the area planted with each variety
- d. the yield from the area planted
- e. for each sale of potatoes by the registered grower, the quantity and variety of potatoes sold
- f. the date of each sale
- g. the names and addresses of persons to whom potatoes are sold by the registered grower in the course of business other than for consumption by the buyer.

Packers

- a. the quantity of each variety of potatoes packed by the registered packer each day
- b. the quantity and variety of potatoes involved in each purchase and sale of potatoes by the registered packer
- c. the date of each transaction
- d. the names and addresses of persons from whom potatoes are bought by the registered packer and to whom potatoes are sold by the registered packer in the course of business other than for consumption by the buyer
- e. whether potatoes bought by the registered packer had already been packed

These detailed records, in conjunction with the registration number on the package, provide for full traceability of all potatoes grown and sold in the country. This information is critical from both a consumer and plant health perspective. The inclusion of the grower registration number on all packages to facilitate a more efficient traceback system is currently being examined.

As in the case of the Food Standards (Potatoes) Regulations, officers of the Department carry out inspections across the supply chain to check for compliance with the provisions of the Act. Action is taken where breaches of the Regulation occur.

4. Plant Health and Seed Certification Directives

In the case of inter- community trade in potatoes, the EU Plant Health Directive 2000/29/EC lays down that the packaging must bear either the registration number of an officially registered producer or of an officially registered

collective storage or dispatching centre located in the area of production. This information along with the other details on the label, package or container is essential in the protection of the country's health status. The entry of diseases such as Brown Rot and Ring Rot could have serious consequences and it is critically important that every precaution is taken to prevent their entry or establishment in the country. It is recognised that the greatest threat from these diseases comes from seed imports. According to the CSO statistics, some 44,000 tonnes of ware potatoes and over 15,000 tonnes of seed were imported in 2002. While it would appear that the level of seed imports is grossly overstated when compared with the results of the Bord Glas Survey which recorded imports of approximately 6,000 tonnes, it must be acknowledged that seed imports have increased in recent years and growers must exert great caution by ensuring that they only purchase seed from reliable sources. It is also essential that the records which are mandatory under the Growers and Packers Act are kept up to date to provide for effective traceback in the event of a disease outbreak.

The marketing of seed potatoes within the EU is regulated by Council Directive 2002/56/EC. The Directive sets down standards for varietal purity, freedom from certain pests and diseases, packaging, sealing and marking. As Ireland is a High Grade Seed Area, only certified basic or pre-basic seed potatoes may be marketed in the State or imported into the State. Officers of the Department have authority to examine any consignment of imported seed potatoes, and if the consignment is found to be infected by disease, or infested with a harmful organism, the Department can order the destruction of the consignment.

UNECE Standards for Potatoes

In addition to the regulations which I have outlined above there are international standards which are agreed by the United Nations Economic Commission for Europe (UNECE). These standards which set down marketing and quality control standards for potatoes moving in International trade between UNECE countries apply to ware potatoes, early potatoes and seed. The UNECE standard for ware potatoes, which has been revised four times since it was first published in 1967, provides for minimum quality standards, tuber sizes and tolerance levels. It also sets down provisions concerning presentation such as uniformity of the package contents, method of packaging, etc., and provisions concerning marking and identification of the potatoes being traded. There is also an optional requirement for an official control mark to be placed on the package.

PLACEMENT OF FERTILISERS FOR POTATOES

Mark Law

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Placing fertiliser at planting was a popular system some 20-30 years ago when fertiliser was relatively cheap and markets were less competitive. For convenience, fertiliser is now commonly spread by broadcasting. Placement of fertilisers may best be described as the application of a portion of a potato crops fertiliser requirement at planting in a tight band below and to the side of the mother tuber using a front mounted hopper and applicator located on the planter tractor.

Today's placement technology can reduce fertiliser costs, increase yields and quality of potatoes. There are now available accurate and efficient applicators which minimise the downtime and health and safety risks of old systems by enabling the use of big bags. Fertiliser products are now much more sophisticated and placement enables secondary and trace elements to be incorporated efficiently, improving both quality and yield.

Increasing environmental concerns such as the eutrophication of watercourses or global warming can both be reduced by the placement of fertilisers.

SUMMARY OF ISSUES ADDRESSED BY PLACEMENT

- Reduced fertiliser costs
- Short growing season
- Increased yields
- Variable quality
- Environmental pollution
- Climate change
- Increased potato consumption

Reduction of fertiliser costs

As the potato root explores only 30% of the cultivated area, all the phosphate requirement for the crop should be placed. Phosphate is immobile in the soil, can be readily fixed by the soil and is required early in the crop life cycle for maximum yield and crop benefits.

Application rates can be reduced by 50-100 kgs/ha over broadcast as placed phosphate is more efficiently taken up and crop requirement of a 50 tonne/ha crop is only 50kgs/ha. This saving at today's prices translates to between 30-50 Euros/ha.

Placed phosphate will increase root weight, optimise tuber number, nutrient and water uptake and increase the speed of establishment.

It is most effective to include both nitrogen and trace-elements with the phosphate at placement, which will help to encourage rapid crop emergence, and avoids the need for costly and largely ineffective foliar nutrients. Most nutrients such as calcium and manganese cannot be efficiently applied as broadcast fertilisers due to oxidation in the soil, and are not translocated from the leaf tissue to the developing tuber where they are required if applied as a foliar.

Increased yield and quality

Fertilisers are more than nitrogen, phosphate and potash as a crop will only grow to the nutrient, which is limiting. Any limitation to crop growth will not only reduce yields but also cause crop stress and therefore quality. Potatoes grow so quickly that soil availability will often not match uptake, particularly during periods of rapid growth leading to internal disorders, reduced yield and crop stress. Therefore, the placement of critical but immobile nutrients close to the seed will create a spoon feeding of these vital nutrients. They will remain available for uptake as the narrow band of placed nutrients will reduce the opportunity for them to be fixed into the soil complex. Recent research has shown the correlation between certain trace and secondary elements and improved quality characteristics:

Calcium: protection against internal rust spot and increase skin strength

Manganese:	reduced common scab
Zinc:	reduced powdery scab
Sulphur:	improve dry matter formation
Boron:	reduced internal browning
Copper:	catalyst for Manganese uptake, increases strength of skins.

Available fertiliser technology can now provide these vital nutrients in granules so that they can now be placed accurately for improvement in both yield and quality.

Law Fertilisers have developed a granule containing specific ratios of calcium, boron, manganese, copper, zinc and sulphur, which can be blended with a nitrophosphate for accurate placement at planting.

Potash should not be placed at planting as the chlorine in the product may damage the developing seed.

Furthermore, as the demand for potash is so high this nutrient needs to be evenly incorporated in the ridge by broadcasting preplanting, preferably pre-plough potatoes. This will protect soil structure and reduce rates of placement fertilisers to minimise effects of placement on the speed of planting. The requirement for potash is 6kgs/ha per day so the potash granules need to be uniformly distributed in the potato ridge so the root systems can satisfy the plant demand.

Yield increases from phosphate only placement against broadcast varied from 7 to 15% whilst the addition of Law's Potato Plus showed further increases of 10 to 25%.

A trial using Law's Potato Plus in Ireland at County Antrim showed a 12% increase in yield with a good skin finish and processing quality.

More detailed work by SAC in Scotland on the benefits of trace elements for the health of the potato showed reductions in scab, black dot and black scurf incidence.

Environmental Effects

The importance of emissions from agriculture being controlled and minimised so as not only to meet EU guidelines on water and air quality but also to minimise wastage of farm resources can be addressed by the placement of lower amounts of phosphate and ammoniacal sources of nitrogen close to the seed. Losses of nitrates and phosphates to watercourses and nitrates to the atmosphere not only damage the environment and threaten the sustainability of agriculture but also increase the threat of input taxes and controls from the EU.

The changing environment has also led to new nutrient requirements, the most important being sulphur. The Clean Air Directives from the EU have dramatically reduced sulphates being deposited onto farmland such that all crops require sulphur, and potatoes require sulphur on a 10:1 ratio to nitrogen to ensure all essential amino acids can be manufactured.

Climate change may not only bring more volatile weather patterns and thus crop stresses but also potentially higher yields. Placed phosphates will increase phosphate uptake and therefore create bigger root systems which will explore a greater soil area and thus minimise the risk of nutrient and water uptake being out of balance with plant demand. Imbalances lead to reduced yields and quality defects such as growth cracks, mis-shapes, scabs and internal disorders. The incorporation of trace elements in a placement fertiliser would not only help to prevent nutrient shortage and thus stress but the use of calcium in particular helps to prevent the production of the stress hormone ethylene which encourages early maturity and thus lower yields.

Increasing Consumption

Placing specific fertilisers will increase the evenness of harvested product size and reduce variation across a field, improving the presentation of the product to the consumer. Placed trace elements will help to improve the appearance of potatoes reducing skin blemishes, improving eating quality and taste and improving size, shape and bloom of tubers. The use of placement fertilisers would reduce the cost per tonne of product and therefore increased consumption could result from lower retail prices. Increasing competition from pasta and rice is having an effect on potato consumption in mainland UK, especially in years of above average prices.

Placement may help to raise product quality standards, which would remove speculative low technology growers, creating a more stable grower sector and marketplace.

The opportunity to develop new potato crops such as seed or salad crops would increase potato markets but would require increased sophistication of production techniques. Placement of fertilisers can increase tuber number and reduce skin diseases, which are fundamental requirements of both of these product sectors.

Conclusion

The potato marketplace and growing environment is changing and growers need to change accordingly. The placement of specific fertilisers at planting enables the potato grower to reduce overall input costs, maximise potential yield whilst protecting crop quality and the environment.

“There is no progress without change. Progress is not an accident, but a necessity...it is part of nature” (Charles Darwin, 1844).

ⁱ Office for National Statistics 2000 Social Inequalities: 2000 Edition., The Stationery Office: London