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Food-growing in Scottish schools: An analysis of the present position and indicators for the future.

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[Doctor of Philosophy]

The University of Edinburgh

2022
Declaration

I confirm that this thesis presented for the degree of PhD, has
i) been composed entirely by myself
ii) been solely the result of my own work
iii) not been submitted for any other degree or professional qualification

TA Griffiths
Abstract

A healthy diet is vital for growth and development and poor diet in childhood can affect academic achievement and can create long-term health problems such as obesity, coronary disease, stroke and cancer (Poulton et al, 2002., Mikkilä, et al, 2005., Unicef, 2019). Childhood obesity is a major concern in Scotland and is linked to an unhealthy diet including ultra-processed foods which have high levels of fat, sugar and salt (HFSS foods) and low levels of vitamins and micronutrients (Food Standards Scotland, 2021).

Children eat what is familiar, so it is important that they have opportunities to experience a wide range of healthy foods early in life. They also are more likely to taste and eat food that they have grown themselves (Passy, Morris and Reed, 2010., Barratt Hacking et al, 2011) and research has supported a link between school gardening and increasing consumption of fruit and vegetables (De Sa and Lock, 2008., Parmer, et al 2009).

This study aimed to determine whether school gardening in Scotland is sufficiently developed to contribute to the drive to increase children’s consumption of fruit and vegetables as one initiative to tackle the high rate of obesity in Scottish children.

Questions about the extent of school gardening in Scotland; why some schools have developed gardens, and some have not; how a garden contributes to the work of the school and whether there are particular factors that inhibit the development of school gardens in Scotland have not been investigated and tackling these gaps in knowledge was the primary aim of this study.

An email questionnaire was sent to all schools in Scotland (total number 2580) to provide information about the school and the garden and 223 responses were received. The overall response rate of 9% was low and there was a very small number of responses from Past Gardening (13) and Non-Gardening schools (6). Exploration of the results was by descriptive analysis enabling illustrative display of the data obtained.
The results confirmed findings from previous studies that integrating the garden into schoolwork throughout the curriculum and across the age range, and having good support from managers, are important features of successful gardens. Engagement with the local community is also beneficial in providing support and gardening knowledge. The main motivators for school gardening were to teach children about healthy food and where it comes from, and the main barriers were finding time in the curriculum and the personnel needed to co-ordinate and supervise work in the garden. Teachers also expressed the need for training and protected time to plan and prepare for lessons in the garden. A particular problem highlighted in Scotland was the short growing season and problems adapting to school terms which finish at the end of June, which is the active growing season, so pupils may not be able to follow a plant from seed to cropping - and eating.

The results also showed that there were fewer gardens in schools with a high percentage of pupils from socially deprived areas. This was a concern as poor diet and obesity are more common in areas with high levels of deprivation. This raises the need for targeting resource to these areas for the development of gardens in the future.

This study can provide a first step towards increasing the availability of healthy food for children and opportunities for them to grow and eat fresh food which is essential for their healthy development in the short and the long-term.
Lay summary

Obesity is a major problem in Scotland in adults and in children. It is a result of a diet which is high in fats, sugar and salt, usually with food which is highly processed, and which lacks the vitamins and nutrients that are necessary for healthy development. Providing opportunities for children to taste and eat healthy food within the school environment can increase the consumption of fruit and vegetables (de Sa and Lock, 2008) and we also know that children are more likely to eat food that they have grown themselves (Passy, Morris and Reed, 2010., Barratt Hacking et al, 2011).

School gardens can have an impact on academic performance, particularly in science subjects, and can provide an opportunity for pupils who do not perform well in the classroom to excel in a different environment (Nelson et al, 2011). It is also an opportunity for pupils to learn gardening skills which can help them in producing healthy, local food in the future.

An online questionnaire was sent to all schools in Scotland (2580). 223 were returned of which 91% had school gardens, 6% had had a garden in the past, but were no longer gardening and 3% did not have a garden. Details about the garden, who was responsible for it and how it was used by the school were obtained and combined with information about the school, to identify any features which might explain why development of food growing in Scottish schools has been slow.

The reasons for gardening and the barriers to school gardening were consistent with those of a study carried out in England (Nelson et al, 2011), but specific concerns were identified in Scotland including the short growing season, the school term dates which mean that the garden is unattended during the time of maximum growth. A list of recommendations for the future development of edible gardening in Scottish schools is presented.
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Sincere thanks to supervisors Professor Catharine Ward Thompson, (Main supervisor) and Dr Greg Kenicer (Assistant Supervisor) for their support and advice throughout the prolonged period of study.

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This is a study of school gardening from the perspective of a retired clinical psychologist, gardener, parent/grandparent and food lover who is concerned about the changes in eating habits I see around me – the constant ‘grazing’; the proliferation of take-away food outlets; the increased use of ready meals; the current diet with ultra-processed foods and lots of sugar; the increase in obesity and the impact of these factors on health.

Concern for the preservation and expansion of horticultural skills and a wish to share the positive effects of ‘hands-on’ gardening also influenced the undertaking of this project and I now intend to return to practising these skills in my own garden.
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Chapter 1 Introduction

Currently, more than 20% of children are living with obesity by the time they leave primary school (Obesity Action Scotland, 2019) and research suggests that this is linked to the consumption of high levels of ultra-processed foods and food and drinks with high levels of fat, sugar, and salt (Burkhalter & Hillman, 2011, Lang, 2020). This can have long-term impacts on health and a poor diet with low levels of fibre, fruit and vegetables, vitamins and micro-nutrients also affects growth and development in all areas (Schanzenbach and Thorn, 2020).

School gardening gives children experience in the outdoors which is beneficial to their health and well-being (Travlou, 2006) and can also increase children’s experience and consumption of healthy food by involving them in the production of fruit and vegetables and encouraging them to taste and eat healthy foods and incorporate these into their diet (de Sa and Lock, 2008).

Information about the extent and functioning of school gardens in Scotland is lacking and it is this gap that the thesis addresses.

1.1 Background to the project

1.1.1 Definition of the problem
1.1.1.1 Diet and Obesity
Over the past 20 years there has been an observable increase in the levels of obesity and overweight in the UK population. Government figures show that the rate of obesity in the population has risen from 17% in 1995 to 28% in 2020 in adults and from 14% in 1998 (when it was first measured), to 16% in 2021 in children (Obesity Action Scotland (2019).
Being overweight is associated with an increase in the health problems such as Type 2 diabetes, heart attack, cancer and stroke (Guh et al, 2007, Obesity Action Scotland, 2019). This is a problem for the NHS and therefore has attracted attention from successive governments, as a result of which a total of 689 separate obesity policies were developed in England between 1992 and 2020 (Theis and White, quoted in Wilson, 2021 p1). Despite this the picture has not changed over the period (Public Health Information for Scotland, 2019).

Although, on the one hand there is pressure to take action to tackle obesity, simultaneously, as Wilson (2021) points out, the food industry is Britain’s major employer, and this creates a dilemma for the government caught between the need to tackle a pressing health issue and the need to retain jobs in the food sector and not to antagonise the major food producers, the advertising industry, and the supermarkets which provide 94% of the food for this country. As a result, the recommendations in the various policies and reports have not been enforced and emphasis is placed on individuals to take responsibility for reducing their weight by eating less and exercising more, even though, as the figures above indicate, this approach is clearly not working.

Weight gain is associated with consumption, so what has changed over the past 20 years that might be contributing to the increase in weight?

Changing lifestyles have led to a change in dietary patterns in the UK over the past 20 years. Many people are working longer hours and the increased availability of ultra-processed foods which are cheap and convenient has led to increased consumption of these foods. The consumption of more foods which are high in fats, sugar and salt (HFSS) has increased and many are not eating sufficient fruit, vegetables and fibre. Monteiro et al (2018) reported that the UK has the most “ultra-processed diet of the 19 countries for which good data are available”:

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The average household availability of ultra-processed foods ranged from 10.2% in Portugal and 13.4% in Italy to 46.2% in Germany and 50.4% in the UK. A significant positive association was found between national household availability of ultra-processed foods and national prevalence of obesity among adults. (Monteiro et al 2018 p18).

There are also many more fast-food outlets as well as opportunities to have food delivered to the door and the increased use of ready prepared meals which are often rich in fats and sugars and low in nutrients and vitamins all contribute to the problem of unhealthy eating.

1.1.1.2 Diet in Scotland

In Scotland the figures for body mass index (BMI), which is the ratio of height to weight and is one way of assessing obesity, are particularly striking. On all measures of obesity and poor diet Scotland fares very badly. Scotland’s rate of obesity in the population is amongst the highest across the OECD (Organisation for Economic Co-operation and Development) countries (Food Standards Scotland, 2020). In 2019, 66% of adults in Scotland were in the overweight or obesity categories, of which 29% were at risk of obesity, and 30% of children aged 2-15 were at risk of overweight, including 16% at risk of obesity (Food Standards Scotland, 2020). The Scottish figures for the prevalence of obesity in more deprived and less deprived areas is also troubling with 23% of children in the least deprived areas likely to be at risk of overweight and obesity compared to 35% risk in the most deprived areas (Obesity Action Scotland 2019).

The awareness that many people in Scotland consume a poor diet, particularly with low consumption of fruit and vegetables (Obesity Action Scotland, 2019), and the realisation that this, in itself, may be a contributor to the problem of obesity was a factor in the instigation of this thesis. If fruit and vegetables are readily available by growing at home or locally and if people have the knowledge and confidence to grow and cook vegetables, it may help to counteract the problem.
1.1.1.3 Knowledge about healthy food
Knowledge about food and diet is not universal and, although there have been public information campaigns about the importance of eating fruit and vegetables (particularly the UK Government’s 5-a-day campaign, launched in 2003), it cannot be assumed that a healthy diet is understood or is readily available. The opportunity to experience eating fruit and vegetables freshly picked from the garden may not be available to all but there are moves to introduce children to these experiences by developing gardens in schools and studies have shown that this can lead to an increase in the consumption of fruit and vegetables. If this is the case then there is a chance of dietary change and, in the long-term, of a decrease in the incidence of obesity and the associated non-communicable diseases.

1.1.1.4 Diet and child development
Good nutrition in early life is essential as it effects growth and development in all areas (Schanzenbach and Thorn (2020). In general, children like to eat what is familiar and so it is important to expose them to a variety of foodstuffs in early life in order that they develop a liking for a varied and healthy diet. A poor diet, with low levels of the micronutrients and vitamins which are present in fresh food, is likely to have an adverse effect on children’s development and on academic performance and, given that eating habits established in childhood are likely to carry on into adulthood (Mikkilä, et al, 2005), can lead to medical problems such as diabetes, cardiovascular disease and stroke in adults (Guh et al, 2007).

It is therefore important to explore ways to increase the consumption of nutrient-dense foods such as fruit and vegetables at an early age and this is regarded as essential for the population (WHO, 2020).

1.1.2 Changing dietary habits
Increasing the consumption of fruit and vegetables requires major dietary change, and we need to consider theories of behaviour change as a
Food-growing in schools

precursor to achieving this. One theoretical model is Social Cognitive Theory (SCT) which focuses on the interaction of personal and environmental factors in creating changes in behaviour Bandura, 1986). Studies of interventions which have been successful in increasing the consumption of fruit and vegetables highlight the factors which are most likely to achieve success (Reynolds et al, 1999). These include the availability and cost of healthy food; exposing children to a wide range of fruit and vegetables, and giving them opportunities to model the desired behaviour, for example by eating fruit and vegetables with classmates or with adults who are known and trusted. If these elements are incorporated into gardening in schools the chances of successfully changing behaviour should be enhanced, so this study examines current practice in school gardening to see if this is happening.

1.1.3 Gardening

A school garden is an environment which offers an opportunity to increase children's knowledge of, and exposure to, different foods and to encourage healthy eating in addition to encouraging them outdoors where they have contact with the natural world. School gardens have been shown to have benefits academically and socially (Williams and Dixon, 2013) and for some particular groups of pupils, such as those with lower ability, or who have become disengaged from learning (Nelson et al, 2011). While this is important in making the case for further investment in the development of more school gardens, it is the potential for school gardens to increase consumption of fruit and vegetables that is of particular relevance to this study. Importantly children have been shown to be more likely to eat fruit and vegetables if they have grown them (Passy, Morris and Reed, 2010).

The effects of different interventions designed to increase consumption of fruit and vegetables have been studied and have shown that growing food in school is an effective way of doing this, but these studies were carried out mainly in England, US and Australia and there is little information available about the extent of school gardening in Scotland, nor are there reports of any
Food-growing in schools intervention studies in Scotland. Tackling this gap in information is the primary aim of this study. If a successful argument for developing further gardens is to be made, it requires a sound basis of information about what is currently happening in school gardens from ‘those who know’ – the staff who are involved. When this information is available a more detailed examination of the effect of growing food in schools on the diet of children can be carried out.

1.2 Objectives of the study

This was a study of school gardens in Scotland to explore the level of school gardening happening at present, the challenges to, and benefits from, such gardening, and how to use school gardens to increase the availability and acceptability of healthy food to children.

Growing food at school has been shown to be an effective way to increase knowledge of and willingness to taste and eat a range of fruit and vegetables and, as such, should be encouraged and supported. However, in Scotland, the development of school gardens has been slow, and information about how many there are, the ways in which they are used, and the benefits they provide, has not been established.

The study investigated the extent and the impact of school gardening in Scotland; the reasons for having a garden; how growing food in school can be used to increase the consumption of fruit and vegetables and whether there are enough schools with gardens to make a difference. The first stage of the process of change was to define the present position by quantifying the number of gardens, clarifying how they were used, identifying the barriers to developing gardens and highlighting steps to be taken to counteract these barriers and to increase the motivating factors, using information provided by current school gardeners.
As well as defining the benefits perceived by the schools currently gardening, the study aimed to ascertain whether schools were using the potential of school gardens to increase children’s knowledge about food and its origins and to increase consumption of fruit and vegetables in their pupils. To this end, the extent to which the known and accepted theoretical principles of changing dietary behaviour are incorporated into current school gardening projects also formed part of the study.

As studies of school gardens had not been carried out in Scottish schools, an additional objective was to determine if there were issues particular to Scotland which may be problematic in the development of school gardens and how such issues could be tackled.

1.3 Theoretical framework
In tackling this issue, it is necessary to explore theoretical perspectives across several areas:

- child development – how children learn and develop
- the impact of spending time in the natural environment on child development,
- the effect of diet on child development
- how to create dietary change in children

Theories relating to these are described in more detail in Chapter 2: Literature Review.

1.4 Research strategy
This was a descriptive research project devised to examine the extent of school gardening and to provide systematic information about what was happening in school gardens and why some schools do not have gardens and why some have given up gardening, using a survey of all the schools in Scotland.
This study aimed to survey every school in Scotland to determine the number of schools which have gardens, the number which had a school garden in the past but had given up gardening and, from those schools which do not have a garden, to collate information about the reasons for their decision not to have a garden. The development of school gardens as places with the potential to increase the consumption of fruit and vegetables in school pupils underpins the study.

The questions in the survey were derived from a literature search and from observations and discussions with providers of school gardening training and from the childhood experiences of a group of adult gardeners, as detailed in the Methodology chapter. The questions combined factors known to contribute to successful school gardens with factors which have been shown to increase the consumption of fruit and vegetables.

Socio-demographic data about pupils and their contexts were examined to enable analysis of any links between individual or neighbourhood deprivation and successful school gardens. There is an increased risk of obesity in areas of high social deprivation (Shrewsbury and Wardle, 2008, Goisis, Sacker and Kelly, 2015) so the development of school gardens in these areas needed to be defined.

Features of the garden, of the pupils who used it, the ways in which it was used within the school, the training and support available to those leading food-growing in the school were examined as well as the main motivators and barriers to school gardening as perceived by the respondent.

There are existing studies of school gardens which were carried out in England (Passy, Morris and Reed 2010, Nelson et al, 2011), and these were used to provide information about features of successful school gardens and comparisons were made to schools with gardens in Scotland to establish if there were any differences or whether the information obtained in the studies of schools in England can equally be applied in Scotland.
1.5 Structure of the thesis

The thesis is organised in six sections:

**Chapter 1: Introduction** – this chapter establishes the reasons for undertaking the study by presenting the background to the study and clarifying the objectives to be tackled and the strategy to be used.

**Chapter 2: Literature Review** - The literature review first sets the context of child development and how the theoretical concepts surrounding this have changed over time and draws attention to the increasing awareness among researchers of the relevance of the culture in which the child is functioning. Bronfenbrenner’s bioecological theory of development is described as it offers a context for understanding the factors that influence healthy development and well-being and provides a wide perspective on the factors which impact on health, including social and political considerations (Bronfenbrenner 1979).

The benefits to children of being outdoors are described, highlighting the contribution of outdoor environments to learning.

The literature review then examines the importance of diet and nutrition to healthy development in childhood and describes the effects of changes in the diet in the UK over the past 20 years due to greater availability and consumption of ultra-processed foods which have high levels of fats, sugar and salt and low levels of vitamins and micronutrients. Reasons for the upsurge of these foods in the diet in the UK are examined and the impact they are having on health is described. One health impact is the rate of obesity and overweight in the population with the long-term health conditions which result from this.

Concern about the incidence of obesity means that there is general agreement on the need for dietary change, particularly increasing the intake of fruit and vegetables (WHO, 2012). Making substantial changes to behaviour in individuals and in the population is a challenge and so Social
Cognitive Theory is used to clarify the key variables required to instigate behaviour change.

Empirical studies which show the positive impact that growing fruit and vegetables in a school garden can have on children’s diet are then examined and this establishes the rationale for the study.

Chapter 3: Methodology – this section describes the development and administration of the survey, data collection and analysis. A questionnaire study of all schools in Scotland was the preferred study design. The questions were designed to split the schools which responded into three groups – those with gardens, those which have had gardens in the past and those which do not have gardens. Each group was then asked to provide detailed information the garden and how it is used. Questions were asked about the school and about the person responsible for the garden and information about the school was obtained from Scottish Government databases to determine the type of school and provide demographic information. Questionnaires were emailed to all schools on two dates and results collated and examined using Excel and tables.

Chapter 4: Results – this chapter presents the results from the survey. Data about the schools are examined for all the schools that responded and this is explored for the three groups separately. The responses to all questions about the gardens are analysed within each of the groups and comparisons made between those with gardens and those which had given up gardening. The motivators for and barriers to school gardening are then examined for each of the three groups, particularly the barriers for the Non-Gardening group, to see if these are barriers which could be removed.

The results for the motivators and barriers to school gardens are compared to results for a similar survey in England to determine if there are particular concerns which are seen as problematic in Scotland, and which might be contributing to a slower rate of development of gardens in schools in Scotland.
Chapter 5: Discussion, Recommendations for future work – this chapter provides analysis and discussion of the findings with reference to the questions set out in 2.6 (p60) and to previous studies and concludes with the implications and recommendations for the future development of school gardens in Scotland.

Chapter 6: Conclusion and Recommendations – This chapter presents a summary of the results with links to the research questions and the theories which underpinned the thesis and its design. Recommendations for future work were also identified.
Chapter 2  Literature review

2.1  Structure of the Literature review

2.1.1  Development and nutrition

As indicated in Figure 2-1, the first section of the Literature review addresses issues of childhood development and nutrition.

The importance of good nutrition in the early years and the effects of nutrition on child development are described as these are fundamental to the thesis. Factors which can contribute to a poor diet are investigated and the effects of poor diet are then described with special attention to obesity.

Two explanations for the development of obesity are described which, despite their differences, share a common solution, which is to reduce the intake of ultra-processed foods which have high levels of fat, salt and sugar.
and increase consumption of healthy foods with complex carbohydrates and high levels of vitamins and nutrients, particularly fruit and vegetables.

2.1.2 Section 2 Theoretical perspectives

2.1.2.1 Theories of child development
Section 2 considers important theories in child development, tracking how the theoretical principles have changed with advancing knowledge over the years and the increasing emphasis on the environment in which the child exists and the importance of the cultural influences on development. Special attention is given to Bronfenbrenner’s theory of child development (Bronfenbrenner, 1979) to illustrate this. This offers a context for understanding factors that influence healthy development and well-being based on the interaction of the child with an increasingly wide series of systems (the contexts in which the child is situated) - from the microsystem, which is the child, parents, relatives, close friends, teachers; to the mesosystem which describes interrelationships between different microsystems and the wider world, which is relevant to the implementation of change in dietary habits which is a major target of the thesis.

2.1.2.2 Children in the outdoors
Theories relating to the benefits to children of spending time outdoors in natural settings on child development and on learning are then investigated and described.

2.1.2.3 Creating behavioural change
Finally, having considered the developing child and the importance of his/her social context, a theoretical perspective that addresses ways of using that social environment to create behavioural change - Social Cognitive Theory - is described (2.4.3) and its relevance to nutritional behaviour clarified. Social Cognitive Theory suggests that personal and environmental factors interact to change behaviour and the influence of personal and environmental factors is examined with a view to defining how interventions, such as school gardening, contribute to the desired changes.
2.1.3 Section 3 Gardening and fruit and vegetable consumption

Having defined the childhood health context in which the project was developed, and the theoretical basis for changing dietary behaviour, the literature review then explores studies which define the impact that gardening can have on health and investigates whether, and how, it can be used to increase children’s consumption of fruit and vegetables.

As gardening involves children directly in growing food, it is one way of introducing them to a range of fruit and vegetables and encouraging them to taste and to eat these. Studies of school gardening are therefore reviewed and the effects on children’s learning, behaviour, nutritional knowledge and, particularly, the effect on increasing consumption of fruit and vegetables, are described.

Interventions which were designed specifically to increase the consumption of fruit and vegetables are reviewed to determine the most successful strategies and the features which are most likely to result in positive change in order to see if these are used in current school gardening projects.

2.1.4 Summary

Obesity and the impact that it has on children’s lives provides the reason for the study, a theoretical standpoint which provides a model for change is described and the use of gardening in school as a stimulus for change is explored. These elements are then applied to Scotland where childhood obesity is a major concern and where systematic study of the present situation and how gardening in schools may provide a means to tackle the problem has not been carried out. It is this gap that the thesis seeks to address.
2.2 Section 1 Development and Nutrition

This section describes the impact of nutrition on development, including the effects of poor diet, the constituents of a healthy diet, the reasons why some families consume an unhealthy diet and the long-term effects of poor diet as outlined in Figure 2-2 below.

![Diagram showing the relationship between nutrition and development.]

**Figure 2-2 Nutrition and Development**

### 2.2.1 The impact of nutrition on development

Good nutrition is vital to healthy development in childhood and throughout life and, in particular, the early years are critical for brain development (Benton, 2008). By birth most of the cells of the brain have formed although they are not organised in the way they are in adulthood. The necessary ‘shaping’ of connections and pathways in the brain occurs throughout childhood and is partly influenced by the environment (physical, verbal, visual, emotional and sensory) in which the child exists (Fuglestad et al, 2008).

During this development there are ‘critical periods’ when areas of the brain are programmed to become ready to respond to stimulation from the environment and this determines the child’s physical, cognitive, emotional and behavioural development (Maggi et al, 2010). If children are severely malnourished during this period, brain development will be compromised,
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and even mild undernutrition can have serious consequences (Nelson, 2000). For this reason, it is vital that children are provided with nutritious food during their early lives.

There are specific micronutrients, such as iron, zinc, iodine, selenium and choline, which have a significant effect on cognitive development (Frayn, 2013). These nutrients are not produced by the body and must be derived from the diet, and they are most readily available through the consumption of fruit and vegetables. Although the effects of these nutrients on cognitive development are dependent on biological and environmental factors, deprivation, or limited intake of these micronutrients, can have detrimental effects in the long-term and these effects may not be responsive to remediation.

As well as providing the necessary nutrients for growth and development, eating healthily is also protective against non-communicable diseases (NCDs) including conditions such as diabetes, coronary artery disease and obesity. In the long-term, it is important to establish good eating habits as early as possible as eating habits formed in childhood strongly influence eating habits later in life (Venter and Harris, 2009).

2.3 Section 2 Diet in childhood

To try to achieve the best possible diet in childhood, we need to know what comprises a healthy diet and to consider how this can be accessible to all children.

2.3.1 Constituents of a healthy diet

A healthy, balanced diet for children includes:

- fruit and vegetables
- carbohydrates such as potatoes, rice, pasta
- proteins such as meat, fish, beans, pulses
• dairy products such as milk, butter, cheese
• fats such as oils and spreads

It is important that healthy food options should be introduced to children as early as possible, ideally from weaning, and that these are offered repeatedly through the infant and toddler years to encourage the child to experience a varied diet from the start. Venter and Harris (2009) claim that it is more likely that children will accept a broad range of foods if the whole family eats a healthy well-balanced diet and if they do this as a family, so sitting down to meals as a family group is to be encouraged. The presentation of sugary or fatty foods, such as sweets, cakes and biscuits, and sugary fizzy drinks to children should be kept to a minimum as these foods and drinks tend to be high in calories but contain few nutrients. (https://www.nhs.uk/live-well/eat-well/) and so do not contribute to healthy development.

2.3.2 Modern diet
One difference is that many people are consuming greater quantities of ultra-processed foods which are high in fats, sugar and salt (HFSS), through ready meals, the proliferation of fast-food outlets and the greater consumption of fizzy drinks, crisps and snacks (Obesity Action Scotland, 2019). These foods are cheap, readily available (Pacheco and Carolina, 2020) and require minimal preparation, so are tempting to financially poor and ‘time-poor’ families. Recent research is suggestive that ultra-processed foods may have an effect on gut hormones which play a key role in regulating appetite and body weight resulting in the normal satiety signals being over-ridden (Zinöcker, and Lindseth (2018), or it may be, as described recently by (Dicken and Batterham, 2021), that the ultra-processing itself directly results in poor health, although the mechanism for this is not yet clear.

The Soil Association defines ultra-processed food as:

“.... food products that have been manufactured through the use of multiple industrial techniques. These techniques can include hydrogenation, extrusion, pre-frying and/or the addition of colourants, emulsifiers and preservatives. Employing ultra-processing techniques
allows manufacturers to create products that are hyper-palatable, cheap to produce, easy to market, and able to sit on store shelves or remain in the kitchen cabinet for years without spoiling”. (Soil Association, 2021, p3).

These products therefore contain little, or no, whole foods, but are industrially manufactured formulations which are ‘ready-to-eat’ or ‘ready-to-heat’ and contain food additives, colouring and flavourings. They are different from ‘processed foods’ which are whole foods which have been preserved by canning or pickling using more traditional methods.

There are other elements that determine what an individual or family eats. In recent years affordability has become very important, with a greater gap now existing between those who can afford to eat well and those for whom food is a higher proportion of their weekly income. Wilson (2021) reported that poorer UK households now need to spend 40% of their income to buy healthy food. Also, the supply of healthy food can be restricted, for example, in areas of high deprivation people often have to use convenience stores which are expensive and may not supply the range of healthy foods available in larger supermarkets (Jones, 2014).

**2.3.3 Issues which contribute to the consumption of a poor diet**

Many circumstances can influence the availability of a healthy diet including the inability to source and pay for adequate food, ease of access to unhealthy foods relative to more healthy food and these factors are examined in detail below.

**2.3.3.1 Food poverty**

Food poverty can be defined as:

*The inability of individuals and households to obtain an adequate and nutritious diet in socially acceptable ways, or the uncertainty that they will be able to do so.*

(Dowler, 2003 p573).

There are many contributory factors to this complex and multi-dimensional concept including income; local access to and availability of affordable,
nutritious food; access to transport; access to facilities to store, prepare and cook food; appropriate skills and knowledge about nutrition and food preparation. Griffith, O’Connell and Smith, (2013), have shown that the proportion of the UK population experiencing food poverty has risen inexorably over the past 20 years (particularly since 2010) as real wages have declined and the price of food has increased substantially. This paper also demonstrates that the proportion of food purchased as processed food has increased in all types of households and at the same time measures of nutritional quality have declined with the largest decreases in households with a single pensioner and those with young children.

O’Connell et al, (2019) reported that while incomes have remained static or decreased, the amount of money required to provide a minimum diet for health has increased in real terms and as a proportion of household income which increases the gap between those who can eat healthily and those who cannot afford to buy good food. The issue of food poverty in the UK has reached the stage where a United Nations report to the General Assembly in 2019 outlined the rise in use of food banks, homelessness, and enforced food choices experienced by an increasing proportion of the population in the UK (Lang 2020,). It is clear from this that food poverty has become a major contributor to poor diet and its consequences.

2.3.3.2 Food insecurity

Food insecurity is another source of concern in the drive to maintain conditions which can promote healthy eating. Food insecurity means that members of a household worry about whether they have sufficient resources to buy food, are not able to afford to purchase the food necessary to provide balanced meals, have skipped meals, or did not eat enough because there was insufficient food available to them.

The Food and Agriculture Organisation (FAO, 1996) has defined three levels of food insecurity:
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(1) food-secure populations with adequate access to food quality and quantity

(2) moderately insecure populations with uncertainty about their ability to find a compromise between food quality and/or quantity

(3) severe food insecurity, with people without access to food passing a day or several without eating

The levels of hunger in the UK are some of the highest in Europe and in December 2020 UNICEF provided financial support to a community project in Britain for the first time in 70 years (Storer, 2020). This scheme supplied breakfasts for children during the period of financial hardship precipitated by the lockdown imposed in response to the Covid19 pandemic.

As well as insecurity at a personal and family level, food insecurity is also a problem for the UK as a whole. As a nation we have become used to all year-round access to food by importing from elsewhere when out of season in the UK and most people have lost any connection with growing seasons and with the sources and production of food. At the same time, the uncertainties of food supply chains have become evident – commercial food growing in the UK is heavily dependent on workers from elsewhere; the UK imports more than 50% of its food and the fragility of supply lines was highlighted recently due to the imminent prospect of leaving the European Union and by the impact of the lockdown in March 2020 to reduce the spread of Covid19, when road and ferry transport was reduced, and supermarket shelves emptied temporarily. Improving access to fresh food by growing at home can help to address some of these issues.

2.3.3.3 Food quality and socio-economic status (SES)

Another barrier to the accessibility of good food to the population is that the availability of food to an individual depends on many factors such as
employment, income, social class, and genetics as well as factors in the food industry which has increasingly focussed on the production and provision of cheap food.

The influence of the large food companies and supermarkets and the lack of an overall food policy in the UK contribute to a lack of action on developing a strategy to ensure that the population can achieve a healthy diet and that children from low-income families have access to the foods they need (Dimbleby, 2021).

There is evidence that some low-income households are unable or do not choose to shop at mainstream supermarkets and that food prices for many foods are higher in small local shops, which is sometimes all that is available in deprived areas (Ginn et al., 2016).

Jones et al (2014) showed that there is a growing gap between the price of more and less healthy foods with healthy foods increasing in price more than unhealthy ones over the past few years and when income goes down, or the cost of food goes up, people switch to cheaper calories, whilst families with children purchase fewer fruit and vegetables which is the reverse of what is required.

Having considered factors which can lead to the consumption of a poor diet it is important to understand the impact of consuming a diet of ultra-processed foods over a period of time. One of the major effects is the development of overweight and obesity as described below.

2.3.4 The impact of the modern diet
While deficiency of food and nutrients is a problem, particularly in developing countries and in populations with low socio-economic status (SES) in developed countries, obesity is also a pressing public health concern. As well as under-nutrition, people who have adequate resources can suffer from malnutrition as a result of a restricted diet with little, or no, fruit and
vegetables (UNICEF, 2019). Children (and adults) can experience both malnourishment and obesity simultaneously. For example, a recent study found that 10% of children in poverty are both obese and food insecure (Schanzenbach and Thorn, 2020).

2.3.4.1 Overweight and obesity
Overweight and obesity in childhood is a global, UK-wide and Scottish problem which has increased over the past 20 years. It is the result of changes in lifestyle and in dietary patterns with an increase in the consumption of ultra-processed, energy-dense foods which are high in fat, salt and sugar (HFSS foods) and low in vitamins and nutrients, and to a decrease in physical activity as more sedentary lifestyles have developed within society (Burkhalter & Hillman, 2011). Another important factor is that obesity and overweight are more prevalent in areas of social deprivation (Shrewsbury & Wardle 2008), and it is important that this factor is explored when setting up the study as developing school gardens in areas of social deprivation should be a priority.

There are health problems associated with obesity in childhood. Children who are overweight or obese have increased risk of hypertension, diabetes, and asthma and, if they remain overweight into adulthood, they are at risk of cardiovascular disease, diabetes, musculoskeletal disorders and some cancers. (Mikkilä, et al, 2005). The World Health Organisation (WHO) sees the prevention of obesity as essential and is keen to support governments in establishing systems which enable children to develop an energy balance which can be maintained throughout life. In order to prevent childhood overweight and obesity WHO recommends that we should:

- increase consumption of fruit and vegetables, as well as legumes, whole grains and nuts
- limit energy intake from total fats and shift fat consumption away from saturated fats to unsaturated fats
- limit the intake of sugars
• be physically active and accumulate at least 60 minutes of regular, moderate- to vigorous-intensity activity each day that is developmentally appropriate. (WHO, 2020)

2.3.4.2 Childhood obesity in Scotland

The figures for childhood obesity are particularly high in Scotland. The Scottish Health Survey, (Scottish Government, 2018a) reported that 29% of children in Scotland aged 2-15 years were at risk of overweight or obesity and 16% of children in that age range were at risk of obesity. This equates to approximately 236,000 children at risk of overweight or obesity and 130,000 at risk of obesity. In 2012 the figures were 31% at risk of overweight or obesity, of which 17% were at risk of obesity, so there has been a small increase over the past 10 years, despite many initiatives to counteract it. (Obesity Action Scotland, 2019).

As in all developed countries, there are inequalities in the risk of being overweight in Scotland, with children living in the least deprived areas being less likely to be overweight or obese, than children from the most deprived areas (Castle, 2015). This divergence is also apparent in the consumption of fruit and vegetables and in access to green space, with children from the most deprived areas eating less fruit and vegetables and having less access to attractive green spaces near their homes.

There are many problems related to being overweight and these can cause much distress to individuals, and these are estimated to cost the health service in Scotland between £363 and £600 million per year for the treatment of the conditions associated with long-term obesity such as diabetes and cardiovascular illness (Scottish Government, 2018a).

The Scottish Government has directed much attention to this problem over the past 25 years. Many of the measures taken are based on initiatives defined in *Childhood Obesity: A Plan for Action*, (UK Government, 2016) including the introduction of a reduction of sugar in soft drinks (the Soft Drinks Industry Levy – known as the ‘sugar tax’), which has been enacted
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across the UK (UK Gov, 2018). Another Scottish Government plan: ‘A Healthier Future: Scotland’s National Food and Drink Policy’, (Scottish Government, 2018b) proposed some major changes. It includes plans for restricting advertising and marketing of food and drink high in fat, sugar or salt (HFSS foods) across the media; extending restrictions on non-broadcast advertising of junk food; developing strategies for alcohol and tobacco; breastfeeding promotion; restricting the placement of HFSS foods in supermarkets so that they are not prominent at checkouts and limiting price reductions and special offers on these foods. All the proposals include actions designed to promote healthier eating and resist the promotion of unhealthy foods. There is an intention from the Scottish Government to introduce legislation to implement these action plans by October 2022.

The Scottish Government’s document “Becoming a Good Food Nation” published in 2018, (Scottish Government, 2018a) also included a section on Food and Drink Education which is relevant to the development of school gardens. This recognised the importance of educating children about food at an early stage and included details of substantial funding for projects aimed at raising awareness in young people about where their food comes from and including teaching about food in the curriculum. This version of the plan also includes a pledge by the First Minister to halve childhood obesity by 2030 which is a very ambitious target.

A further attempt to progress the agenda for tackling obesity in Scotland was the establishment of the ‘Obesity Alliance’ in 2018 (Scottish Obesity Alliance, 2018). This body was set up to serve as a forum for organisations in Scotland working on obesity. It enables them to work together to influence the Scottish and UK Governments’ policies on overweight and obesity. It is a pointer to the recognition that tackling obesity and poor diet will require integration and collaboration of many services, industries and non-statutory bodies to help to identify the actions needed and to deliver the changes necessary.
Despite all these measures, as the figures above indicate, there has been a small rise in the rates of risk of obesity since 2012, (Obesity Action Scotland, 2019) and so other, or additional, action is needed, although 10 years is a relatively short time to demonstrate the major behavioural and societal changes desired.

Having reviewed the problems associated with obesity in childhood in Scotland it is necessary to consider theories relating to the link between food consumption and weight gain.

2.3.5 Weight gain – theories

The most established theory for the gain in weight is the ‘energy balance’ model – which basically states that weight gain is due to “too many calories in and too few calories out”. As a result, the method of tackling the increase in obesity is seen to be to reduce the calories eaten and to exercise more to use the calories taken in to balance the intake and output and thereby to prevent weight gain.

This approach has been used to try to tackle the obesity problem for many years but with little success - the rates of obesity and overweight continue to increase.

An alternative model - the carbohydrate insulin model has been postulated by Ludwig et al (2021). This model links obesity to the consumption of low-quality, ultra-processed food. He claims that it is the consumption of foods with a high glycaemic load such as processed, rapidly digestible, carbohydrates that change our metabolism and lead to weight gain.

*When we eat highly processed carbohydrates, the body increases insulin secretion and suppresses glucagon secretion. This, in turn, signals fat cells to store more calories, leaving fewer calories available to fuel muscles and other metabolically active tissues. The brain*
perceives that the body isn't getting enough energy, which, in turn, leads to feelings of hunger. In addition, metabolism may slow down in the body’s attempt to conserve fuel. Thus, we tend to remain hungry, even as we continue to gain excess fat. (Ludwig et al, 2021, p9)

He therefore argues that reducing the consumption of these rapidly digestible carbohydrate foods and replacing them with foods which take longer to digest lessens the underlying drive to store body fat and enables people to lose weight more easily. This is of interest as it may move the emphasis from putting the responsibility for weight loss on the individual to eat less and exercise more and instead encourage more investigation of ultra-processed foods which may then influence the design of interventions and widen the responsibility to include food manufacturers, advertisers and suppliers.

Further research into this model, and the consequential methods of intervention to tackle obesity, is required, but whichever of these theoretical models proves to be more pertinent, both recommend an increased intake of fruit and vegetables as a treatment approach so the theoretical basis of behaviour change and interventions which have successfully increased fruit and vegetable consumption will be reviewed in the theoretical background section below.

2.4 Theoretical perspectives

Establishing a framework for this research involved considering theoretical elements from several areas, such as how children develop and learn; how children are influenced by the environment and culture in which they function; the impact of diet on the development of the brain and child development; the impact of being in nature on children’s learning and theories of creating behavioural change, particularly in relation to creating dietary change.

2.4.1 Child development

The study of human development is the study of change from conception to adulthood and old age. In the early stages, changes are rapid from a
‘helpless’ new-born, to a child able to sit and stand and to feed themselves then to learning to speak and developing complex thinking strategies and problem-solving and the ability to interact and collaborate with others, all within a few years. Development occurs across all domains including perception, knowledge, thinking, learning, memory, emotion and language and enable the child to develop skills as well as relationships with family members, with peers and within their community (Packer, 2021).

The study of child development is often presented as age-related, with researchers focussing on defining the behaviours and characteristics of children at different ages. Although there are cultural variations in child development, there is general agreement that the stages through which we pass as children can be labelled infancy, toddlerhood, early childhood, middle childhood and adolescence.

There is also general agreement that development is not a smooth progression but occurs in phases with periods of relative stability (stages) interspersed with periods of rapid change (transitions), (Packer 2021).

Increasingly the emphasis in research in child development has moved from descriptive studies of observations of children’s behaviour, to understanding the ‘processes’ rather than the ‘outcomes’ of growth and development with information from a range of sources (family, community, culture) being integrated. (Schaffer, 1996).

Historically, one of the most influential early theorists in child development was Piaget who postulated (1964) that children need to manipulate objects and ideas in order to learn. He described a series of stages through which children progress in their thinking, with each stage corresponding to the structure or logic of their intelligence. Piaget’s main stages of development are sensorimotor, pre-operational, concrete operational, and formal operational and the order of these stages is invariant as each serves as the foundation for the next, so progressing through one stage is a prerequisite for progressing to the next. With the benefit of appropriate experience it may be
possible to progress through the stages more rapidly so determining what kind of experiences might be beneficial can potentially benefit development. This is important in relation to the supporting the development of dietary intake which is relevant to this thesis.

Piaget was superseded by Vygotsky (1978) who emphasised the importance of language in child development as it is fundamental to interaction between people. Vygotsky’s theory emphasised the importance of social and cultural experience in child development - the child develops because people respond to what he/she does and says, with the child becoming more proficient as he/she learns and adapts. He saw language and numeracy as tools to facilitate intellectual development and to enable the child to develop within a culture. Thus the role of adults in supporting children to construct knowledge is important.

Vygotsky was at the forefront of the development of cultural psychology and the role of culture in child development has been increasingly realised over recent years (Packer, 2021) in contrast to earlier theories outlined below.

Over the hundred years that child development has been studied, there have been several broad theoretical perspectives which have been influential:

- Genetic psychology (1890s – 1950s) placed the emphasis on endogenous factors i.e., the genetic inheritance of the child, and assumed that the child passes through a series of stages and an interaction between the child and the environment (Gesell et al, 1943).
- Behaviourism (1930s – 1950s) emphasised exogenous factors and that development was due to external features that 'shape' behaviour and paid little attention to evolution. Development was seen as a function of learning by shaping, or reinforcement of behaviour (Watson, 1925, Skinner, 1953).
- Cognitive developmental psychology (1950s – present) saw the relationship between the child and the environment as fundamental. Endogenous and exogenous factors were seen as equally important
with exogenous factors providing the source of information and endogenous factors enabling the processing of the information. This led to an ‘information-processing model (Chomsky, 1957).

- Constructivism (1950s – present). Constructivism also sees endogenous and exogenous factors as important and the interaction between the child and the environment as instrumental, with the child’s exploratory behaviour contributing to the developmental process. Piaget (1962) proposed a sequence of stages in which the child actively constructs knowledge of the world. He saw these stages as universal and following a fixed sequence. Each stage builds on the previous one: sensorimotor, preoperational, concrete operational, formal operational (see Piaget, 1962).

- Cultural psychology (1980s – present) founded by Vygotsky (1993). He saw development as driven by the child’s need to live in a social environment and to respond to that environment by developing higher level psychological functions. Taking a cultural perspective makes it possible to set aside the division between ‘nature’ and ‘nurture’ inherent in most developmental theories and broadens the perspective of child development to encompass other cultures and societies (Packer, 2021).

From this summary of child development theories we can see that social factors play a critical role in the early phases of children's development. The influence which these factors have on healthy development depends upon the stimulation, support, and nurturance in the social environments in which children live, learn and grow.

By the time children start school their development has been influenced by factors at three levels of society: their family, their neighbourhood and the broader society in which they are growing up. In particular there are socio-economic effects on health which begin in early life and affect development. Thus, the social environment is a fundamental determinant of early child development which, in turn, is a determinant of health, well-being, and
learning skills across the life course. The opportunities that the child has to build a broad range of experiences across a range of settings determines in part the outcome of the developmental process and providing access to healthy food and enabling children to learn about diet and health can enhance their development.

As described above, increasing attention has been given to the culture in which the child is developing in recognition of the impact that this has on providing experiences and opportunities which affect development (Packer, 2021). This can include the opportunity to experience nature and green spaces which have been shown to be beneficial to health and well-being and are relevant to learning outdoors as shown below.

2.4.1.1 Benefits of contact with nature
The health and well-being outcomes of being in outdoor spaces has been an area of research and policy interest for some years (Sustainable Development Commission, 2008). In particular, the positive effects of time spent in green space on health and well-being has been documented (de Vries et al., 2003., Hartig et al; 2003., Ward Thompson and Travlou, 2007).

There is evidence that spending time in natural places can lead to positive mental health outcomes (Barton and Pretty, 2010). The results of their analysis of 10 UK studies to assess the impact of green exercise on self-esteem and mood indicated that even short-term exposure to green exercise improves both self-esteem and mood irrespective of duration, intensity, location, gender, age, and health status.

Green spaces are defined as:

‘natural or semi-natural areas partially of completely covered by vegetation, including parks, woodlands and allotments, which provide habitat for wildlife and can be used for recreation’ (Parliamentary Office of Science and Technology, 2016).

Buck and Gregory (2013) report a link between green spaces and health and strong evidence of an association linking access to, living close to or being
exposed to green space and indicators of physical and mental health for many population groups.

2.4.1.2 Benefits for children

The benefits of spending time in the outdoor environment for children has been investigated in relation to their use of outdoor spaces for physical activity (Veitch, 2005), in tackling obesity (Ebberling, 2002), stress reduction (Douglas 2005) and alleviating symptoms of attention deficit hyperactivity disorder (ADHD) (Taylor and Kuo, 2001). Health benefits have been found in increasing physical activity and this is recognised by the World Health Organisation as a reason to develop environments that encourage greater levels of physical activity (WHO, 2010).

Being in nature brings benefits even without increasing physical activity as described by Hewes and MacEwan (2005). Children are attracted by ‘wild places’ such as forests and fields and derive benefit from the experiences they gain there as well as in more structured urban green spaces such as parks and play areas (O’Brien and Murray, 2007).

In addition to the benefits of play and activity in open spaces there is growing evidence that there are social and nutritional benefits as a result of spending time in more structured green spaces such as community gardens which also confer positive effects on physical and mental health (Wakefield et al 2007).

Access to nature provides ‘affordances’ for physical activity, play and learning. As well as contact with nature there are educational benefits from using the outdoors (Mannion et al, 2006) and further information about learning in relation to school gardens is provided (See 2.5.5.2).

Outdoor education can include learning about nature, society, the interaction between nature and society and oneself and can involve working with others, developing new skills, undertaking practical conservation and, potentially, influencing society. The intended outcomes of such experiences can encompass:

Chapter 2 Literature Review
• knowledge and understanding,
• attitudes and feelings,
• values and beliefs,
• activities or behaviours,
• personal development
• social development (Dillon et al, 2005)

Although the intrinsic properties of wildness and are not present in school gardens research evidence suggests that being outdoors in a natural environment supports learning and development and this can contribute to the learning programme for school gardening. This is explored further in 2.5.4 below.

Having reviewed theories of child development and the value of spending time in the outdoors, we can progress to theories exploring the links between child development and nutrition which are important in developing an understanding of the establishment of good eating habits and how to encourage change in establishing dietary patterns.

**2.4.2 Bioecological theory of human development**

A healthy diet is fundamental to healthy child development and to address the question of the influences on what we eat it is useful to use a bioecological perspective to child development such as that devised by Bronfenbrenner and illustrated in *Figure 2.3* below.
Bronfenbrenner proposed a theory of child development based on the interaction of the child with an increasingly wide series of systems (the contexts in which the child is situated) from the microsystem which is the child, parents, relatives, close friends, teachers; the mesosystem which describes interrelationships between different microsystems; the exosystem which is where the impact is indirect, such as the parent’s workplace which can affect the child if what is happening at work changes the way in which the parents interact with the child, and the macrosystem which involves the society in which the child is living and includes cultural values, the economic circumstances of the family and the resources and opportunities linked to this.

Bronfenbrenner saw these systems as interrelated (Bronfenbrenner, 1979) and having an effect on all aspects of development.

Figure 2-3 Bioecological Model

[Link to Bioecological Model](https://psychology.fandom.com/wiki/Bioecological_model) (accessed 18/06/22)
With experimental testing of his model over many years he and his collaborators made adjustments to the theory adding the concept of time to his original systems and defining the principles as:

- Proximal processes
- Personal characteristics
- Control
- Time

this forming the PPCT (Bronfenbrenner, 1986).

The proximal processes described by Bronfenbrenner denote the everyday activities and interactions in which individuals are engaged. These change over time. He argues that, in order to develop well, the child needs interaction with an adult with whom it has a strong, mutually emotional bond. The interaction leads to activity which needs to be increasingly complex over time and preferably with activities introduced by the child. This interaction enables the child to respond to other aspects of the environment which encourage exploration, manipulation and imagination and thereby, further development.

He reports that a disruptive effect on this process can be caused by poverty, and when poverty in the home is combined with living in a poor neighbourhood the effects are compounded (Bronfenbrenner, 1986). In later work he also asserts that the “hecticness” and unsettled nature of working life for many families can be disruptive of healthy development by not allowing time for the important interaction and activities to take place (Bronfenbrenner et al, 2006). His ideal scenario is of a child, in a loving, supportive and encouraging environment, with an adult who is also supported and in circumstances which are calm and comfortable.

The theory, as illustrated in Figure 2.3 above, emphasises the importance of the interactive nature of different parts of the system on healthy development. Central to the system is the individual but it is the interplay
between the individual and the environment and the process by which that functions that is the driving force behind healthy development.

Studies of eating behaviour have primarily focused on the individual, but more recent studies have explored the importance of the environment in determining eating habits. Brug, et al (2008) examined systematic reviews which indicate that socio-cultural environmental factors which define what is acceptable and appropriate to eat are also important. The high availability of energy-dense foods and social pressure to eat such foods are part of the everyday environment for many and supporting environmental changes that would make healthy nutrition more readily available as well as 'protecting' people against unhealthy foods would be helpful. School-based interventions to promote healthy eating and to counter the social pressure to eat unhealthily are cited as examples of good health promotion practice. (Brug, et al, 2008).

### 2.4.3 Theory of Behaviour change

![Figure 2-4 Social Cognitive Theory and Dietary Behaviour](image)

Bandura (1986) proposed a theory of human behaviour change which he called Social Cognitive Theory (see Figure 2.5 below). Previous theories had emphasised behaviour, whereas Bandura wanted to incorporate cognitions – the thought processes that accompany actions, into the theory. He argued that behaviour is determined by the interaction of three factors – personal/individual, environmental and behavioural and that the interaction between these three predicts changes in behaviour. Bandura described the interaction between these elements as 'reciprocal determinism' meaning that
a change in one lead to change in the others. He saw the individual (the 'self-system') as monitoring, evaluating and regulating behaviour (Bandura, 1978).

![Diagram of Bandura's Social Cognitive Theory](image)

2.4.3.1 Self-Efficacy

Bandura also postulated (Bandura, 1986) that there are factors which regulate motivation and action for the individual, "why" and "how" the action is determined. One of these is forethought which is an anticipatory control mechanism that determines if a person is likely to undertake an action due to their expectation of the likely outcomes of the action. This has two elements, firstly, self-efficacy which is the person's belief in their capacity to behave in a way which attains their goals. This means that if we think that we can achieve something we are more likely to take the action that will be needed to achieve it. For example, if we believe that we can increase the number of vegetables that we eat we are more likely to buy and taste more vegetables.

The second element is outcome expectancy which concerns people's beliefs about the possible consequences of their actions. So, if we think that we will enjoy eating some vegetables then we are more likely to taste them. These individual factors then interact with factors in the environment to create behaviour change. Eating a carrot pulled from the school garden when with the classmates who sowed and tended the carrot would be an example of environmental triggers which could encourage eating vegetables.
Having outlined the theory, it is time to look at how this can be applied to the field of health and nutrition in order to change dietary behaviour.

2.4.4 Behaviour changes and nutrition

2.4.4.1 Application of Social Cognitive Theory to diet
Bandura proposed that health behaviours are mediated by motivation, ability and opportunity. The chances of healthy behaviour are greater when individuals are motivated to act healthily, have the ability to act healthily, and when the environment provides opportunities for healthy behaviour.

Further observation of environmental factors which influence health behaviour led to the development of a system to analyse environments linked to obesity (Swinburn, 1999). This system is known as ANGELO (Analysis Grid for Environments Linked to Obesity), and it categorises societal and environmental drivers of obesity across four domains - physical, economic, legislative and socio-cultural. Each of these can be divided into two levels – micro-environments such as schools, homes, workplaces and neighbourhoods and macro-environments such as education or health systems; government; the food industry; and society’s attitudes and beliefs.

This is demonstrated in the diagram below:

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro-environment e.g., family, school, community</td>
<td>Macro-environment e.g., regional, national</td>
</tr>
<tr>
<td>Physical</td>
<td>What is available and accessible – garden, built environment?</td>
</tr>
<tr>
<td>Economic</td>
<td>What are the financial costs or incentives? The belief that healthy food is more expensive?</td>
</tr>
</tbody>
</table>
Table 2-1 ANGELO system

Table 2-1 (devised by the author from findings in Swinburn, 1999) defines these factors and provides examples of their relevance to healthy eating and the environmental influences on this at the two levels. For example, in the economic domain there is the impact of high food prices for healthy foods at the individual and family level, while at the macro-level there are countermeasures with supermarkets setting low prices and special deals for the unhealthy options. To create change the environmental factors at both levels would ideally need to be aligned. There are further examples of the environmental factors below:

1. Physical environment

At the micro-environmental level, the physical environment refers to local opportunities for healthy and unhealthy choices, such as points-of-purchase for different foods and the availability of healthy food options at home and in school canteens.

At the macro-environmental level, it includes the rules defined by authorities (local and national) which impact on the availability of fresh food.

2. Economic environment

This refers to the relative costs of healthy and unhealthy foods. The costs of healthy food to the individual and family are at the micro-level and the approach of supermarkets and other food providers, including fast-food outlets, to the provision, marketing and comparative costs of fresh food vs highly processed food can be seen as an economic factor at the macro-level.
3. Political environment

There are rules and regulations that may influence food choice and eating behaviour for individuals and families at the micro-level, for example, school nutrition policies such as bans on soft drink vending machines or on what treats can and cannot be brought to school.

Decisions such as prohibiting food outlets near schools and the imposition of the ‘sugar tax’ are apparent at the macro-level. (Obesity Action Scotland, 2019). Many more changes are described in government plans and strategies at the macro-level but action from governments to enact and enforce these plans is slow.

4. Socio-Cultural environment

At the micro-level this refers to the social and cultural norms within which the individual and the family functions and other social influences such as social support for the adoption of health behaviours or social pressure to engage in unhealthy habits. This is important in the school context where children can be influenced by teachers and their peer group. However, it can also be used to support change by using classmates, teachers, or familiar television personalities to model eating healthy foods.

At the macro-level the socio-cultural environment may refer to the general lack of knowledge about healthy eating and the long-term health consequences of eating a diet high in fats, sugar and salt, such as obesity, diabetes, coronary disease, and cancer.

An ANGELO analysis of Scottish Government policies for dealing with obesity carried out by Mooney et al in 2015, showed that the Scottish Government has several policies in the behavioural domain and some in the built environment (physical environment), but fewer in the legislative and particularly in the economic domain. This is likely to be due to pressures from business (the food industry) and trade agreements, but it is at odds with the research findings about what the National Food Strategy has defined as
most effective (Dimbleby, 2021). The plans already defined include the imposition of a sugar and salt reformulation tax which encourages food producers to reduce the levels of sugar and salt in their products or to reduce the size of portions; holding businesses to account for their progress towards reducing salt and sugar use by requiring annual reports detailing their progress towards this goal; introducing an “Eat and Learn” initiative for schools to provide pupils with experience of cooking and learning about healthy food and food preparation from early years to school leaving. Some have been or may be implemented but the record of this to date is not encouraging.

Ideally, action is required across all domains at micro- and macro-levels. The emphasis in this study is on examining interventions at the micro-level (individual, family, school) and defining features of these initiatives which best enable changes across all domains, and which can later be applied to schools in Scotland.

It is at the micro-environmental level that the issue can be addressed by developing edible gardening in schools. Micro-level approaches are designed to increase knowledge and skills, such as in giving dietary advice and information about growing food to enable the individual to make changes to dietary behaviour.

Having defined the extent of the problems resulting from poor diet and associated obesity, which is the “why” of the study, it is necessary to direct attention to possible ways to create dietary change – the “how” of the study. The studies above indicate the importance of increasing consumption of fruit and vegetables as a means of improving health, but evidence about interventions which might achieve this is required and this is addressed below.
2.4.5 Interventions to increase consumption of fruit and vegetables

The Behavioural Insights Team in the UK regards the main message from studies looking at changing dietary habits in children to be that making healthier food choices should be made as easy as possible for parents and their children (Halpern and Flahaven, 2018). People with little money tend to buy food locally where the promotion of cheap, unhealthy food is common. Providing information and education to parents is not sufficient to create change in eating habits, and McGill, (2015) and Halpern and Flahaven (2018) suggest that this type of approach is even less effective with families in lower socio-economic groups where the cost of food is the main factor.

Learned food preferences are determined by two factors. The first is exposure to a food, and more exposures are needed as the child gets older (Birch et al. 1987). Cooke (2007) has shown that repeated opportunities to taste unfamiliar foods increases consumption of those foods. The second is modelling the eating behaviour and preferences that the child sees within his or her social groups (Harper & Sanders 1975; Birch 1980; Venter & Harris, 2009). Children like foods that they know, and they eat the foods that they like, so exposure to a wide range of fruit and vegetables is vital and can be achieved in the context of a school garden.

Many interventions have been examined and those using several components, rather than a single one, have been found to be more successful in increasing fruit and vegetable consumption (Blanchette and Brug 2005, de Sa and Lock, 2008).

The most successful elements were defined as:

- accessibility and availability of fruit and vegetables
- education about food and nutrition
- taste preferences
- parental involvement
Growing food in a school garden, as part of the general educational activity of the school, may help to address some of these important issues about children's knowledge of food, its sources and variety, as well as providing opportunities to sample fresh fruit and vegetables and to spend time outdoors and engage in physical activity.

2.4.1 Summary - Criteria for behavioural change in relation to increasing consumption of Fruit and Vegetables

What we eat is determined by what is readily accessible, reasonably priced and what we see others eating. If fruit and vegetables are to become a greater component of the diet, they need to be readily available, cheap and acceptable to all. One way to achieve these goals is to encourage the production of fruit and vegetables. Learning to do this at school will begin to engage with the predictors of fruit and vegetable consumption postulated by Reynolds (1999). He reported that availability, modelling, nutritional education and motivation (i.e., self-efficacy, outcome expectancies, and food preference) were most related to consumption.

The criteria for successful dietary change therefore include:

- availability
- modelling
- exposure
- outcome expectancy
- self-efficacy
- food preference

The importance of these in school gardens in Scotland is assessed as part of the study.

The need for dietary change to tackle obesity and the theoretical basis for making change happen have been described and producing healthy foods such as fruit and vegetables as part of the school programme has been
Food-growing in schools shown to be an effective way of increasing consumption in children. Further examination of the impact of gardening in schools is provided below following the plan shown in Figure 2-6 below.

2.5 Section 3 Gardening and fruit and vegetable consumption

Gardening as an activity has a number of benefits which have been examined in research studies. Although many of the studies relate to adults, the findings relate to gardening at home which is relevant to all family members. Exploration of the relevance of childhood gardening experience to adult gardeners and their relationship to food-growing was carried out in a small study carried out as a preliminary to this study and described in Section 3.2.5.

The benefits of gardening are described below in three parts as shown in Figure 2-6. The impact of interacting with nature is described and the interaction of gardening with health and on the consumption of fruit and vegetables are described before the importance of school gardening is investigated.

Figure 2-6 Benefits of Gardening
2.5.1 Connection to Nature (Green space)

Evidence is accumulating about the mental health benefits of spending time in green space, and this applies to adults and to children.

There is recognition that:

Exposure to the natural environment and green space is associated with lower levels of obesity and higher levels of physical activity, but there is unequal access across the population, with those living in the most deprived areas less likely to live in the greenest areas.

Barton (2010) reported an analysis of 10 UK studies of exercise in green spaces which indicated that exercise in any green space was beneficial to mood and self-esteem and that the improvement was increased by the presence of water. Both short term and long-term improvements were noted and were found in both men and women.

The low level of physical activity in children and, in particular, their lack of contact with the outdoors has been studied by a number of scholars (see Wells and Evans (2003), Taylor, 2006, Travlou, (2006), and Roe, 2009. All agree on the benefits to health and well-being that flow from contact with the outdoors. Louv, 2005, produced what has become a popular book in which he described what he called “nature deficit disorder” highlighting research linking the need for contact with nature to healthy child development and suggesting ways in which families could counteract this deficiency. In addition to producing food school gardens provide access to green space and some physical exercise during the school day.

There are now many initiatives that encourage children into the outdoors, both during school hours and more generally.

Initiatives based in school

School-based initiatives include the eco-schools project which is well established and is very effective in engaging with schools, with more than
98% of Local Authority schools in Scotland participating in the scheme. Eco Schools is organized by Keep Scotland Beautiful and receives funding from the Scottish Government.

The eco-school’s system was introduced into Scotland in 1995. It is:

“An international initiative designed to encourage whole school action on sustainable development education issues. It is an environmental management tool, a learning resource and a recognized award scheme. It empowers young people to take action towards an economically, socially and environmentally just world”. (Eco Schools, 1995)

It aims to provide an opportunity for schools and pupils to develop action for the environment in biodiversity, waste management and sustainability.

Extensive work has been carried out detailing ways in which eco schools’ initiatives can support the implementation of Curriculum for Excellence and this is of major benefit to teachers.

The Scottish Government has also developed a Curriculum for Excellence through Outdoor Learning, (2010) in which there is clear support for the principle of using outdoor activities as a basis for extending learning. Although school gardens are not specifically mentioned, reference is made to Grounds for Learning, and Forest schools.

Grounds for Learning is the Scottish adaptation of Learning through Landscapes, a scheme which helps schools in England to develop their outdoor space into an exciting place to be in order to encourage children to be active and to connect with nature. Established in 1995 it continues to provide schools with support to make their outdoor spaces into exciting and rewarding places for children.

Forest School is an organisation which aims to provide children with opportunities to play outdoors, particularly in woodland environments and to encourage freedom and self-directed play.
Evaluation of these projects tends to be ad hoc and piecemeal and so does not provide replicable evidence of benefits.

Although learning has been the major focus for outcome research, for children the impact of being outdoors is more pervasive than its relevance to learning. Louv, (2005) in his book “Last child in the Woods: Saving our Children from Nature Deficit Disorder” makes a case for benefits of involvement with nature in health, concentration, behaviour and depression. Roe, J, (2012) in her PhD project reported that, for adults, there is a clear link between being in natural environments and improved mood.

2.5.2 Impact of gardening on health

Gardening provides opportunities for physical exercise, interaction with nature and, for some, social contact, all of which contribute to health. Gardening involves low to moderate intensity physical activity (Pretty, 2005), which is good for physical and mental health. Higher levels of social activity in older gardeners rather than in non-gardeners are described by Wakefield (2007),

Interaction with nature is known to improve mental health and de Bell, 2020, used data from the Monitor of Engagement with the Natural Environment (MENE) to study this effect in gardens. The MENE survey has been collecting and analysing data since 2009 to explore the relationship between adults and children’s contact with nature, and to examine the impact of that contact on health and wellbeing and whether it is linked to activities which will benefit the environment. Most of the comparisons have been in relation to public spaces, but the de Bell study (2020) used gardens rather than public spaces and compared people with a garden to people with no garden access and found that those with gardens were more likely to meet the recommended levels of physical activity and reported greater well-being. The information was subjected to socio-demographic controls including gender, occupational social grade of the main income earner as a measure
of socio-economic status, employment status, marital status, children in the household and home ownership. After adjusting for socio-economic variables, garden use and high SES were associated with higher odds of reporting good health and well-being and being more likely to meet guidelines for physical activity. Lower SES was associated with less access to garden and people in lower SES groups were less likely to relax in the garden although they were just as likely to participate in gardening as those in higher SES groups, so gardening was an activity undertaken by all.

2.5.3 Food growing and fruit and vegetable consumption
As well as the benefits of being outdoors, there are health benefits in growing vegetables. Carney et al (2011) reported a community vegetable project which gave instruction and support in growing vegetables to 44 Hispanic farmworker families. This improved vegetable consumption in adults and children as well improving physical and mental health and reducing food insecurity and helped to strengthen family relationships as work was often carried out by the whole family. Similar improvements in dietary intake of healthy foods were reported by Ober Allan et al (2008) in a community gardening project.

Although there is an assumption that people who grow fruit and vegetables will eat more fruit and vegetables, there is little evidence of research specifically examining this subject. However, an American study (Aleimo, 2008), used a telephone survey to investigate the fruit and vegetable intake of urban community gardeners and confirmed that adults living in a household where one member was involved in a community gardening project were 3.5 times more likely to consume 5 portions of fruit or vegetables per day than those who were not involved in community gardening. In a systematic review of the benefits of gardening and food-growing for health and well-being (Ohly et al, 2016) reported that they found some increased consumption of fruit and vegetables although they were
critical of the quality of the research, (particularly those papers that presented quantitative evidence). As they pointed out, most of the quantitative studies were using self-report measures of food intake to monitor change and these are subject to bias.

2.5.4 School gardening

The worldwide growth of school gardening projects has been rapid and extensive. Williams and Dixon (2013) conducted a review into the impact of garden-based learning on academic outcomes in schools and described a resurgence in the development of school gardens over the past 20 years. Although most of the studies they surveyed were based in the US, there is evidence of a similar development in the UK. The Food Growing in Schools Taskforce, which was a government initiative led by Garden Organic, with members from the private sector, schools, environmental organisations, and the media, commissioned a study to review the literature relating to the benefits of school gardening and to carry out a survey into the extent of gardening in schools and to examine how gardening is embedded into the schools.

The research was carried out by Nelson and colleagues for the National Foundation for Educational Research (NFER) and Garden Organic and reported in 2011 (Nelson et al, 2011). They found that food-growing in schools facilitated learning, built skills, improved awareness of the natural world and promoted health and well-being as well as providing support for schools and the local communities. The report provides little information about how the garden is incorporated into teaching as it was left to teachers to integrate the garden into the curriculum in their own way, and this varied with the curriculum, the age of the pupils and the subjects being taught – science, maths, nutrition, health, cookery, and the promotion of healthy eating. However, they noted that only half of the 1300 food-growing schools surveyed integrated the garden into lessons and only a quarter involved all
the pupils in the garden (Nelson et al, 2011). As a result of the survey, they defined the conditions that they regarded as optimal for the delivery of food-growing in schools. These included:

- positive school leadership which supports and resources the gardening project.
- staff who can provide practical skills in growing, cooking and project management
- resources to support the project – often from within the local community and businesses. Nelson et al, 2011 p 51

The NFER study also reported that teachers require more food-growing and preparation skills (Nelson et al, 2011) in order to pass on the skills to pupils. They quoted a survey from RHS which investigated the distribution of gardening skills in children, their parents and grandparents and found that only 1% of parents were taught to garden in school compared to 55% of grandparents so the lack of skill and knowledge of teachers is perhaps not surprising. Growing food in a school garden, as part of the general educational activity of the school, may help to address some of the important issues about children's knowledge of food, its sources and variety, as well as providing time outdoors and physical activity.

In addition, the contribution that school gardens can make to increasing horticultural knowledge and skills, such as understanding of growing cycles and seasonality, food, pest control and practical gardening skills was reported.

2.5.4.1 Engaging children

There have been many initiatives to encourage the development of food-growing in schools. Most have been linked to attempts to increase fruit and vegetable consumption and have been funded by the larger supermarkets such as Morrison’s It’s Good to Grow Campaign.
Food-growing in schools

[https://www.itsgoodtogrow.co.uk](https://www.itsgoodtogrow.co.uk) which was launched in 2011 and enabled schools across the UK to collect vouchers which could be exchanged for gardening equipment seeds, wellington boots, tools and even greenhouses. Also, the Growing Schools Garden ([https://thegrowingschoolsgarden.org.uk](https://thegrowingschoolsgarden.org.uk)) was established by the UK government in 2006 to encourage schools to use the outdoor classroom as a resource and to ensure that all children had access to green space as an opportunity for learning, particularly focussed on food and farming. Another scheme, which was established by Tesco, – the Tesco Bags of Help scheme ([https://tescocommunitygrants.org.uk](https://tescocommunitygrants.org.uk)) provides funding for local schemes, and specifically includes projects that help to improve and sustain outdoor spaces. All of these have provided a stimulus to action in some areas, but they depend on school staff to apply and to organise the use of the funding.

### 2.5.4.2 Establishing edible gardening in schools

There are schemes established by organisations such as the Royal Horticultural Society (RHS), and Garden Organic which provide more focussed horticultural support and training. The RHS scheme is the most widely used and best studied. It is also a scheme which is accessible in Scotland and has increasing support with the opening of a Scottish branch of the RHS in 2014 which provides access to training and support for staff, as well as materials, seeds, and other information. A report of the Campaign for School Gardening to the RHS by Passy (Passy, Morris and Reed, 2010), on the impact of school gardening on learning is described in more detail below. It provides a good baseline for subsequent studies on the development of school gardening in other parts of the UK, including Scotland. Within the report, key ingredients which help to embed school gardening into schools, are identified and confirming that these key factors are present in gardens in Scottish schools is incorporated into my study. Further description of the RHS Campaign for School Gardening is presented below.
2.5.4.3 RHS Campaign for School Gardening

This scheme was established by the Royal Horticultural Society in 2007. It has four aims and objectives:

- to encourage all schools to get growing, and to acknowledge the right of every child to get involved in gardening
- to demonstrate the value of gardening in enriching the curriculum, teaching life skills and contributing to children’s mental and physical health
- to convince everyone involved with education in schools of the value of gardening in developing active citizens and carers for the environment
- to show how gardening can contribute to a sustainable environment *(RHS, 2007)*

The scheme is available to schools via the RHS website, and it provides information and a structured 5-tier, benchmarking system with advice available on the website and in other formats and with competitions and free seeds as an incentive for pupils. Over the years the range of the support materials has grown and now includes 302 items including:

- information sheets e.g. ‘A glossary of soil terms’, ‘A checklist of potentially harmful plants.
- activity guides e.g., ‘Art from the garden’, ‘Be a pomologist’.
- spotter guides e.g., ‘Be a flower spotter’, “Autumn flowers and fruits’.
- projects e.g., creating raised beds, chilli challenge
- lesson plans
- class growing topics

This is a very extensive range of materials which is attractive to look at as well as providing useful information and challenges *(https://schoolgardening.rhs.org.uk/resources)* and would be beneficial for most schools. The emphasis on professional development for school staff distinguishes this from other schemes and the staff training courses are now
Food-growing in schools available in twelve centres across the UK (including in Scotland) and on-line. A report on the impact of the Campaign (Passy et al., 2010) lists the following outcomes:

- greater scientific knowledge and understanding
- enhanced literacy and numeracy
- increased awareness of the seasons and understanding of food production
- increased confidence, resilience and self-esteem
- development of physical skills, including fine motor skills
- development of a sense of responsibility
- a positive attitude to healthy food choices
- positive behaviour
- improvements in emotional well-being

(Passy, Morris and Reed, 2010 p ii)

The emphasis is on developing school gardening, and the impact on healthy eating is present, but not explicitly mentioned, in the overall aims and objectives of the campaign.

Although the Campaign was well-established, the uptake in Scotland was slow. By June 2012, 15,500 schools were enrolled in the Scheme (51% of the schools in England) and only 562 of the schools registered were in Scotland (23% of Scottish schools). The reason for the difference in the rate of development of school gardens between England and Scotland is one of the questions to be addressed in this study.

2.5.5 Effects of food-growing in schools

2.5.5.1 General effects
There is a wide variation in the scope of gardening projects; the ages of children involved – from pre-school to secondary level; the intensity of participation i.e., the number and frequency of gardening sessions available to the pupils; the content of the gardening sessions; the degree of integration
into the curriculum and across school activities; the training available to staff and whether the training is from school staff or delivered by an outside agency, in the school or on other premises. Despite the lack of consistency in what is provided, which can make it difficult to compare the results of studies, there is evidence of benefits to learning, increased knowledge of the environment, improved nutrition and well-being (Jones et al, 2007, de Sa and Lock, 2008, Passy, Morris and Reed, 2010).

2.5.5.2 Impact on Learning

Improving diet is not the main aim of the education system or of individual schools, so the time and effort entailed in establishing and maintaining a school garden must have relevance for educational goals.

Williams and Dixon’s (2013) review of academic outcomes of school gardening projects between 1990 and 2010 in the United States, reported positive academic impacts, particularly in science and mathematics. Language and social development also showed benefits. Their study of 48 papers found that these outcomes were consistent across types and sizes of schools, different gardening programmes and investigation by different research methods.

Improvements in science and maths are also the most frequently reported academic benefits by Ozer, 2003., Graham et al 2005., Klemmer, Waliczek and Zajicek, 2005., Pigg, Waliczek and Zajicek, 2006 and Lyon and Bragg, 2011.

Blair’s review of the US literature in 2009 (Blair, 2009), found demonstrable improvements in science and in “food behaviour” but did not reinforce previous findings of other studies of improvements in environmental attitudes or behaviour.

Passy’s report, (Passy, Morris and Reed, 2010) on the impact of school gardening on learning, investigated the effect of the RHS Campaign for school gardening on learning in all curriculum areas (maths, science,
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languages, personal, social, health, and arts. It comprised a desk study of the characteristics of the schools which were registered with the Campaign in 2010, and a series of interviews with a representative sample of schools to examine the impact that participation in the scheme was having on learning in the schools. The desk study analysed quantitative data from the RHS database of schools, some of which were new to gardening and some of which already had established gardens before joining the RHS Campaign. The researchers had access to the benchmark academic levels attained by the school, the attainment levels and deprivation indices.

The second part of the study was a 2-stage case study of a representative sample of 10 schools with a questionnaire sent to the school, followed by a visit during which interviews were conducted with the staff responsible for the school garden, head teachers, and parents. The aim was to determine what the schools were doing and how membership of the Campaign had affected their gardening activities and to look at the wider learning outcomes in relation to four categories defined as important by Dillon.

- cognitive learning which includes all academic outcomes
- affective learning which includes values, attitudes, self-perceptions
- behavioural and physical learning including personal behaviours, physical skills and behaviour
- interpersonal learning including social interaction, communication and teamwork

Dillon et al, 2005 p22

The study also indicated benefits to the school, particularly if gardening becomes central to the ethos of the school and is fully integrated into the curriculum.

They found that in the cognitive domain, outdoor learning gave pupils more control, that scientific learning improved with more experimentation and knowledge; that measuring, counting and sequencing all improved in maths and that physical skills, both gross skills (such as digging and hoeing) and fine motor skills (such as are used in sowing seeds and tying plants to
stakes), showed improvement. The work in the garden also improved interpersonal skills as it encouraged teamwork within the class and often collaboration with local groups or individuals in the community.

The enquiries in the schools also highlighted issues such as that the amount of ground available did not seem to be relevant to the success of gardening in a school and that a highly motivated member of staff was an essential element for the success of a gardening scheme, together with support from the head teacher. Funding was often provided from local sources and support from local garden centres and local gardeners was frequently forthcoming.

Concerns that were raised included worries about the sustainability of the garden in the short-term (for example, watering during the summer holidays) and as well as in the long-term (if the person with most involvement retired or left the school). At the strategic level it was important that gardening was embedded in the school development plan and that sufficient staff were employed who were committed to using the outdoors in the curriculum. Also, that staff were given time to prepare for gardening lessons and to develop their expertise and that of other staff.

Passy, Morris and Reed, (2010) also found that teachers and other staff involved had criticisms of the RHS scheme. They reported that the time required to prepare submissions for the higher-level benchmarks was onerous and expressed a wish for more Continuing Professional Development (CPD) sessions from RHS staff, but preferably carried out in schools, rather than at RHS gardens, to enable schools to benefit from contact with other schools.

All of these factors will be examined in this study in order to make sure that these features of a successful scheme are present in school gardening in Scotland.
2.5.5.3 Impact on nutritional knowledge

Educating children about food and increasing their consumption of fruit and vegetables is a priority aim for school gardening and many studies show that food-growing in schools is an effective way of achieving this (de Sa and Lock, 2008., Berezowitz, Bontrager Yoder, and Schoeller, 2015., and Huys et al, 2019).

Other studies have shown that children’s knowledge of, and preferences for, some vegetables increased in schools with a nutrition education curriculum supported by a school garden (Lineberger and Zajicek 2000., Morris, Neustadter and Zidenberg-Cherr 2001., Ransley, 2010), and Nelson et al 2011 found that pupils were more likely to try new vegetables if they had grown them and that this effect was still apparent after one year. The Stephanie Alexander Kitchen Garden Program which incorporates cooking and growing food in its remit in schools in Victoria Province, Australia, also found a significant increase in the willingness of children to try vegetables with which they were not familiar, if they had grown or cooked them (Block, 2009).

Learning about food, its production, and its place in relation to social and environmental sustainability can be incorporated into the school syllabus and a review of research into multi-faceted interventions by Van Cauwenburghe et al in 2010 indicated that changes to the curriculum, the type of food provided within the school and engagement of important stakeholders (such as parents) in the intervention led to greater effects on diet and nutrition.

Also, de Sa and Lock (2008) who reviewed interventions designed to promote fruit and vegetable intake in school children, showed that 22 of the 30 studies they reviewed reported a significant increase in fruit and vegetable consumption at follow-up. This is an important review as it was used to inform the development of European Union (EU) Agricultural policy to incorporate school fruit and vegetable programmes into agricultural reforms and so supports policies in health, education and agriculture across the EU.
2.5.5.4 Impact on learning about sustainability

Discussions about ecological, ethical and animal welfare aspects of food are now on the international agenda and issues of food security and the environmental impacts of an industrialised food system are under scrutiny (Lang, 2020). However, there is little research into school programmes which target food and diet in relation to biodiversity, climate change, local economy, social justice and animal welfare issues, although all of these topics can be incorporated into the curriculum in teaching about food, nutrition and health.

Blair (2009) looked at the long-term impacts of school gardening and postulated a link between gardening in childhood and adult attitudes to the environment. This is partly based on a finding from Chawla (1998), who suggested that adults who had exposure to nature as children were more likely to be environmentally aware and concerned in adulthood.

Environmental studies is another area where gardens contribute to enhanced learning as described by Graham et al 2005.

In addition, a study by Jones et al (2012) examined the interaction of healthy eating and teaching about food sustainability through a range of activities in school. The activities drew on experience in the classroom, the school dining room and the school garden and there was an over-arching ethos throughout the schools on food and sustainability issues. However, they found that combining health and sustainability issues in the same teaching programme was not as successful in causing change in food intake as more straightforward approaches.
2.5.5.5 Impact on horticultural knowledge and skills

Given the diversity of physical skills involved in gardening there is little mention in the literature of this area as a beneficial consequence of school gardening.

For example, gross motor skills such as are used in digging, hoeing, watering, pushing wheelbarrows, building raised beds and erecting support systems and fine motor skills in tasks such as sowing seeds, weeding, pricking out, potting on, tying in, and pruning. Eye-hand co-ordination is important in sowing seeds and dead-heading. Other important skills supported by gardening are patience – such as when waiting for seedlings to appear and delaying gratification while waiting for the strawberry crop to ripen.

There is also little reference in the literature relating to school gardens to the relevance of learning specific horticultural skills as a skill set which can lead to employment, or the later use of these skills in adulthood, apart from the report by Nelson to inform the Food Growing in Schools Taskforce (Nelson et al., 2011). This included reference to enhanced horticultural skills and knowledge in a review reported in Dillon et al. 2003 in pupils as a result of gardening activity, but this was an incidental outcome of the gardening programme rather than an objective of the pupils’ involvement in the garden.

2.5.5.6 Problems with studies of school gardening

Many studies of school gardening provide evidence of the value to curriculum subjects and to increasing the consumption of fruit and vegetables as a means to a healthier diet, but many problems in research design and analysis are described in the publications.

- It can be difficult to establish reliable data collection and outcome measures in studies of children’s food consumption. Self-report measures can be problematic due to difficulty with recall (especially
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with young children) and social desirability may influence the responses (Ohly et al, 2016).

- There is inconsistency in the measures used to assess outcomes in studies - such as grams per day, or portions of fruit and vegetables per day (Berezowitz, Bontrager, Yoder and Schoeller, 2015).
- There are problems about measuring change in consumption of fruit and vegetables in children. There is a limit to the number of pieces of fruit a child can eat in a day, so the behavioural changes are small. Detecting small changes in small studies needs a high level of statistical power and, for this reason meta-analysis is often used to calculate the significance across several studies with the same hypothesis (Langellotto and Gupta, 2012) although the same problems of variability in the definition of measures and outcomes also make meta-analyses difficult.
- Many studies have low statistical power because of small sample sizes and lack of long-term data (Ozer, 2007., Robinson-O'Brien et al 2009).
- Most of the studies have been carried out in affluent areas, usually in Europe, the United States and Australia and may therefore not be directly transferrable to more deprived areas of the world where obesity is increasing.

Despite these reservations, a high degree of consistency in the findings of significant change across many studies of school gardening means that food-growing in schools is now accepted as an effective way to increase consumption of fruit and vegetables.

2.5.6 Summary of findings from the literature review

- Healthy development in childhood requires that the child has a sufficient amount of nutritious food available. There is general
agreement on the need to increase consumption of fruit and vegetables and to ensure that these healthy foods are available to all.

- **Dietary habits established in childhood persist into adulthood.** We like to eat what is familiar, so early introduction to a wide range of fruit and vegetables is essential. We also know that children are more likely to eat fruit and vegetables if they have grown them.

- **At the macro-level, government is acting by changing laws relating to the sugar and salt content of processed foods and by reducing the ease of availability of HFSS foods in supermarkets and the advertising of these foods.** At the micro-level, i.e. the personal and family level, dietary change is required. This is difficult for families of low Socio-Economic Status as the cost of healthy food is perceived to be high relative to the cost of ultra-processed foods which are readily available and cheap.

- **Introducing children to growing fruit and vegetables at school is an effective way of increasing consumption.**

- **Theory suggests that criteria for successful dietary change include exposure, taste, self-efficacy, and modelling which can be provided by growing food at school.**

- **School gardens can also be used to support academic subjects and can be integrated into the school meals programme.**

- **The development of school gardens in Scotland and how they are used has not been studied.**

Research has supported a link between school gardening and increasing consumption of fruit and vegetables (Passy, Morris and Reed, 2010), and the study aims to determine whether school gardening in Scotland is sufficiently developed to contribute to the drive to increase children’s consumption of fruit and vegetables as one initiative to tackle the high rate of obesity in Scottish children.
The literature review provided clarification of the issues underlying the study, consulted relevant theoretical models and reviewed the approaches that have been tried and this then enabled definition of the research questions.

### 2.6 Research questions

The questions to be addressed are listed below:

**Question 1: How does the number of schools with gardens in Scotland compare with the number without gardens and the number which have had gardens but no longer do so?**

**Objective:**

- To ascertain how many schools have gardens, do not have gardens, or had gardens in the past but no longer do so?

**Question 2: What are the characteristics of schools which have gardens, do not have gardens, or have had gardens in the past?**

**Objectives:**

- to define the type of schools in all three categories
- to examine demographic information about schools with gardens, without gardens and which gardened in the past, but no longer do so (urban/rural; type of school; socio-economic status; proportion of children from minority ethnic backgrounds) to see if there are common features which might clarify why schools do, or do not, or have given up gardens.

**Question 3: What are the characteristics of effective school gardens in Scotland?**

**Objective:** To examine:

- the nature of gardening in the school
- the age range of pupils involved in gardening
• the proportion of pupils, teaching, non-teaching and other staff involved in the garden
• how the garden is used
• the training and support available for the school garden and if, and how, this is used

**Question 4:** What are the characteristics of school gardens which successfully integrate a theory of behaviour change with features of effective school gardening?

Objective: To match present practice in schools with the criteria which are associated with successful behaviour change.

**Question 5:** What factors do school gardeners consider to be motivating factors for school gardening?

Objective: to determine what are the issues that contribute to the success of school gardens from those involved in school gardens.

**Question 6:** What factors do school gardeners consider to be barriers to school gardening?

Objective: To identify features related to rural schools, time and curriculum pressures which will make the development and maintenance of school gardens difficult.

**Question 7:** Are there specific factors relevant to the development of school gardens in Scotland compared to England?
Objective: To identify factors which disproportionately affect growing in schools in Scotland.
Chapter 3  Methodology

3.1 Introduction
This chapter describes the methods used to answer the research questions, how the questions for the questionnaire were compiled and piloted and the procedure followed for distributing the questionnaires and collating and analysing the responses.

This is a cross-sectional, descriptive study, carried out by a survey of all the schools in Scotland in order to establish the current status of food growing in Scottish schools. In addition, comparison is made with food-growing in schools in England to determine whether there are factors which make food growing in Scotland more challenging than in England where a higher proportion of schools have gardens.

3.2 Development of the questionnaire

Preparation of the questionnaire for the survey involved the following steps which are described in further detail below:

- A literature search was carried out as reported in Chapter 1 above (see 3.2.1 below).
- Consultations were held with staff from Royal Botanic Gardens Edinburgh (RBGE) and Royal Horticultural Society (RHS, Scotland) to learn from their experiences. Both organisations run schemes to introduce gardening to schools and to support schools in their gardening efforts (see 3.2.2).
- Observations were carried out by attendance at sessions of both of the RBGE and the RHS schemes (see 3.2.3).
3.2.1 Questions raised by the Literature review

The literature review considered evidence for the importance of increasing the consumption of fruit and vegetables in childhood and the contribution that school gardens can make to that process. The development of school gardens and the benefits that they deliver to pupils in academic and other areas was reviewed. It also indicated features which are important in developing and maintaining successful school gardens. The importance of a healthy diet and the pressure on families trying to achieve this were reviewed and means to achieve a change in dietary behaviour were described.

The factors which are influential in using school gardens to contribute to dietary change were defined and include:

- motivation – encouraging children to taste and eat new foods (F&V)
- repeated exposure to fruit and vegetables – giving children repeated opportunities to try different foods
- modelling – encouraging tasting and eating different foods with people who are known and trusted and who can act as role models

The factors which were found to sustain school gardens include:

- involving teachers as trusted adults and role models in growing and tasting food
- supporting teachers as the main lead in school gardens
- establishing school policies which support food-growing
• involving parents where possible

These theoretical and practical contributors to behaviour change provided direction for the questions used in the study.

### 3.2.2 Consultations

In order to learn from the experience of organisations which are involved in supporting school gardening, consultations were held at Royal Botanic Gardens Edinburgh (RBGE) and the Royal Horticultural Society (RHS) (Scotland).

#### 3.2.2.1 Schools Gardening Project at RBGE

**Skills Development Manager (Schools)**

The RBGE scheme has been running for several years and is designed to give pupils practical experience of gardening. The schools which attend are not required to have a garden, or to be planning to develop one. A limitation of the scheme is that the schools need to be within walking distance of RBGE as the time involved in travel and the cost of transport for a class plus staff would not be manageable for the 6-8 weeks of the course. During their attendance the pupils are given the opportunity for ‘hands on’ work in the School Garden area of the Demonstration Garden at RBGE. The demand for these sessions is increasing and on-line teaching material has been created as an additional resource. Continuing Professional Development sessions for teachers are in development which will reach many more staff.

Information about the content of the course is described in the Observation session 3.2.3.1 below.

#### 3.2.2.2 RHS Campaign for School Gardening (Scotland)

**Development Manager for Scotland, Royal Horticultural Society**

The RHS Campaign for School Gardening has been in operation across the UK since 2007, but relatively few Scottish schools have been involved,
although it is open to all. However, the RHS has recently (2013), opened RHS (Scotland) a new branch of the organisation and so, at the time of the study, the Scottish programme was in the early stages of development. The intention of RHS (Scotland) is to promote the development of the Campaign for School Gardening and to increase the availability of teaching sessions for school staff across Scotland with the appointment of regional development officers in the east and west of Scotland. The RHS (Scotland) staff are very knowledgeable, and they are able to draw on the materials and experience of the RHS UK Campaign.

- Discussion about the accessibility of these schemes to all schools reinforced the need to include demographic data about the schools in the survey to establish whether all groups were equally represented
- The discussion about accessibility to all also reinforced the intention to circulate the questionnaire to all schools in Scotland
- A question about the use being made of the RHS scheme was inserted in the questionnaire at the request of the RHS Development Manager for Scotland.

### 3.2.3 Observation sessions

#### 3.2.3.1 Schools Gardening Project at Royal Botanic Gardens Edinburgh (RBGE)

Nine sessions of the School Gardening Project at RBGE were attended between mid-March and late June 2014 and again in 2015 with a group of Primary 4 children from a local Primary school. The classes were held weekly in a designated area of the Demonstration Garden at RBGE. There was also a follow-up session in September to harvest some of the vegetables.
3.2.3.1.1 **Format of the sessions**

Following a short (10 minute) session in the classroom to explain the task for the day, the pupils collected the necessary tools and other equipment and walked to the Demonstration area of the garden as a group. A minimum of 3-4 staff and volunteers from RBGE provided supervision and guidance as the tasks were carried out.

During these sessions pupils had hands-on experience of horticultural techniques such as sowing seeds, planting out seedlings, watering plants and weeding as well as learning about the importance of soil, pest control, weather conditions and other relevant topics. The seeds chosen had a short growing period to enable the pupils to harvest some of what they had grown, for example, lettuce and radishes.

An additional session was arranged for each class at the start of the following school year to allow them to harvest crops which had developed over the summer break (for example carrots and potatoes).

The staff accompanying the pupils but were observed to become more interested as the weeks went by. Teachers and parent volunteers who accompanied the pupils to and from school were not always committed to gardening but were encouraged by the RBGE staff to become involved and tended to do so more readily as the weeks passed and they became familiar with the format and the RBGE personnel.

The enthusiasm and knowledge of the RBGE staff and their ability to engage pupils was striking and was transmitted to the children.

Being an observer at these sessions gave the opportunity to see how the children responded to ‘hands on’ activities in the garden, and to speak to the teachers about their observations of the pupils learning outside the classroom.

- Questions about the gardening experience of staff in schools were added to the survey form as an outcome of this experience.
3.2.3.2 RHS Campaign for School Gardening (Scotland)

Three sessions were attended which were organised by RHS (Scotland) Campaign for School Gardening and were part of an ongoing programme for teachers involved with school gardening. These were day-long sessions held in schools which had gardens.

I attended sessions in Larbert High School and Perth High School and was impressed by the quality of the teaching from the RHS trainer and by the enthusiasm of the teachers attending. The availability of this training will, by now, have increased and so the opportunities to access training for teachers across Scotland will be substantially higher. The course materials provided by the RHS were shared with the Campaign for School Gardening in England and were being adapted by the staff for the growing conditions and the short growing season in Scotland. The sessions were one-off, day-long, events for teachers and more specialist training plans and alternative delivery methods were in development.

3.2.3.2.1 Format of the sessions

Groups of teachers, who were engaged in school gardening, met at a school which had a garden, for a day-long course of practical skills and information and to discuss issues that were important to them. Some of the attendees had experience of edible gardening and some did not and the material provided was appropriate for all. The focus was on providing information and resources available for staff from RHS such as planting schedules and information sheets about composting and other tasks. There were also ideas for lessons and related activities in subjects such as English and Art. As well as providing practical help and information, the attendees gained considerable support from the interaction with staff from other schools. Questions were raised about the range of vegetables which can be grown and how to deal with practical problems such as the need to walk through a colleague’s classroom, with a class of children carrying watering cans, in order to gain access to the garden. The attendees were very appreciative of
the resources available and the supportive and knowledgeable presentation 
from the RHS (Scotland) staff. They expressed concern about their own lack 
of gardening experience but were enthusiastic about their ability to develop a 
garden, particularly with the support of their peer group and of RHS staff. 
This reinforced the findings of Passy, Morris and Reed (2010) that staff would 
welcome more Continuing Professional Development (CPD) sessions with 
experienced gardeners.

- A question about the gardening experience of the staff involved with 
  the school garden was added to the “About You” section of the 
  questionnaire.

### 3.2.3.3 Outcomes from consultation and observation sessions

Contact with the tutors from RBGE and RHS provided information about the 
content of the sessions for children at RBGE and those for teachers provided 
by RHS (Scotland). The practical difficulties associated with fitting training 
for staff around school timetables were highlighted and the importance of 
staff training to increase knowledge and confidence in growing was clearly 
stated and reinforced the findings of other studies. Importantly the staff 
interpreted being released for training as a measure of support from school 
managers for school gardening and recognition of school gardening as an 
asset to the school.

Direct contact with the teachers who were involved in these sessions helped 
to clarify what those leading food-growing in schools wanted to learn and the 
contact with pupils gave insight into the pleasure that experiential learning 
and watching plants grow and then eating the produce brought to them.

- As a result of attendance at these sessions, questions about how the 
garden is used in the school (to contribute to the curriculum or as an 
out-of-hours activity), how gardening is integrated into the school 
timetable, and practical issues about access to the garden and
maintaining the garden over holiday periods were incorporated into the study questionnaire and analysis.

### 3.2.4 Pilot of questions for the study

In order to check that the questions in the study questionnaire were relevant, comprehensible, easy to use, and that data were received in a format suitable for analysis, eight colleagues and friends were asked to complete the questionnaire and to comment on the contents.

Of this group, four were experienced gardeners (aged 53 – 72 years, 2 male and 2 female), two were non-gardeners (aged 30 – 35 years, one male and one female), and two were gardeners with limited experience (aged 55 – 58 years, both female) (see Table 4.1). Three had experience of devising and analysing questionnaires, two had been secondary school teachers and one worked in design.

They were asked to complete the questionnaire as if they were from a Non-Gardening school, a Past Gardening school and a Gardening school so that all questions were scrutinised. After completing the questionnaire, they were presented with a paper form (see Appendix 2) and the results are shown in the Results section (4.1.1).

As a result of this input typographical errors were corrected, but no other alterations were made to the questionnaire form.
3.2.5 Adult survey on learning about gardening

A small investigative survey was carried out in an attempt to ascertain whether having experience of food-growing in childhood has lasting effects; how the gardeners acquired their knowledge and skills, and what they thought they gained from food-growing as children. The premise is that growing fruit and vegetables and exposure to healthy food in childhood encourages healthy eating, sets a pattern for eating habits and provides experience which is useful in later life. If childhood experience was found to be important in increasing knowledge and appreciation of healthy food, it would be another reason to promote food growing in schools.

In addition, studies have shown (Passy, Morris and Reed, 2010) that school staff are reluctant to become involved in gardening because of lack of knowledge and skills which raised the question of how and when adults learn to grow food, so an investigation into how adults who grow food learned how to do this, would be helpful.

There is further evidence of a lack of gardening experience in the population from a study by the RHS cited in the Food Growing in Schools Taskforce report (2011, p46). This describes a survey, commissioned in 2009 by the RHS, in which they asked 500 parents, grandparents and primary school-aged children about their gardening habits, to discover whether there is a ‘lost generation of gardeners’. The survey found that fewer than 1% of parents were taught to garden while at school, compared to 55% of grandparents and 40% of children. Although this relates only to those who learned gardening at school it may be indicative of a general reduction in gardening in the parents’ generation compared to grandparents and to children and this age bracket is likely to include teachers.
The study was therefore carried out for two reasons:

1. Knowledge about food, where it comes from and how it grows, opportunities to taste a wide range of foods in childhood and experience of growing food are all issues which have been shown to influence consumption of fruit and vegetables and which are available through food-growing at school and at home. Questions about whether this is borne out by the experience of adults who grew food in childhood was of interest.

2. Previous studies have shown that lack of knowledge and experience of food-growing in staff is a barrier to developing school gardens (Rickinson et al, 2004. Passy, Morris and Reed, 2010), so finding out whether gardeners who had experience in childhood considered that this supported their growing as adults would be useful.

The survey was carried out with three groups of adults, all of whom are keen gardeners. They were:

- attendees at the Annual General Meeting of the Scottish Allotment and Gardens Society (SAGS) in June 2013, (23 responses)
- members of the Dunblane and District Gardening Club (D&DGC) in March 2014 (11 responses)
- members of the Badenoch Gardening group (Badenoch) in Newtonmore in March 2016 (18 responses).

A copy of the survey form is available in Appendix 3 and the results from the questionnaire are reported in the Results chapter (see 4.2).

- Although this was based on a small sample, the results suggest that there is value in providing opportunities to learn about food and how to grow it in childhood. It was therefore a contributory factor in the development of the questionnaire, in particular, in the addition of a
question about the gardening experience of the adults who have primary responsibility for the school gardens.

3.3 Main study

The main study was a questionnaire-based survey of all the schools in Scotland in order to establish how many schools in Scotland had gardens, how many have had gardens in the past but no longer do so and how many did not have gardens.

There were questions aimed at establishing the characteristics of the schools in each group to see if there were features that could provide an explanation for why some schools had developed gardens and some had not. Then elements of the gardens were examined, including how the garden was used within the school, the proportion of pupils and staff involved in the garden, who was responsible for the garden and what support was available to the school to help with the garden. Scottish schools have been slow to develop gardens so there were also questions about whether there were specific issues which hinder the development and maintenance of food-growing in Scottish schools.

The factors which motivated schools to develop gardens and the barriers that they perceive to food-growing in school were explored. It was important to be proactive in asking Non-gardening schools for the reasons that they had not developed a garden and to ask Past Gardening schools why they stopped food-growing. If consistent issues were presented, then these could be addressed before attempting to enlist more schools in gardening schemes, in order to improve compliance.

Information (age, sex, role of the garden lead in the school, or their gardening experience) about those who completed the questionnaire (the ‘garden leads’) was gathered and compared across the groups to see if there were any features which might be linked to whether the school developed and
maintained a garden as this too could be used to enhance the chances of success of future schemes.

Quantitative data were derived from the survey data and qualitative data from an open-ended question included in the questionnaire.

### 3.3.1 Target population for the main study

To obtain the maximum information it was decided to survey the total population of schools in Scotland. It was considered that the total number (2580 schools in 2014) was manageable and that the alternative of attempting to define a representative sample across the disparate sizes of schools, geographic locations and demographic variables would have been very difficult and would have resulted in small numbers in some categories.

School details were obtained from:

Scottish Government Schools open in September 2014

This document provides information including school name, address, pupil roll, teacher numbers, urban/rural location, denomination and proportion of pupils from minority ethnic groups.

### 3.3.2 Ethical considerations

In accordance the Research Ethics Policy and Procedure of Edinburgh College of Art at the University of Edinburgh, a Level 1 self-audit checklist was completed and is available in Appendix 4.

A form for Level 2 of the Ethics Procedure was prepared, but not used, as direct contact with children was only when participating as an observer of the Education team at RBGE during school teaching sessions with staff present. This was in accord with the Safeguarding Policy in operation at RBGE.
3.3.3 Data management plan
As recommended by the Digital Curation Centre at the University of Edinburgh (Jones, 2011) a Data Management Plan was completed and is available in Appendix 5. This facilitated consideration of the collection, storage, analysis and use of data in the short-term and for the longer-term.

3.3.4 Questionnaire design
3.3.4.1 Selection of the survey form provider
Several different survey administration software forms were considered and the following points were taken into account before deciding on Google Forms as the vehicle for delivering the questionnaire:

- email was considered to be the most appropriate method of delivery to reach and involve all schools.
- It is a user-friendly form.
- The form was self-administered, so the questionnaire could be completed when convenient for each school.
- Seven different question formats were available (choose from a list, checkbox, multiple choice and grid were used).
- Logic branching was available to separate the three target groups – those schools with gardens (G), those which had gardens in the past (PG) and those without a garden (NG).
- Responses could be transferred to Excel and statistical packages, such as SPSS, to facilitate analysis.

3.3.4.2 Selection of questions
Questions were developed in several ways:

- Information was required about the schools and the respondents as well as some demographic information. - see ‘About your school’ and
‘About you’ (questions 35 – 43) in the study questionnaire in Appendix 8).

- Some questions from a study of food growing activities in schools undertaken by the National Foundation for Educational Research (NFER) on behalf of the Department for the Environment, Food and Rural Affairs (Defra) and Garden Organic to inform the Food Growing in Schools Taskforce (Nelson et al, 2011) were incorporated as one aim of the project was to detect any differences between food growing in English and Scottish schools and to reveal barriers that are specific to Scottish schools.

- Findings from studies which had defined characteristics of successful school gardens (Passy, Morris and Reed, 2010) contributed to some questions as it was important to see whether these features were present. These included support from senior management and embedding gardening into the school curriculum.

- A question about whether introducing children to gardening was a motivation for the school garden was added. This has not received attention in previous studies. Although some reports had observed that children acquired horticultural knowledge and skills as a result of working in the garden (Nelson et al, 2011), the suggestion that this might be a motivating factor for school gardening had not been considered. Also, the small study carried out with adult gardeners suggested that gardening in childhood provided knowledge and experience of fruit and vegetables which they carried with them. They also learned skills which remained useful in adulthood and considered that this early learning may have contributed to them growing food in later life, so the question was pertinent.

- The limited gardening experience reported by school staff as a barrier to school gardening led to the inclusion of a question about whether the staff responsible for the garden had previous experience of food-growing.
Questions about the person completing the questionnaire were added to provide information about the ‘garden lead’ as the need for someone to fulfil such a role was evident from previous studies (Passy, Morris and Reed, 2010).

Finally, respondents were invited to leave any comments they wished about food-growing in schools. This was an opportunity to generate some qualitative information about school gardening from within the target population.

3.3.4.3 Question format and order of presentation

The recommendations of research studies into questionnaire design summarised by (Lietz, 2010), were observed in designing the questions and determining the order of presentation of the questions.

Adding some questions from the NFER study meant accepting the wording of those questions in order to be able to compare the responses.

Dichotomous and fixed response questions were used where possible, and open-ended questions were avoided to enable quantitative data to be obtained. The wording of questions was chosen to avoid leading the respondent to a particular answer.

Although no ‘Text’ or ‘Paragraph’ (open-ended) questions about the school garden were included, the ‘Other’ option in some questions gave an opportunity for the respondent to provide more information.

Using Google forms facilitated the production of questions which were clear, simple and specific by the use of nine pre-set question types, such as ‘choose from a list’, ‘checkbox’, ‘multiple choice’ and ‘grid’, and this offered a framework which fulfilled the criteria and was easy to complete.
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Demographic data about the schools were added from the Scottish Educational Establishment Database (SEED) (see Appendix 6).

3.3.5 Questionnaire
The questionnaire is available at:

https://docs.google.com/forms/d/1XoFrLANqW820v7HZV7q0ezWLFfTqIg1k9uh5kB9kFdl/edit (a paper version is available in Appendix 8 and screen shots of the content in Appendix 9)

3.3.6 Survey questions and process

An initial question “Is your school involved in gardening?” was asked of all respondents. Logic branching was then used to separate the responses into 3 groups – Gardening (G), Non-Gardening (NG), and Past Gardening (PG). This determined the form of the questionnaire which was presented to the respondent.

In addition, each respondent was asked about their role in the garden, their age and sex and the extent of their gardening experience and the address of the school and an email address were requested.

At the end of the questionnaire the respondents were invited to make any further comments they wished about school gardening.

Further information about the format and content of the questionnaire as it applied to each group is provided below:

3.3.6.1 Gardening group
If the respondent indicated that their school was involved in gardening, questions covering the following areas were presented:
Food-growing in schools

- The numbers and ages of pupils involved in gardening.
- The nature of gardening in the school.
- Who was responsible for the garden?
- How the garden was used in the school.
- The proportions of pupils, teaching staff and non-teaching staff involved in the garden.
- The support available to assist with the garden, if any.
- The sources of that support.
- Training or support schemes used.
- The factors which motivated the school to develop a garden.
- Any barriers perceived by the respondent to the development of food growing in schools.
- Plans for food growing in the school in the future.

3.3.6.2 Past Gardening group

The questions for the Past Gardening group were identical to those for the Gardening group with the addition of questions to determine how long ago food-growing in the school stopped, the reasons for stopping, and what would encourage the school to restart gardening.

Also, the question about future plans for gardening at the school provided slightly different options for the Gardening group from that for the Past Gardening group as seen in Table 3.1:

“Which of the following statements best describes the plans for food growing in your school in the next few years?”

<table>
<thead>
<tr>
<th>Past Gardening group</th>
<th>Gardening group</th>
</tr>
</thead>
</table>
Food-growing in schools

<table>
<thead>
<tr>
<th>We do not plan to offer food growing activities</th>
<th>We plan to stop offering food growing activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>We plan to restart food growing activities</td>
<td>We plan to reduce our food growing activities</td>
</tr>
<tr>
<td>Other</td>
<td>We plan to continue food growing at the present level</td>
</tr>
<tr>
<td></td>
<td>We plan to increase our food growing activities</td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
</tbody>
</table>

*Figure 3-1 Future Plans*

3.3.6.3 *Non-Gardening group*

This group was asked only two questions:

- “If your school is not currently involved in growing food, will your school take part in growing food in the future?”
- “What would encourage you to consider starting a food-growing scheme in your school?”

3.4 *Survey procedure*

3.4.1 *Summary*

When the questionnaire had been developed a number of steps were followed:

- obtain contact details for Directors of Education (DoEs)
- email DoEs informing them about the study and asking for their support
- circulate questionnaire to all schools by email with date for return
- responses received – Google Forms
• transfer to Excel
• transfer to SPSS, if necessary
• contact MSPs for support
• contact Education Scotland at suggestion of MSP and submit item to their e-bulletin to encourage further responses
• resend to attract further responses
• collate responses
• carry out the analysis

3.4.1.1 Phase 1 – Pre-send
The first step was to obtain the names and addresses of all Directors of Education from the scot.gov website and to check these.

The Directors of Education (DoEs) for all 13 local authorities were contacted by email on 30th April 2015. They were informed that the questionnaire would be sent out in a few weeks and a link to the questionnaire was provided within the letter. They were asked to support the project by encouraging staff to complete the survey form and were assured about the anonymity of responses. Although DoEs were not invited, or required, to respond, eight did so. All were very supportive, two passed the survey to a colleague for action, and two sent forms (application to undertake research in Education) to be completed, although these were received after the questionnaire had been sent to all schools.

3.4.1.2 Phase 2 – first send
• The questionnaire was sent out to all schools (2580) by email (obtained from https://www.gov.scot/publications/school-contact-details/) on 30th April 2015 and a reminder on 11th May 2015 with a deadline of 19th June for return.
• 152 responses were lodged by 30th June with another arriving on 8th August (total 153).
Several problems arose with 41 ‘Delivery failed’ notices being received. These were followed up and the errors included problems with addresses (misspelt names – Hutchison, not Hutchinson; Ann Marie, not Anne Marie) and some counter-intuitive council web addresses – northlan, not northlanarkshire. This caused some delays while the problem was identified and questionnaires were sent to the corrected addresses.

Two councils – Stirling and South Lanarkshire sent forms to be completed to allow access to schools. These forms arrived quite some time after the questionnaires were sent out and responses had been received from several schools in these authorities, so no further action was not taken.

There was contact from a school in Ayrshire to say that the questionnaire could not be opened. The full URL was sent to the school, rather than a short version. A further response two days later indicated that this had not been successful but no other schools indicated that they had the same problem.

3.4.1.3 Phase 3 Questionnaire – Second send

In an attempt to increase the number of responses, it was decided to send the questionnaire again the following year.

In advance of this, a letter was sent by email to all Members of the Scottish Parliament (MSPs) with an interest in Horticulture seeking their support in encouraging schools to return the questionnaire. The MSPs selected included those in the “Grow your Own” working Group which was formed to take forward aspects of the National Food and Drink Policy “Recipe for Success”. Also, MSPs from the Children and Young People Group and the Food Group and Education and Culture Committee.

Unfortunately, this approach to MSPs coincided with an election which, naturally, preoccupied all the MSPs. (Parliament was dissolved on 24/03/2016 and the election was held on 05/05/2016).
However, there was a response from Richard Lochhead MSP, through his contacts with RBGE, and he provided a link with Education Scotland which he thought might be helpful. This independent organisation was established by the Scottish Government, in 2011 as:

“an impartial body to support quality and improvement in Scottish Education”


A statement about the project was sent on 26th May 2016 for inclusion in the organisation’s e-bulletin and blog. No direct contact was received from members of the group as a result of this, but none was expected, as the purpose was to increase awareness of the project and to generate support if it was mentioned during team members’ visits to schools.

Following this, the questionnaire was sent again to all Scottish schools on 14th June 2016 with a covering letter inviting those schools which had not completed the form on the previous mailing do so this time and informing those who had already submitted a response that no further action was required.

As a result of these efforts, a further 70 questionnaires were returned, making a total of 223 and it was decided that this would form the response group on which the analysis was carried out.

### 3.4.2 Data analysis

#### 3.4.2.1 Data collation

The first stage of the data analysis was to collate the information received the process of which is described below.
All the emailed responses were recorded on Google Forms from which a response summary was available on Google Sheets. This summary of the results did not provide adequate scope for the addition of demographic information as detailed above or for a more comprehensive analysis of the results and so the information was transferred to Microsoft Excel.

A number of adjustments were made to the data when they were transferred to Excel (Microsoft Corporation, Version 16.44) for analysis and these are listed below.

- A single spreadsheet was created with the questions in the same order as in the survey form.
- Separate spreadsheets were then generated for the three groups (G, PG and NG) in addition to the spreadsheet with the combined responses.
- The column headings, which were in the form of entire questions, were modified to a meaningful short form (“Who is responsible for food-growing in your school?” to “Responsible”).
- The data were tidied to make analysis more straightforward. For example, the number of categories of responses under some headings – e.g. “Teacher” were reduced to include “principal teacher”, “assistant head teacher” and “teacher” for clarity and ease of analysis.

Once these changes had been made, demographic data about the schools were added from the Scottish Educational Establishment Database (SEED) (see Appendix 6 for explanation and source) prior to analysis.

The information from this source included

- the type of school (Primary, Secondary, Special)
- the number of pupils in the school
- the urban/rural classification of the school (as classified using the Scottish Government Urban/Rural classification - the 8-fold measure was used. (For definition see Appendix 7).
• the proportion of pupils in the school from ethnic minority groups
• and the proportion of children in the school who live in the 20% most deprived data zones in Scotland.

Checks were then carried out to ensure that all data had been transferred and further random checks were conducted to search for inaccuracies.

3.4.2.2 Data analysis
Once in Excel a further transfer to SPSS statistical package was carried out, although ultimately this was not used as the numbers in the Non-Gardening (NG) and Past Gardening (PG) groups were too small to allow for reliable statistical analysis. Instead, comparisons between groups were made in Excel, using Excel formulae. The results were then illustrated using charts (see Results 4.3.2).

3.4.2.3 Questionnaire responses
Secondly, the responses to the questionnaire were examined and the results compared across the three groups - Gardening, Past Gardening and Non-Gardening to elicit detailed information about how schools in Scotland view food growing and how they use school gardens and to determine what the schools see as the facilitators and the barriers to gardening and how this compares to the responses in England.

3.4.2.4 Information about the respondents
Thirdly, within the questionnaire the respondents were asked to provide their age group, sex, gardening experience and their role in the school garden and this information was compared across the groups to establish whether any of these factors are relevant in the development and maintenance of school gardens.
3.4.2.5 Comments - Qualitative analysis of ‘Comments’

Fourthly, thematic analysis was carried out, using NVivo12 (QSR International Version 12.6.9) to explore the open-ended responses made in the ‘Comments’ section of the form.

3.5 Problems with the survey form

Some problems with the survey became apparent.

1. The Google summary did not accommodate the ‘Choose from a list’ option when the additional ‘most frequent’ option was also required. (main barrier, main motivator). For example: “Based on your experience what are the main barriers to food growing in schools in Scotland and which one factor do you think is the main barrier”. Using Excel for analysis provided a solution.

2. Questions which were worded very similarly (for example, a change of tense between present and past gardeners) were treated as different by Google Forms. For example: “who is responsible for co-ordinating food growing activities at your school” vs “who was responsible for co-ordinating food-growing activities at your school?” for current and past gardening schools respectively. This led to a plethora of columns on the results table and unnecessary complication. Although the question format was more appropriate for respondents the data were not affected when combined.

Other, procedural, problems in using the survey were identified:

3. Date sent – Summer term was chosen as gardening would be underway and the questionnaire would be relevant. The survey was sent in April 2015 and May 2016 which was quite late in the school year and coincided with the run up to end of year activities, such as
parents’ evenings, sports days, or outings. It also overlapped with the change to the following academic year, which takes place three weeks before the end of the school year in some secondary schools. A better date would have been towards the end of the Easter term, in March or April.

4. Some questionnaires bounced back due to incorrect or inaccurate details names and addresses. As noted above there were many of these and, although efforts were made to correct and resend, it is unclear how many of these were subsequently returned.
Chapter 4 Results

The first two parts of the Results chapter report on projects that contributed to the design of the questionnaire which formed the main part of the study, the results of which are reported in Part 3.

- Part 1 – as part of the development of the questionnaire a pilot of the wording and presentation of the questionnaire was carried out to ensure that the survey form was comprehensible, easy to use and that the data received were in a format suitable for analysis.
- Part 2 - a survey of adult gardeners to determine the influence of childhood experience of gardening in later life also formed part of the process of development of the questionnaire.
- Part 3 - the main study of school gardens in Scotland. The third part of the Results chapter records the main outcomes of the study. Figures and Tables of all results are included and description with figures and tables shown below to illustrate the results.

4.1 Part 1 Pilot of questions for the study

In order to ensure that the questionnaire was comprehensible, relevant and would provide data suitable for analysis, eight colleagues and friends were asked to complete the questionnaire and to comment on the contents. See Appendix 2 for a copy of the form used.

They were asked to complete the questionnaire as if they were from a Non-Gardening school, a Past Gardening school and a Gardening school so that all questions were scrutinised by all the volunteers. They were then presented with the paper form shown in Appendix 2 asking them to comment on the layout, wording, appearance and ease of use of the form, to add anything that they thought was missing from the questionnaire and invited to make comments. They provided their name, age, sex, gardening experience...
and other relevant experience and were asked to time how long it had taken to complete the questionnaire.

Of this group, four were experienced gardeners (aged 53 – 72 years, 2 male and 2 female), two were non-gardeners (aged 30 – 35 years, one male and one female), and two were gardeners with limited experience (aged 55 – 58 years, both female). In addition, three had experience of devising and analysing questionnaires, two had been secondary school teachers, two had experience of working with children in gardens or other settings and one worked in design. The results are shown in Table 4.1 below.

<table>
<thead>
<tr>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Gardening experience</th>
<th>Other relevant experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53</td>
<td>M</td>
<td>Experienced</td>
<td>Teacher</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
<td>F</td>
<td>Experienced</td>
<td>Teacher, Girl Guide leader</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>M</td>
<td>Experienced</td>
<td>Use survey forms</td>
</tr>
<tr>
<td>4</td>
<td>45</td>
<td>F</td>
<td>Experienced</td>
<td>Work with children in garden</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>M</td>
<td>No experience</td>
<td>Designer</td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>F</td>
<td>No experience</td>
<td>Questionnaire design and analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Worked as carer</td>
</tr>
<tr>
<td>7</td>
<td>55</td>
<td>F</td>
<td>Limited experience</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>58</td>
<td>F</td>
<td>Limited experience</td>
<td>Use and analyse questionnaires</td>
</tr>
</tbody>
</table>

*Table 4.1 Pilot of questions for the study*
Results of the piloting:

- All eight approved the layout of the questions and agreed that the wording was understandable and coherent.

- The average time taken to complete the questionnaire was 7 minutes for the Past Gardening and Gardening sections which were the longest, although 10 minutes was specified in the covering letter sent out with the questionnaire, to allow for slower responses.

- Three made positive comments on the attractiveness of the questionnaire which they considered would increase the likelihood of engagement.

- Four found typographical errors which were corrected.

- None of the group made any additions to the questions.

As a result of this the typographical errors were corrected, but no other alterations were made to the questionnaire form.

**4.2 Part 2 Survey of adult gardeners**

Lack of gardening knowledge and skills is one barrier to the development of school gardens (Rickinson *et al*, 2004, Nelson *et al* 2011), so information from experienced gardeners about how and when gardening skills were developed and the lasting influence of food-growing in childhood could indicate whether early experience helped to build the knowledge and confidence that teachers say they lack. A small investigative survey was undertaken to investigate these issues.
The survey of adult gardeners attending three gardening groups was a paper-based form with multiple choice questions which the gardeners completed while attending a meeting of the group. A copy of the survey form is in Appendix 3 and figures showing the results below.

- The participants were:
  - attendees at the Annual General Meeting of the Scottish Allotment and Gardens Society (SAGS) in June 2013, (23 responses)
  - members of the Dunblane and District Gardening Club (D&DGC) in March 2014 (11 responses)
  - members of the Badenoch Gardening group (Badenoch) in Newtonmore in March 2016 (18 responses).

The questions asked about what they grow; their reasons for growing food; who introduced them to gardening; what they consider that they gain from growing food and whether learning to grow food in childhood influenced their growing as adults.

### 4.2.1 Results of the questionnaire to adults

![Reasons for growing food](image)

*Figure 4-1 Reasons for growing food*
As shown in Figure 4.1 gardeners appreciate:

- the flavour of food they have grown
- the range of fruit and vegetables they have access to by growing fruit and vegetables that are difficult to purchase.
- the reduction in air miles
- it is something they have always done
- gardening as a beneficial form of exercise.

![Pie chart showing who introduced people to gardening.](image)

**Figure 4-2 Who introduced you to gardening?**

When asked how they were introduced to gardening the results showed that:

- A substantial majority of the gardeners (79%) were introduced to gardening by their parents or grandparents. School was listed by 12% and only 7% of the gardeners had no tuition at all when they were children (see Figure 4.2).
When asked what they gained from the experience of gardening when they were children, the results (in order of importance) are shown in Figure 4.3. They were:

- taste
- learning the techniques to grow food successfully
- learning about food
- being in nature
- spending time with parents

Taste was a clear winner in the reasons for growing vegetables and learning about gardening also ranked highly.

The survey form was refined between administrations and only the Badenoch group was asked whether this early experience of growing food influenced their later food-growing with the following results:
Food-growing in schools

Chapter 4 Results

4.2.1.1 Summary of the results of the survey of adult gardeners

- The results showed that growing food at home provided positive experiences of the taste of healthy food, increased knowledge about food and how to grow it, made fresh food readily available and continued to stimulate interest in gardening into adulthood.

4.3 Part 3 Results of the main survey

4.3.1 Introduction

This section of the results chapter begins by providing information about the total number of schools which responded to the questionnaire and whether

Figure 4-4 Influence of growing in childhood

72% of the adult gardeners believed that the experience of food-growing in childhood had influenced their gardening in adulthood as seen in Figure 4.4.
they were involved in gardening, have had a garden in the past or do not have a garden.

**Question 1:** How does the number of schools with gardens in Scotland compare with the number without gardens and the number which have had gardens but no longer do so?

The total responses were then divided into the number and percentage of each Type of school (Primary, Secondary and Special), after which the total group was sub-divided into the three categories – the Gardening group (G group), the Past Gardening group (PG group) and the Non-Gardening group (NG group) for further examination and to address the second question:

**Question 2:** What are the characteristics of schools which have gardens, do not have gardens, or have had gardens in the past? Information about the location of the school, the type of school (primary, secondary or special), the funding source, the percentage of pupils from ethnic minority groups and the percentage of pupils from the 20% most deprived data zones in Scotland was examined.

**Question 3 - What are the characteristics of successful school gardens in Scotland?** was addressed using the findings from the body of the main questionnaire and the results of this are illustrated with figures and tables as appropriate.

Evidence to answer **Question 4: What are the characteristics of school gardens which successfully integrate a theory of behaviour change with features of effective school gardening?** was derived from the responses to the questionnaire, while **Question 5: What factors do school gardeners consider to be motivating factors for school gardening?** and **Question 6: What factors do school gardeners consider to be barriers to school gardening?** were directly asked in the content of the questionnaire.

**Question 7: Are there specific factors relevant to the development of school gardens in Scotland compared to England?** drew on responses to the questionnaire and the comparison with the study of English schools carried out by National
The results of the main study are presented in sections as illustrated below.

<table>
<thead>
<tr>
<th>SECTION 1</th>
<th>Total responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type of school (Primary, Secondary, Special)</td>
</tr>
<tr>
<td></td>
<td>Centre Type (Local Authority, Independent etc)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION 2</th>
<th>Information about the schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Information about the schools</td>
</tr>
<tr>
<td></td>
<td>Demographics</td>
</tr>
<tr>
<td></td>
<td>Representativeness of sample</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION 3</th>
<th>Information about the gardens - Questionnaire responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of time gardening</td>
</tr>
<tr>
<td></td>
<td>How the garden is used</td>
</tr>
<tr>
<td></td>
<td>Who is responsible</td>
</tr>
<tr>
<td></td>
<td>Age of pupils</td>
</tr>
<tr>
<td></td>
<td>Statements about the garden</td>
</tr>
<tr>
<td></td>
<td>Proportions of pupils and staff involved</td>
</tr>
<tr>
<td></td>
<td>Types of support available</td>
</tr>
<tr>
<td></td>
<td>Sources of support</td>
</tr>
<tr>
<td></td>
<td>Use of training and support</td>
</tr>
<tr>
<td></td>
<td>Use of RHS scheme</td>
</tr>
<tr>
<td></td>
<td>Motivators for school gardening</td>
</tr>
<tr>
<td></td>
<td>Barriers to school gardening</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION 4</th>
<th>Information about the respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
</tr>
<tr>
<td></td>
<td>Role in garden</td>
</tr>
<tr>
<td></td>
<td>Gardening experience</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION 5</th>
<th>Comments made by the respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main themes analysed</td>
</tr>
<tr>
<td></td>
<td>Main themes, who made the comments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTION 6</th>
<th>Comparison with English schools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motivators</td>
</tr>
<tr>
<td></td>
<td>Barriers</td>
</tr>
</tbody>
</table>

*Figure 4-5 Results sections*
4.3.2 Section 1 Total responses

4.3.2.1 Involvement in gardening (all responses)

223 responses were received after circulating the questionnaire to all Scottish schools (2580) in April 2015 and June 2016. The overall response rate was 9%.

- 203 (91%) of the 223 schools that responded reported that they had school gardens (G group). Only 7 schools (3%) which did not have school gardens (NG group) responded to the questionnaire, and 13 schools (6%) which had gardened in the past but are no longer doing so (PG group), submitted responses, as demonstrated in Figure 4.6.

4.3.2.2 Type of school (total responses)

- of the total number of schools in the study group 69% (n=154), were Primary schools, 26% (n=59) Secondary schools and 5% (n=12) Special schools (see Table 4-2).
Table 4-2 School type for the total study group

Funding Type (total responses)

- 91% of the participating schools were Local Authority funded, 4% were Independent, 2.5% were Grant Aided. 3% did not respond to the question (see Figure 4-7).
4.3.3 Section 2 Information about the Schools

4.3.3.1 Analysed by group (G, PG and NG)

The information about the schools was analysed and comparisons made between the groups and the data were also examined separately for each group. The Figures and Tables below show the results of the between-group comparisons.

4.3.3.1.1 Type of School

*Figure 4-8 School types in G, PG and NG groups*

- 146 (65%) of the schools in the Gardening group were Primary schools, 47 (23%) Secondary schools and 12 (5%) Special schools.
- 62% of the Past Gardening group were secondary schools. There was also a high percentage of secondary schools in the Non-Gardening group (57%).
Food-growing in schools

- Overall, gardening was most common in primary schools (n=146, 65% of the responses) and this is examined further in the results section for the Gardening group (Figure 4-8).

4.3.3.1.2 Funding Type

![Funding Type - All groups](image)

*Figure 4-9 School types in G, PG and NG groups*

- The majority of schools in the G group - 91% (n=203) were run by the Local Authority, and the rest were Independent 4% (n=9) or Grant-Aided 2% (n=5) (Figure 4-9).
- In the Past Gardening group, 85% were Local Authority and 8% Grant Aided.
- The Non-Gardening group were all Local Authority managed.

4.3.3.2 Demographic information about all groups

Responses from the three groups were examined for any variations which might contribute to the likelihood of a school developing and maintaining a garden. Factors measured were among those collated by the Scottish Government which include:

- urban/rural classification
• the proportion of pupils from ethnic minority groups and
• the proportion of pupils living in the 20% most deprived data zones in Scotland.

4.3.3.2.1 Urban/Rural classification
Demographic data relating to the location of schools was defined by the Scottish Government Urban Rural Classification [https://www.gov.scot/publications/scottish-government-urban-rural-classification-2016/](https://www.gov.scot/publications/scottish-government-urban-rural-classification-2016/). The urban/rural classification enables every postcode in Scotland to be allocated to one of six or eight different urban and rural categories. Every school was allocated to one of these categories based on its postcode. The 8-fold measure was used. (For definition see Appendix 7)

![Urban/Rural classification](image)

**Figure 4-10 Urban/Rural Classification of G, PG and NG groups**

• the majority of schools in the Non-Gardening (86%) and Past Gardening (76%) groups were from urban areas, while schools with gardens were dispersed across all categories of the urban/rural classification (see Figure 4-10).

4.3.3.2.2 Ethnic minority measures of schools
The proportion of pupils from ethnic minority groups and the proportion of pupils from the 20% most deprived data zones in Scotland was obtained from
the Scottish Educational Establishment Database (SEED) on the Scottish Government website: https://www2.gov.scot/Topics/Statistics/Browse/School/Education/Datasets/contactdetails September 2018 data were used.

With small numbers in the NG and PG groups, these figures may be misleading, but there was an indication that:

- The Gardening group had a lower proportion of pupils from ethnic minorities (42% of schools have less than 20% of pupils from Ethnic Minorities – the Scottish average is 24%).
- The Non-Gardening group had a much higher proportion of pupils (72%) from ethnic minorities than the other two groups.
- There was a greater spread of schools across the range in the Gardening group than in the Non-Gardening and Past Gardening groups as shown in Figure 4-11.

4.3.3.2.3 Social deprivation measure – all groups
Schools with gardens showed a disproportionately low level of social deprivation. 72% had less than 50% of pupils from the most deprived areas as shown in Figure 4.12.

- The figures for the percentage of schools with more than 50% of pupils from the 20% most deprived data zones were:
  - Gardening group 6%
  - Past Gardening group 16%
  - Non-Gardening group 28%

### 4.3.3.3 Demographic information by school type

Demographic data were also analysed by School Type to consider possible differences between Primary, Secondary and Special schools.
### 4.3.3.3.1 Urban/Rural classification by school type

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th></th>
<th>Secondary</th>
<th></th>
<th>Special</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Large urban areas</td>
<td>26</td>
<td>17%</td>
<td>17</td>
<td>29%</td>
<td>6</td>
<td>50%</td>
</tr>
<tr>
<td>Other urban areas</td>
<td>34</td>
<td>22%</td>
<td>23</td>
<td>39%</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Accessible small towns</td>
<td>10</td>
<td>6%</td>
<td>6</td>
<td>10%</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Remote small towns</td>
<td>4</td>
<td>3%</td>
<td>7</td>
<td>12%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Very remote small towns</td>
<td>1</td>
<td>1%</td>
<td>0</td>
<td>0%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Accessible rural areas</td>
<td>41</td>
<td>26%</td>
<td>2</td>
<td>3%</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Remote rural areas</td>
<td>17</td>
<td>11%</td>
<td>2</td>
<td>3%</td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>Very remote rural areas</td>
<td>22</td>
<td>14%</td>
<td>2</td>
<td>3%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>155</td>
<td>100%</td>
<td>59</td>
<td>99%</td>
<td>12</td>
<td>100%</td>
</tr>
<tr>
<td>No response</td>
<td>68</td>
<td>164</td>
<td>211</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>223</td>
<td>223</td>
<td>223</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 4-3 Urban/Rural classification by School Type*

- Secondary (78%) and Special schools (84%) were more likely to be in more urban areas, with Primary schools spread throughout all urban/rural areas (see Table 4.3).

### 4.3.3.3.2 Ethnicity by school type

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th></th>
<th>Secondary</th>
<th></th>
<th>Special</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>0 – 5%</td>
<td>32</td>
<td>21%</td>
<td>6</td>
<td>10%</td>
<td>1</td>
<td>8%</td>
</tr>
</tbody>
</table>
Table 4-4 Percentage of pupils from ethnic minority groups by School Type

Primary schools had a fairly even spread of pupils from ethnic minorities in the categories measured (0%, 0-5%, 5-10%, 10-20% and >20%) Table 4-4).

- Secondary schools had a higher percentage in the 5-10% and 10-20% categories and, although there are only 12 special schools and information was not available for seven of them, two had 10-20% and two had >20% from ethnic minorities which is considerably higher than the other groups.

4.3.3.3.3 Social Deprivation by school type

<table>
<thead>
<tr>
<th></th>
<th>Primary</th>
<th></th>
<th>Secondary</th>
<th></th>
<th>Special</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>0 – 25%</td>
<td>99</td>
<td>64</td>
<td>33</td>
<td>56</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25 – 50%</td>
<td>13</td>
<td>8</td>
<td>11</td>
<td>19</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>50 – 75%</td>
<td>11</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>&gt;75%</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No response</td>
<td>28</td>
<td>18</td>
<td>14</td>
<td>24</td>
<td>8</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>155</td>
<td>100</td>
<td>59</td>
<td>100</td>
<td>12</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4-5 Percentage of pupils living in the 20% most deprived data zones in Scotland

Data relating to deprivation was condensed into four categories rather than the 20 available to avoid complex tables.
• The most outstanding pattern to report in this section is that all of the Special schools which answered this question had 25 – 75% of pupils from the 20% most deprived data zones in Scotland (see Table 4-5).

The study group was also compared to the data for all Scottish schools on all the measures as shown below.

### 4.3.3.4 Sample schools compared with all Scottish schools

Although no attempt was made to enlist a representative sample of schools in the study, as all Scottish schools were contacted, it was hoped that the sample which responded would be representative. This would potentially make the data more meaningful and enable results to be generalised to the rest of Scotland.

From the total of 223 schools, the percentages of primary, secondary and special schools were calculated and compared with the percentages for Scotland.

![Figure 4-13 Comparison of Type of school in sample schools with all Scottish schools](image)

*Figure 4-13 Comparison of Type of school in sample schools with all Scottish schools*
4.3.3.4.1 School type comparison

- Of the three types of school (primary, secondary and special schools) gardening was most common in primary schools (n=146, 65% of respondents, Figure 4-13).
- The proportions in each school type were then compared as illustrated in Figure 4-13 above. There is little difference between the study group and the figures for all Scottish schools. A high proportion of NG and PG groups in secondary schools was clear in this chart when compared with the proportion of secondary schools in Scotland, but again the small numbers in these groups made comparison unreliable.

4.3.3.4.2 Funding type comparison

Over 91% (n=203) of all groups were from schools run by the Local Authority which is consistent with the norm for Scotland (96%). The proportion of schools in all centre types closely mirrored the figures for schools throughout Scotland (Figure 4-14).
4.3.3.5 Sample schools vs Scottish schools (demographics)

4.3.3.5.1 Urban/Rural Classification

The location of schools in the study group, as indicated by the Urban/Rural classification system employed by Scottish Education, is very similar to that for Scottish schools as demonstrated in Figure 4-15.

4.3.3.5.2 Ethnic minorities

Figure 4-16 Pupils from Ethnic Minority groups in Sample schools vs Scottish schools

Chapter 4 Results
Food-growing in schools

Fewer of the sample schools had a small percentage of pupils from ethnic minority groups than was the norm for Scotland. 28% of schools in Scotland had less than 5% of pupils from ethnic minority groups, while the figure for the study group was 17% (see Figure 4-16).

4.3.3.5.3 Social Deprivation

![Social Deprivation - Sample schools vs Scottish schools](image)

Figure 4-17 Social Deprivation - Sample schools vs Scottish schools

Figure 4-17 shows that the sample schools had a considerably higher proportion of pupils from areas with low levels of social deprivation than the proportion for Scotland as a whole, so the schools were in more affluent areas. 24% of Scottish schools had less than 25% of pupils from deprived areas, whereas for the sample schools it was 58%, although the number of Scottish schools for which the deprivation information was not available on the SEED database was high (47%).
4.3.4 Section 3 Information about the gardens -

4.3.4.1 Questionnaire results
As described in the Methodology section, the questionnaire comprised a single question to distinguish those schools which were growing food (the Gardening group) from those which were not (the Non-Gardening group) and from those which had grown food in the past but were no longer doing so (the Past Gardening group). This question determined which set of questions followed for each of the groups.

The responses were explored for each group separately and were later combined to provide comparisons between the groups when appropriate.

4.3.4.2 Length of involvement in school gardening

![Length of Involvement](image)

*Figure 4-18 Length of involvement as a percentage in each group*

*Figure 4-18* shows that food-growing was well-established (more than 4 years) in almost half of the schools in the Gardening group (45.3%) and almost two thirds (62.2%) had had gardens for three years or more.
This contrasted with Past Gardening schools 77% of which only had gardens for three years or less (Figure 4.18), with 23% of the PG schools unsure of how long the school had participated.

4.3.4.3 Nature of gardening in the school

Qu. Nature of gardening in the school – is it used in classwork, is it an extra-curricular activity or a combination of these?

As shown in Figure 4.19, 27% of the Gardening schools use the garden for classwork with a further 53% making use of the facilities for both gardening and for non-curricular activities. The comparable figures for the Past Gardening group are 15% and 46%.

Only 10% of the Gardening schools used the garden just for extra-curricular activities, whereas, in the Past Gardening group, the extra-curricular use was substantially higher at 38%.

In addition, there was a substantial list of other ways in which the Gardening schools used the garden including: eco work; as a transition project between P7 and S1; as an elective instead of PE twice per week in secondary school; as a Family Action day.
Several of these additional uses merit further exploration and explanation and may provide inspiration for other schools.

4.3.4.4 Responsibility

Qu. Who is responsible for co-ordinating food-growing activities in your school?

![Responsibility - G Group and PG Group](image)

*Figure 4-20 Responsibility for the school garden - G and PG groups*

It was clear from *Figure 4-20* that the main responsibility for school gardens lay with teaching staff in both groups.

In 59% of Gardening schools and 54% of Past Gardening schools, the teaching staff took responsibility for growing food. In only 9% of Gardening schools and 8% of Past Gardening schools did non-teaching school staff take the main responsibility for the garden.

A few, (5% Gardening schools and 15% Past Gardening schools), had significant involvement from parents and grandparents.

In 13% Gardening and 15% Past Gardening schools there was no-one with overall responsibility for the garden and the schools adopted a “we all muck in” approach.
4.3.4.5 Age groups

Qu. What age groups of pupils are involved in food-growing in your school?

As shown in Figure 4-21, gardening was more prevalent in primary school-aged children than with children in Secondary schools where the constraints of the curriculum may have been an inhibiting factor, although the reason for the difference was not explored in this study. A higher proportion of S1 – S4 pupils in the past gardening group may suggest that gardening was tried in some secondary schools, but with limited success.

4.3.4.6 Statements about school gardening

Schools were asked to indicate which of the following statements were true for their garden.

Figure 4-21 Age groups of pupils in G and PG groups
Qu. Which of the following statements are true about food-growing in your school?

* We grow food in the school grounds in an outdoor plot/raised beds
* We grow food using a space in the local community (e.g. an allotment)
* We grow food in pots in the school
* We grow food in pots outside
* We grow all our food organically
* We make and use our own compost
* Food growing activities are part of our school’s overall policy
* Food growing activities have the support of senior leaders/managers
* Food growing is frequently planned into lessons
* Food growing is accessible to pupils through extra-curricular clubs/activities
* Food growing is targeted at specific groups of pupils (e.g. year groups, SEN pupils, etc.)
* Food growing is taught “off-timetable” through one-off events or enrichment days/weeks
* Food growing is part of a Skills for Work project

No restrictions were placed on the number of responses a school could make to this question in an attempt to build a picture of how schools were developing food-growing facilities. There were therefore more responses than the number of schools participating. The number of responses for each question was printed in the bars in Figures 4-21 and 4-22 below and the number of times an item was chosen was indicated by the length of each bar.
Most Gardening schools used outdoor space in the school for growing food (179 in a plot and 101 in pots). Only 22 were using growing spaces, such as allotments, in the local community. In the Past Gardening group, the pattern was similar. Some of the Gardening schools (69) had pots indoors, but it was not clear whether this was as well as, or instead of, growing outdoors.
• Support for food-growing from senior managers was evident (150) in the Gardening group and also in the Past Gardening group. It was claimed that gardening is part of the school policy for some (66) but this was not the case for the Past Gardening group.

• Composting and growing organically were undertaken by both groups.

• Food-growing was planned into lessons for 78 Gardening schools but for others (75) it was available as an extra-curricular activity. In the Past Gardening schools gardening was not planned into lessons.

• Gardening was targeted at specific groups in 47 Gardening schools and this targeting is noticeable in a high proportion of the Past Gardening schools. The ‘specific groups’ included pupils with special educational needs.

• In some cases (34 in the Gardening group and 3 in the Past Gardening group) growing food was available as part of day-, or week-long, enrichment events which could involve parents, and occasionally (18) it was part of a “Skills for Work” project which aimed to introduce secondary school pupils to the skills and attitudes necessary and desirable when starting work. (https://www.sqa.org.uk/sqa/32645.html accessed 2nd May 2020).

4.3.4.7 Proportion of pupils, teachers and other staff involved
Qu: What proportions of the following groups (pupils, teachers, non-teaching school staff) are/were involved in food-growing last year in your school?
Figure 4-24 shows that 28% of the Gardening schools (n=56) had more than three-quarters of the school’s pupils involved in the garden and 37% (n=75) involved more than half of their pupils. This compared with only 15% (n=2) of the Past Gardening schools in which more than 50% of pupils were involved in the garden.

Previous studies have shown that where more pupils and staff are involved with the garden, the more successful it is (see in the Discussion Chapter 5).
The same pattern was apparent when the proportion of teachers was examined (Figure 4-25). In the Gardening group 65% of schools (n=131) had less than half of the teaching staff involved in gardening whereas in the Past Gardening group the figure was 85% (n=11) which would make the upkeep of the garden difficult to sustain.

Figure 4-26 Proportion of non-teaching school staff involved in the garden - G and PG groups

Figure 4-26 Proportion of non-teaching school staff involved in the garden - G and PG groups
As indicated in Figure 4-26 there was little help available from non-teaching school staff in school gardens, particularly in Past Gardening schools where 85% (n=11) had less than 50% of non-teaching staff involved.

4.3.4.8 Types of support
Qu. Did your school have any of the following types of support for food-growing in the past year?

Funding
Help with developing staff knowledge and/or skills
Help with developing pupils’ knowledge and skills
Lesson planning
Help with relevant off-site trips
Material resources e.g. tools, seeds, buildings, plants
Human resources e.g. volunteers, parent helpers
Making local land available for growing
None of the above
Other:

Figure 4-27 Types of support available - G and PG groups
Figure 4-27 indicates that the Gardening schools made use of many types of support, including help with material resources such as seeds, buildings and plants (n=106) and human resources such as volunteers and parent helpers (n=105). Funding and staff training and development are also used.

There was a long list of options provided in the ‘Other’ responses many of which were combinations of the school staff and volunteers, mainly parents and grandparents and the school’s eco-committee. There were also a few schools where innovative solutions have been found, such as: “a gardener funded by ‘Roots and Shoots’ charity”; “a supply teacher employed on a weekly basis March-October.”

Many other types of support were listed by the participants including money for raised beds from a local Rotary Club; free seed potatoes; and a National Lottery grant to make a nursery allotment (see Appendix 12).

Almost half (46%) of the Past Gardening schools did not have any support available.

4.3.4.9 Sources of support

Qu. From which of the following has your school received support (either formally or informally) to help with food-growing?

Business (local or national)

A charity (local or national, such as the Royal Horticultural Society, Botanic Gardens Edinburgh, Royal Caledonian Horticultural Society.

Local Authority - parks and gardens department
Parents
Another school
None of the above
Other:
The main sources of support used by the Gardening group were from parents and local businesses and charities (see Figure 4-28). Many of the organisations were local to the school, including Local Authority Parks and Gardens departments (mentioned 4 times), a TV company related to Gaelic media, and food plants donated by local gardeners. The Climate Challenge fund was used by one school to purchase and erect a polytunnel, and family and friends were mentioned several times.

A substantial list of additional sources was provided by the respondents including ‘Food for Thought’; “Britain in Bloom”; and a local college.

4.3.4.10 Training and Support schemes

Qu. Which of the following training and support schemes do you use (if any)?

Royal Horticultural Society (RHS) Campaign for School Gardening
Royal Caledonian Horticultural Society (RCHS) Schools Gardening scheme
Royal Botanic Garden Edinburgh (RBGE) Gardening for Schools sessions
None
Other:
Overall, few schools had used any of the training schemes available as shown in 
**Figure 4-29**. In the Gardening group, 62% (n=126) had not had training through any scheme such as those run by RHS and RBGE. 18% (n=37) had used the RHS Campaign for School Gardening; 3% (n=7) had attended teaching sessions at RBGE and 10% (n=17) had found other training, through organisations such as the Royal Scottish Horticultural Society (The Caley), the Royal Highland Education Trust (RHET) and St Andrews Botanic Garden.

Only one of the Past Gardening schools had used any training scheme. In this case it was the RHS Campaign for School Gardening.

The reasons for this were not apparent but further publicity for training schemes may be helpful. At the time of the preparation of this study in 2015, Curriculum for Excellence was in the early stages of implementation, which may have had an impact on the preparedness of schools to take on additional tasks or training.

4.3.4.11 **Use of the RHS Campaign for Schools Gardening**

This question was included at the request of the RHS Development Manager for Scotland who had recently taken up her post and was keen to learn about
the use of the Campaign for School Gardening in Scotland. She was particularly interested in schools which had achieved a high level and then slipped back, but it was not possible to discern this from the results for the reasons described below.

Only 30 schools responded to the question but even these limited results were unreliable as five respondents selected more than one level as the ‘current level’ despite the instruction to ‘Please choose ONE’.

More confusingly, two respondents selected a ‘Highest level’ which was lower than the “Current level”, which is not possible and indicated that the question was not clearly understood, and the results were therefore ignored, although RHS (Scotland) may be interested to pursue this.

The limited involvement of Scottish schools in the Campaign for School Gardening at the time of the survey, (2015), may indicate a lack of awareness of the scheme and therefore a question which asked about a series of ‘levels’, which were unknown to most respondents, may have been confusing and contributed to the poor response.

4.3.4.12 Reasons for giving up gardening

It was hoped that the Past Gardening group would be a source of information about potential difficulties in sustaining school gardening. However, only 13 questionnaires were submitted from schools which had previously had a garden and had given this up. This question was included to explore the experience of the Past Gardening group and the reasons for giving up and what might encourage them to start again.
Gardening stopped within the past two years in 69% of the Past Gardening schools (see Figure 4-30).

76.9% had been gardening for 3 years or less when it was stopped and 23.1% were not sure of the time scale (Figure 4-31).
Only 15.4% of schools which had stopped gardening had used the garden to contribute to the work being undertaken in the classroom (Figure 4.32) which suggested that the school was not committed to developing the garden as part of the schools educational offering.

4.3.4.13 Reasons for stopping food growing in schools

What were the reasons for stopping food growing in your school? (Please choose all that apply)

Lack of staff time
Lack of interest from pupils
Lack of support from the local community
Lack of interest from staff
Lack of money for equipment etc
Practical issues, like watering during school holidays
Other:
Figure 4-33 Reasons for stopping gardening

As shown in Figure 4.33, lack of time and lack of interest from staff were the most frequently given reasons for stopping as well as lack of interest from pupils.

4.3.4.14 Restarting gardening

Qu. What would encourage you to restart gardening?

*What would encourage you to consider restarting food growing activities in your school?*
*(Please choose all that apply)*

- Funding for equipment etc
- Clearer links with Curriculum for Excellence
- A mentoring scheme with schools with well-established school gardening schemes
- Training for staff
- Other:
Figure 4-34 Reasons for restarting gardening

This question evoked a range of responses. As Figure 4.34 shows, funding for equipment and training for staff were thought to be the most likely incentives to start gardening again.

4.3.4.15 Future Plans

4.3.4.15.1 Gardening group

Qu. Which of the following statements best describes the plans for food-growing in your school in the next few years?

<table>
<thead>
<tr>
<th>Gardening group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>We plan to stop offering food-growing</td>
<td>1</td>
</tr>
<tr>
<td>We plan to reduce our food-growing</td>
<td>1</td>
</tr>
<tr>
<td>We plan to continue food-growing at the same level</td>
<td>103</td>
</tr>
<tr>
<td>We plan to increase our food-growing</td>
<td>92</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
<tr>
<td>Not selected</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4-6 Future Plans, Gardening group
As shown in Table 4.6, 103 (51%) of the 203 schools in the Gardening group indicated that they intended to continue growing food at the same level as at present, with a further 92 (45%) indicating that they planned to increase food-growing in the school.

Only 2 schools (1%) planned to stop or reduce gardening and there were 4 schools which ticked the “Other” category. The reasons they provided were that:

- “the school is closing”
- “not sure”
- “we will include it in the curriculum”
- “we are taking an allotment with the local authority”

4.3.4.15.2 Past Gardening group
Qu. Which of the following statements best describes the plans for food-growing in your school in the next few years?

<table>
<thead>
<tr>
<th>Past Gardening group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not plan to offer food-growing</td>
<td>4</td>
</tr>
<tr>
<td>We plan to restart food-growing</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4-7 Future plans, Past Gardening group
Again, a positive response was received with 7 of the eleven schools (64%) which responded intending to restart food-growing (see Table 4.7)

4.3.4.15.3 Non-Gardening group
Qu. If your school is not currently involved in growing food, will your school take part in growing food in the future?

<table>
<thead>
<tr>
<th>Non-Gardening group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 4-8 Future plans, Non-Gardening group

Of the 7 responses from Non-Gardening schools 2 (28%) said they “definitely” intend to grow food in the school in the future, and a further 4 (57%) that would “possibly” start food-growing (see Table 4.8).

4.3.4.16 Motivating factors for and Barriers to school gardening
The questions about the motivations for schools becoming involved in food growing and the barriers that they perceive to this activity are important to this study. If more schools are to be encouraged to start gardening, then what we can learn from schools where gardening is underway, and from schools where gardening has been tried and then stopped, is valuable.

4.3.4.16.1 Motivators for school gardening
The question about the motivations for school gardening was worded as below:

*What motivates your school to grow food and which one factor motivates your school the most?*

This factor was a motivation (please choose all that apply)
Main motivation (please close only ONE box)

- To teach about the environment
- To teach about nutrition
- To teach about where food comes from
- To support the delivery of an outdoor curriculum
- To teach about gardening
- To encourage pupils to exercise
- To support the science curriculum
To support the food technology curriculum
Food growing was a personal interest of a member of staff
Pupils’ request
To subsidise school dinners with self-grown produce
Parents request
To interest pupils in the possibility of a career in horticulture
We were given the opportunity to join a food growing scheme (by a charity, local council, supermarket or other organisation)
To help develop skills for a healthy adult life

As a question about motivating factors was not relevant to the Non-Gardening group, the responses came from the Gardening and Past Gardening groups only (total number 216).

As seen above, respondents were asked to select all the motivating factors that applied in their school from a list of fifteen options and then to indicate which one of these which they considered to be the main motivator.

This was an attempt to clarify what the respondents considered to be of major importance in the development of food-growing in schools.

Rankings of the results were used for the comparison because of the different sizes of the Gardening and Past Gardening groups. The results for the Main Motivators and Motivators were combined for this report and any anomalies are mentioned below.

For the Gardening group the most frequently chosen motivators were:

- to teach about gardening
- to teach about nutrition
- to teach about the environment
- to teach where food comes from
- to develop skills for a healthy adult life

Table 4-9 Motivators, Gardening group
Teaching about gardening was important to the Gardening group but did not rank highly for the Past Gardening group.

When the responses to this question were combined (i.e. main motivators and motivators) and the responses from all groups are then rank ordered, the results were as shown in Figure 4-35:

1. to teach where food comes from
2= to teach about the environment
2= to teach about gardening
4. to support the outdoor curriculum
5. to teach about nutrition
6. to develop skills for a healthy adult life
7. to support the science curriculum

Figure 4-35 Motivators and Main Motivators - G and PG groups
Food-growing in schools

8. to support the food technology curriculum

9. personal interest of a member of staff

10. pupils’ request

11. to encourage pupils to exercise

12. to interest pupils in a career in horticulture

13. to subsidise school dinners with produce from the garden

14. opportunity to join a food-growing initiative

15. parents’ request

4.3.4.16.2 Barriers to school gardening

*This question was asked of all three groups – total 223

Based on your experience what are the main barriers to food growing in schools in Scotland and which one factor do you think is the main barrier?

Barriers (please tick all that apply)
Main barrier (please choose only ONE)

Lack of material support (e.g equipment, seeds)
Lack of personnel to coordinate activities
Lack of personnel to supervise activities
Lack of outdoor space
Lack of indoor space
Lack of support from senior leaders/managers
Lack of interest from staff
Lack of interest from pupils
lack of support from community/parents
Lack of time in the curriculum
Health and Safety concerns
Lack of staff knowledge and skills
Different priorities and interests in your school
Difficulty synchronising the curriculum with growing seasons in Scotland
Other
Figure 4-36 Barriers to school gardening - Combined results

The responses to this question were combined (i.e. main barriers and barriers) as there was consistency across the groups and for ease of interpretation and responses from all groups were then rank ordered with the following results (see Figure 4.36).

- Time in the curriculum
- Personnel to co-ordinate
- Personnel to supervise
- Growing seasons
- Materials
- Staff knowledge and skills
- Staff interest & different priorities
- Outdoor space
- Lack of pupil interest
- Lack of parental and community support
Food-growing in schools

- Lack of indoor space
- Lack of support from management
- Other

### 4.3.5 Section 4 Information about the respondents

All respondents were asked to provide information about their role in the school garden, their age and sex and their gardening experience. The answers to this series of questions are shown below, comparing the percentages of respondents in each group (Gardening, Past Gardening and Non-Gardening).

#### 4.3.5.1 Age

![Age - All respondents](image)

*Figure 4.37 Percentage of respondents by Age*

*Figure 4.37* shows that the percentage of respondents from the Gardening and Non-Gardening groups increased across the age range, whereas the Past-Gardening group shows a higher percentage from the 30–39-year age group.
4.3.5.2 Sex

There was a disproportionately high percentage of females in the Gardening group compared with males (see Figure 4.38), whereas the relative proportions in the Past-Gardening and Non-Gardening groups mirror the proportions of female to male teachers across Scotland obtained from: [https://www.gov.scot/publications/teacher-census-supplementary-statistics/](https://www.gov.scot/publications/teacher-census-supplementary-statistics/) (accessed 31/05/20)

<table>
<thead>
<tr>
<th>SEX - All groups</th>
<th>Male</th>
<th>Female</th>
<th>Prefer not to say</th>
<th>Not selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>G Group</td>
<td>14%</td>
<td>84%</td>
<td>1%</td>
<td>0%</td>
</tr>
<tr>
<td>PG Group</td>
<td>31%</td>
<td>69%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>NG Group</td>
<td>29%</td>
<td>71%</td>
<td>1%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Figure 4-38 Percentage of respondents by sex*

<table>
<thead>
<tr>
<th>Female/Male teachers in Sample schools vs Scottish schools</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scottish schools</td>
<td>77%</td>
<td>23%</td>
</tr>
<tr>
<td>G group</td>
<td>84%</td>
<td>14%</td>
</tr>
<tr>
<td>PG group</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
<td>NG group</td>
<td>71%</td>
<td>29%</td>
</tr>
</tbody>
</table>

*Table 4-10 Percentage of male and female teachers Sample schools vs Scottish schools*
4.3.5.3 Role in the school garden

Figure 4-39 Percentage of respondents by their role in the garden

Teachers were the largest contributors in all three groups, with headteachers providing the second largest input (see Figure 4.39).

4.3.5.4 Gardening experience

Figure 4-40 Percentage of respondents by their gardening experience.
A higher percentage of Gardening school respondents had life-long experience of gardening, than in the Past or Non-Gardening groups and only 7% of this group had no gardening experience. In the Past Gardening group, 23% had no gardening experience and the highest percentage (54%) had only gardened in adulthood, so their experience of gardening was limited as shown in Figure 4.40.

It was interesting to observe the number who were prepared to “learn on the job”. They were almost all teachers, of varying ages (see Table 3-10 below) and were all in the Gardening group.

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex and role in the garden</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-29</td>
<td>3 female teachers, 1 male teacher</td>
</tr>
<tr>
<td>30-39</td>
<td>6 Female teachers, 1 Female headteacher</td>
</tr>
<tr>
<td></td>
<td>1 Male teacher</td>
</tr>
<tr>
<td>40-49</td>
<td>9 Female teachers, 2 female headteachers, 2 male teachers</td>
</tr>
<tr>
<td>50-59</td>
<td>2 female teachers, 6 female headteachers, 1 male teacher</td>
</tr>
<tr>
<td></td>
<td>1 parent, 1 non-teaching school staff</td>
</tr>
</tbody>
</table>

*Table 4-11 Respondents "learning as part of the project"*
Summary of findings about the respondents

- **Age** – The Past Gardening group had a high proportion of younger respondents.
- **Gardening experience.** – A higher proportion of the Past Gardening group had no experience or had experience of gardening as an adult than in the Gardening group.

Section 5 - Analysis of Comments

4.3.5.5 Introduction

All respondents were invited to make comments at the end of the questionnaire. 96 respondents (43%) chose to do this and it was felt that that level of response required full investigation of the data provided. The full list of the comments is provided in Appendix 10 with information about the people who made comments in Appendix 11.

Analysis of the comments was carried out using NVivo (NVivo12, 2020) which enabled the analysis of unstructured text from interviews etc (in this case, free text comments) and provided an opportunity to seek and report on relationships in the data.

The NVivo software was used to analyse the Comments in three ways:

1. a word frequency analysis of all comments
2. examination of demographic and other data about the informants and their schools to look for salient features which might be relevant to the comments made
3. thematic analysis of the patterns observed in the Comments and combination of this with the demographic and other data used in 2.
4.3.5.6 Word frequency analysis
The first investigation was a word frequency query which is portrayed in the
diagram below (Figure 3-40). This demonstrated that “gardening”, “growing”,
“school” and “pupils” are all words which are central in the Comments as
would be expected and is confirmation that the appropriate concepts were
being explored.

![Word frequency analysis of all the comments on the questionnaire.](image)

4.3.5.7 Information about the informants and the schools
The 96 records which contained comments were then examined for
similarities and differences between the informants and for any common
factors shared by the schools from which the comments came.
4.3.5.7.1 About the Informants

The age, sex, role in the school garden and gardening experience of those who made comments were reviewed (see in Appendix 11)

- The comparisons confirm that those who made comments (n=96) did not differ from the group responding to the questionnaire as a whole (n=223)

4.3.5.7.2 About the Schools

The proportions of comments from Local Authority, Independent and Grant-aided schools and between Primary, Secondary and Special schools mirrors the proportions of these schools which completed the questionnaire. Likewise, the proportions of schools from urban and rural areas and ethnic minority groups and with pupils living in the 20% most deprived data zones in Scotland.

- The schools from which Comments were forthcoming were therefore not different from the total group of respondents (see Appendix 11).

4.3.5.8 Thematic Analysis

The primary reason for using NVivo was to analyse the unstructured text in a systematic way to elicit themes which were shared between respondents and which may have endorsed, extended or contradicted findings from the questionnaire. The process and outcomes are reported below.

NVivo process

The process followed was that the 96 comments were listed and were viewed independently by two assessors (Dr Siân Robson and myself), to elicit the dominant themes. Individual comments could contain statements relevant to several themes. These themes were then shared by email and a consensus coding meeting was held to clarify any differences and agree a final list. There was a high level of consistency after the first trawl and agreement was reached after a short discussion at the consensus coding meeting (March 2020).
4.3.5.9 List of themes and subthemes with examples

Using this inductive approach, six main themes emerged, and these are displayed below in order of the frequency with which they were mentioned, with the number of times each was mentioned in brackets.

The six themes were:

- **Successes** (68)
- **Difficulties** (47)
- **Learning outcomes** (28)
- **Help required** (10)
- **Ideas for the future** (9)
- **Eco-schools initiative** (6)

The themes and their subthemes are shown below. Quotes from some of the comments are given as examples and the role of the person making the comment is noted.

**Theme 1  Successes (68):**

*Figure 4-42 Theme 1 – Successes*
The features that the participants view as successes fell into six categories as illustrated in Figure 4.42. They are listed below in order of frequency with “developing facilities” in first place. As demonstrated in the examples quoted, an impressive range of facilities had been developed in some of the schools and those involved were keen to share information about what they had achieved and the methods used.

Secondly, the opportunities which were provided by the garden for “working with other agencies” were rated as successful.

The third and fourth categories mentioned were the “Pride” and “Enjoyment” that came with the garden. The descriptions of what had been achieved were impressive and were clearly of benefit in the schools quoted.

The next section of the successes category (“Securing Funding”) included some innovative fund-raising schemes.

The final section was “Mental Health” benefits which were mentioned in 3 of the comments.

**Developing facilities (17)**

- “There was also funding available at this time for polytunnels and gardening equipment. We were also able to access Awards for All funding to buy hot composting units to be able to make our own compost faster. We teamed up with our local garage to reuse the tyres as planters for potatoes”.  **Teacher**
- “We are planning to build a ‘Grow, Eat, Make, Sell’ initiative for S4 pupils who will have difficulty accessing a full curriculum next session, 2015-2016. We are building a raised bed area and will install a polytunnel. Pupils will spend 2 periods a week gardening/growing food supported by staff from SRUC, Elmwood Campus. They will spend a further 2 periods a week cooking with produce that they have grown. They will spend a further period a week doing Employability studies.”  **Teacher**
Working with others (16)

- “The best year we had was when Vogrie Park gardeners gave us a large number of veg in pots ready to be transplanted”. Teacher
- “We are lucky enough to have worked with Mairi Coxon from RHS”. Teacher

Pride (13)

- “The school was established in 1962 and horticultural and environmental activities are at the heart of the work of the school. Please feel free to come for a visit and experience a model garden!” Teacher
- “We started off on a small scale with a small Garden Club of around 8 children. We had several small raised beds and 2 parent helpers. Initially we wanted to identify if the children would be interested in food growing. That was 5 years ago. We now have 6 parent/grandparent helpers, 10 raised beds, and a new Greenhouse. We are growing food for the School canteen to use the number of Garden Club members continue to grow each year with our present membership being around 25 very enthusiastic children. School gardening provides an interesting and fun learning experience for kids and our School is actively promoting this.” Parent/Grandparent helper.

Enjoyment (12)

- “Those of us involved really enjoy the activities. It’s hard work and generally undervalued. After all, without food what do we have?” Teacher
- “Our children enjoy getting out and growing their own food and then eating/cooking it.” Teacher
Securing funding (7)

- “We were also able to access Awards for All funding to buy hot composting units to be able to make our own compost faster.”  
  Teacher
- “We have signed up for free tools from Saughton Prison's tool recycling project. A lack of suitable tools and equipment was initially a main deterrent. We have also managed to get lots of freebies from our local recycling centre. Internet searches have yielded free seeds from Kew gardens and a number of other resources.”  
  Teacher

Mental health benefits (3)

“I believe that working in the garden is a very therapeutic activity for the children and one that should be offered in all schools.”  
Teacher

Theme 2  Difficulties (47):

![Diagram](image.png)

*Figure 4-43 Theme 2 - Difficulties*
Theme 2 comprises the things that were reported as difficulties (see Figure 4.43). The most frequently mentioned of these was Garden Maintenance which related mainly to the problems of having someone to tend the garden during the 6 week school summer break. The second difficulty was the term dates, with schools breaking up at the end of June when many crops are not ready for harvesting. Also, the timetable for many secondary schools changes in May and the garden needs to be prepared for new pupils at the time when most gardeners would be planting crops. Thirdly, lack of funding was an issue, particularly for small schools in rural areas with a small population. Shortage of time and staff were also mentioned and staff mentioned finding ways to counteract this without having to give up their lunch breaks. Vandalism was a difficulty for some and again some innovative approaches had been tried to counteract this – such as leaving the greenhouse unlocked, but without success. The late growing season, particularly in Northern Scotland where planting cannot start until May was listed as a difficulty as there is not sufficient time for the children to benefit and sample what they have grown before the term finishes at the end of June. Lack of support from management within the local authority was reported as a difficulty as well as lack of horticultural knowledge in the staff.

Garden maintenance (9)

- “Maintaining the garden over the summer break is a big difficulty. If we have a warm summer there is no one available to water plants and food crops we have planted and most things need the summer to grow as we often can’t plant veg etc until May because of late frosts etc”. Teacher
- “It is with regret that we have decided to withdraw significantly from our commitment to our Edible Garden due to difficulties in maintaining it.” Teacher
Term dates (8)

- “We often leave it too late when planning for a crop that can be harvested before the summer holidays.”  
  Teacher

- “Another problem is the change of timetable in June since it comes just when we should be in the middle of planting, but we have to be starting preparing the allotments.”  
  Teacher

Lack of funding (7)

- “We are a very small rural school with land to grow things. It is the funding to continue this activity that is the most difficult to achieve.”  
  Non-teaching school staff

Lack of time (6)

- “I have to be creative in lessons to allow time to actually do the gardening, or it is always in lunchtimes.”  
  Teacher

Staffing (5)

- “Need trainers to come to us as we can not allow staff to go out for training with so little supply cover available.”  
  Teacher

Vandalism (4)

- “Our biggest hurdle is vandalism - we have even tried to make the youth welcome - leave the greenhouse unlocked and a bin for the empties etc but they still vandalise.”  
  Teacher

Growing seasons (3)

- “most things need the summer to grow as we often can't plant veg etc until May because of late frosts etc.”  
  Teacher

Lack of management support (3)

- “lack of support from local authority is a big issue, there are so many boxes to tick before you can put a seed in the ground and this has been very challenging when we have been trying to establish our
Food-growing in schools

garden with our ASD and nurture pupils for whom the garden offers an alternative curriculum, social and emotional and life skills.” Teacher

Lack of horticultural knowledge (2)

- “If any future initiatives were to be extended to schools then a fund where extra staff (teaching or non-teaching), who have gardening knowledge, could be bought in rather than a half hearted job done by staff who are not gardening enthusiasts”. Teacher

Theme 3 Learning outcomes (28):

The learning outcomes mentioned are listed in Figure 4.44 with comments about the range of academic skills that can be taught using the garden as well as the life skills that can be developed.

It was also recognised that the garden can help to teach children about the environment and about sustainability.

Some schools used the garden with pupils who need learning support and others mentioned the value of the garden in opportunities to learn social skills and some provided gardening as part of their outdoor learning syllabus.
Curriculum-based learning (8)

- “It also teaches many other skills - numeracy, literacy and helps with social skills.” Teacher

Life skills (5)

- “I strongly believe that involving children in planting, growing, cooking and selling produce has given some of our pupils real purpose and enabled them to develop real life skills.” Teacher

Environment and sustainability (5)

- “Having a garden for the young people to learn about the environment, food and exercise, and also to use as a for of relaxation tool has greatly helped them with their self-esteem, confidence as they feel part of something.” Non-teaching school staff

Learning support (4)

- “Gardening is a lifeskill which we teach as part of our Learning Support curriculum.” Teacher

Social skills (4)

- “It is a good social experience and is very compatible with Curriculum for Excellence.” Teacher

Outdoor learning (2)

- “all pupils experience gardening as part of our outdoor learning.” Teacher
Theme 4 Help required (10):

![Pie chart showing Help required, General advice, Horticultural advice]

Figure 4-45 Theme 4 Help required

Theme 4 listed just two items (see Figure 4.45) with pleas for horticultural advice about what to plant and how to manage the conflict between growing season and school terms and more general types of advice relating to convincing management of the value of the school garden.

Horticultural advice and knowledge (6)

- “We often leave it too late when planning for a crop that can be harvested before the summer holidays so some advice on the best plants and methods would be great.” Teacher

General help and advice (4)

- “Any support that can be provided to promote the value of school gardening in the curriculum to our school management team will be very gratefully received!” Teacher
Theme 5  Ideas for the future (9):
The fifth theme (Figure 4.45) related to suggestions that the respondents made about the future, to counteract some of the difficulties they experienced and these merit further attention. They included ways to work with other agencies on developing school gardens and the importance of ensuring the inclusion of a ‘garden lead’ who could be the major driver of the project.

Figure 4-46 Theme 5 - Ideas for the Future

Links with other organisations (5)
• “Another idea is that local authority gardeners could be trained to oversee the gardening part while teachers simply deliver the curriculum guiding the gardeners and the children through the curriculum.” Teacher

Someone to lead on gardening projects (4)
• “People to help/drive forward are the barriers.” Teacher

Theme 6  Eco Schools initiative (6)
• “The eco garden has been a real benefit to the school.” Teacher
The Eco Schools project was specifically mentioned, always in glowing terms, on 6 occasions. Development of the links between school gardens and Eco School projects may be one way to progress school gardening in the future.

4.3.5.10 Combining themes, demographic data and information about the respondents.

The NVivo platform allows the assimilation of demographic and other information with the Comments after coding, so the data was scrutinised (using a process of matrix coding) to reveal links between themes and demographic factors and to follow specific lines of enquiry. For example, it was possible to determine the number of respondents with different gardening experience who requested horticultural help and advice, or how many schools which reported difficulties with vandalism were in urban or rural areas.

Using this procedure different combinations of the data were examined and a selection of the relevant findings is shown below.

- Experienced gardeners made more Comments and, in particular, they commented on the enjoyment they got from growing food and the pride they, and their pupils, experienced as a result. (see Table 4.12 below).
- Cross-matching ‘Successes’ and ‘Gardening experience’ (see Table 4-11 below) revealed that pride, enjoyment and appreciation of working with others were mentioned by all groups, from those with no gardening experience to those who had been gardening for many years.
- Those ‘learning on the job’ showed enthusiasm about developing a school garden and this is a group to target with training and advice in order to sustain their interest and increase their expertise.
Although the numbers were small, those with limited gardening experience (‘as an adult’ and ‘I’m learning as part of the project’) mentioned needing horticultural advice and support more frequently than those with no experience and those with a lot of experience.

<table>
<thead>
<tr>
<th>Successes</th>
<th>None</th>
<th>Since childhood</th>
<th>As an adult</th>
<th>I’m learning as part of the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing facilities</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Mental health benefits</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pride</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Securing funding</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Working with others</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 4-12 Successes noted by respondents with different levels of gardening experience

Vandalism was compared across: urban/rural classification; school type; school size; proportion of pupils from ethnic minorities; proportion of pupils from 20% most deprived data zones in Scotland.

Only four schools made comments about vandalism and, of these, two were from large urban areas, one from an accessible rural area (An area with a population of less than 3,000 people, and within a drive time of 30 minutes to a Settlement of 10,000 or more), and one from an accessible small town (A settlement of 3,000 to 9,999 people, and within a 30 minute drive time of a Settlement of 10,000 or more) see the full list of definitions at: https://www2.gov.scot/Topics/Statistics/About/Methodology/UrbanRuralClassification. All were Primary schools, of varying size from 34 pupils to 536 pupils, so there was no clear pattern. Similarly, the ethnic minority and social deprivation data did not indicate any shared pattern when matched with Vandalism, but the numbers were very small.
4.3.6 Summary of the Comments section

Overall, the examination of the Comments added useful qualitative information to the results obtained from the questionnaire.

The findings from the thematic analysis corroborated those of the questionnaire as the comments made by respondents addressed many of the same issues as the questionnaire such as staffing problems, lack of time in the school day, lack of gardening experience in staff and practical issues linked to garden maintenance.

However, the additional information gained from the open-ended ‘Comments’ question created a fuller picture of what those completing the questionnaire think about food-growing in schools and allowed them to draw attention to areas which were not addressed in the survey, such as their feelings of ‘pride’ and ‘enjoyment’ gained from the school gardens. They used this as an opportunity to express feelings about what the garden meant to them and to their pupils. The comments showed that gardening was a useful tool to create a sense of personal and community achievement.

Informants also gave examples of specific things that they had done, or that they found to be a challenge which were not otherwise covered by the questionnaire. For example,

“We enjoy growing our produce from seed and using it to create soup, stews etc. We planted an orchard with help from the Cairngorms National Park last year and look forward to a fruit harvest in years to come”.

“We often leave it too late when planning for a crop that can be harvested before the summer holidays so some advice on the best plants would be great”

These responses could potentially guide support for schools to work together to assist learning or prevent other schools from making the same mistakes.
4.4 Section 5 Comparison with English schools

4.4.1 Introduction
As outlined in the Methodology section, questions about the motivating factors for and barriers to school gardening were modelled on the questions in a survey of the impact of school gardening on learning carried out in schools in England by National Foundation for Educational Research (NFER) on behalf of Defra (the Department of Education, Food and Rural Affairs and Garden Organic (Nelson et al, 2011) in order that comparison could be made and to establish whether the same elements were seen as motivating factors in Scotland as in England and to identify any particular barriers which apply in Scotland.

The following questions about gardening were added to the Motivators section of the study questionnaire, introducing the concept of learning about gardening as a goal in itself.

- “To learn about gardening”
- “To prepare for a career in horticulture”

Also added to the study questionnaire was a question about who had responsibility for the school garden as the need for a key member of staff to lead on the work in the garden was found to be important in studies by Passy, Morris and Reed 2010, and Nelson et al, 2011).

As in the Nelson study, the respondents were invited to select as many Motivators as appropriate, but to restrict themselves to one Main Motivator to try to ascertain what was the most significant factor in deciding to have a school garden.
### 4.4.2 Comparison with English schools - Motivators

Fifteen possible motivators were listed as options in the present study and 14 options were given in the NFER study. The top five Main Motivators for the two studies are shown below. Although there were ten other options available, there was a high level of consistency in that both studies chose the same five items with only a slight difference in order.

**Main motivators**

<table>
<thead>
<tr>
<th>Main motivator</th>
<th>Present study</th>
<th>NFER study</th>
</tr>
</thead>
<tbody>
<tr>
<td>To support the delivery of an outdoor curriculum</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>To teach about where food comes from</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>To teach about the environment</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>To teach about gardening</td>
<td>4</td>
<td>*</td>
</tr>
<tr>
<td>To develop skills for a healthy adult life</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Personal interest of a member of staff</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

*option not available

*Table 4.13 Comparison of Rankings of the Main motivator – present study and the NFER study*

Although four of the five most frequently reported Main Motivators appeared in both studies, there were differences of emphasis. The Scottish group selected the support given by gardening in the delivery of the outdoor curriculum as the first choice with teaching about the source of food, which was the first choice in the English study, ranking second (*Table 4.13*).

**Motivators**

<table>
<thead>
<tr>
<th>Motivator</th>
<th>Present study</th>
<th>NFER study</th>
</tr>
</thead>
<tbody>
<tr>
<td>To teach about gardening</td>
<td>1</td>
<td>*</td>
</tr>
</tbody>
</table>
Table 4-14 Rankings of the motivators in this study and the NFER study.

The rankings of the Motivators in the two studies were also similar with only slight differences in order between the two groups. To teach about Gardening was not available in the English study but received the top rank in the present study (Table 4.14).

4.4.3 Comparison with English schools - Barriers

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Present study</th>
<th>NFER study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of time in the curriculum</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lack of personnel to co-ordinate the activities</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lack of personnel to supervise the activities</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Difficulty synchronising the curriculum with food growing seasons</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Lack of material resources</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4-15 Rankings of the Barriers in this study and the NFER study.

The barriers reported for both studies were very similar (Table 4.15). The only difference between the two studies was that the problem of synchronising the growing seasons with the school curriculum was ranked more highly in the Scottish than in the English study.
Chapter 5  Discussion

This Chapter presents key findings which provide a basis for answering the research questions and for contextualising this study in relation to previous research detailed in the literature review.

Previous studies have defined features that make for effective school gardens and have described interventions which increase children’s consumption of healthy food, but school gardens in Scotland have not been examined to see if they to provide these elements or, if indeed, there are additional factors that apply in Scotland. This study sought to address that gap.

5.1 Key Findings

1. Overall the number of responses was small in relation to the target population (223 questionnaires returned from 2580 sent out – 9%) and particularly from the Past Gardening (13) and Non-Gardening (7) groups.

2. Most of the Gardening schools were Primary schools.

3. Fewer (6%) of Gardening schools were in more deprived areas compared with 68% in less deprived areas.

4. Responsibility for school gardens was taken mainly by teachers.

5. Factors which have been described as supporting successful school gardening were all higher in the Gardening group
   - there was support from managers
   - the length of time the school had been gardening was greater
   - a high proportion of pupils and staff were involved in the garden
   - the garden was used in teaching across the curriculum
   - support for the garden (from parents and the local community) was available and used

6. The Gardening group had a high proportion of teachers with long-term gardening experience.
7. Respondents from schools with gardens described the “pride” and “enjoyment” that they and their pupils got from the garden.

8. Motivating factors included teaching about food and its sources, and teaching about the environment.

9. Barriers included the short growing season in Scotland, and difficulty working around school timetabling.

10. Schools which had stopped gardening cite funding and lack of interest from staff as the main reasons for stopping.

5.2 Discussion

Approximately 30% of Scottish children aged 2-15 years are at risk of obesity or overweight and only 15% eat the recommended 5 portions of fruit or vegetables per day. This is considered to be the result of a diet with a high proportion of ultra-processed foods which are high in fats, sugar and salt and low in the vitamins and nutrients are required for healthy development and that are available in fruit and vegetables. There is a link between unhealthy eating and dietary intake poor academic achievement (Burrows et al, 2017) and with long-term health problems such as diabetes, coronary disease and cancer. Research shows that food-growing in schools can increase children’s knowledge about food and encourage healthy eating (Morris, Briggs and Zidenberg-Cherr, 2011) and can increase the consumption of fruit and vegetables (Berezowitz et al, 2015; de Sa and Lock, 2008; Huys et al 2019). We also know that children are more likely to eat food that they have grown themselves (Barratt Hacking et al, 2011, Passy, Morris and Reed, 2010).

Previous research into school gardens indicates that the factors that contribute to success are:

- positive school leadership which supports and resources the gardening project and builds it into the whole school ethos (Nelson et al, 2011)
Food-growing in schools

- staff with practical growing skills and opportunities for them to develop skills in other areas such as cooking, project management and organisation (Nelson et al, 2011)
- resources for developing and maintaining the garden – both human and material (Orme et al, 2011)

With these issues in mind the results were scrutinised to discover how successful school gardening is in Scotland and to investigate whether the characteristics which have been found to be required for successful school gardens are present.

5.2.1 Discussion of the research questions

This chapter will use the findings of the questionnaire to address the research questions defined in 2.6, followed by discussion of how these responses can contribute to the wider problems in society such as dietary behaviour in children, obesity, and healthy child development.

5.2.1.1 Question 1:

How does the number of schools with gardens in Scotland compare with the number without gardens and the number which have had gardens but no longer do so?

Although the number of schools which participated in the survey was small, (only 9% of the total schools in Scotland), which does not enable the main question to be answered with certainty, the results obtained provide valuable information about the present situation and some guidance for the future.

The limited number of responses from Past Gardening and Non-Gardening schools was disappointing as it was hoped that these groups would help to identify key processes for increasing the number of gardens by elucidating reasons for not having, or for giving up, school gardens.

Chapter 5 Discussion
There are several possible reasons for the low response rate. Firstly, this was a questionnaire from outside the Education system and so there was no indication that the time and effort spent completing it would have any effect for the school in the future. It is likely that this had particular impact on schools which do not have gardens, or which have given up gardening as, faced with a questionnaire that they may not consider to be very relevant, in a busy schedule, at a busy time of year would choose not to complete it.

However, the responses that were received indicated enthusiasm and appreciation of what gardening can offer to schools, and respondents from all groups made useful comments and suggestions for future developments. The Gardening schools are clearly committed to the principle of school gardening and learning from their knowledge and experience can only be helpful for the future.

The next question tackled was:

5.2.1.2 Question 2:

*What are the characteristics of schools which have gardens, do not have gardens, or have had gardens in the past?*

The features of schools in each category are reviewed in the Results in Chapter 4 and the main findings confirm the following:

5.2.1.2.1 Type of school

Gardening was more prevalent in primary schools (45%, n=146) than in secondary schools (23%, n=57) where the constraints of the curriculum may be an inhibiting factor, although the reason for the difference was not fully apparent from the responses received.

Also, there was a high percentage of secondary schools in the Past Gardening (62%) and the Non-Gardening (57%) groups which may indicate that some secondary schools tried gardening, perhaps in an attempt to involve pupils who are otherwise difficult to engage, but found it difficult to
sustain. On the other hand, this may indicate a lack of interest in food-growing in these schools, although the responses received from this group to a question about their future plans in relation to gardening, demonstrated a wish or intention to develop a garden.

5.2.1.2.2 Demographic data
From the demographic data collected about the schools, it was clear that the location of the school - whether it was in an urban or a rural area did not have a substantial effect on whether the school had a garden as the Gardening schools were dispersed across all the urban/rural categories. However, a majority of the Past Gardening and Non-Gardening groups were from urban areas. The reasons for this should be examined in future work. It also deviated from the findings reported in the survey of food-growing in 4479 institutions (schools and early years settings) in England by Nelson et al. (2011) that:

"institutions in urban areas are more likely to grow food than those in rural areas" (Nelson et al, 2011, p5)

This should also be explored in future studies to see if it is an anomaly arising from the small numbers in the Past Gardening group or if it is a significant difference.

The results also demonstrated a smaller percentage of pupils from ethnic minorities in the schools in the Gardening and Past Gardening schools than in the Non-Gardening group, although the schools in the Gardening group reflected a similar range of percentages of ethnic minority pupils to that found in Scottish schools as a whole. In other studies information relating to the proportion of pupils from ethnic minority groups is not reported, and the very small numbers in the Non-Gardening group may make this finding inaccurate, but further investigation is merited.

The proportion of schools with gardens which had a low percentage of pupils from socially deprived areas (i.e. schools with less than 50% of pupils from the 20% most deprived data zones in Scotland), was 6% which was smaller
than would be expected from the figures of the proportions in this category from across all Scottish schools (12%), indicating that schools with gardens were more common in more affluent areas. This was an important finding which has implications for the development of school gardens in the future as social deprivation is linked to poor diet and obesity (Goisis, Sacker and Kelly, 2015., Shrewsbury and Wardle, 2008) and it suggests that special efforts will be necessary to effectively engage and support schools in the areas with high levels of deprivation to develop gardens.

- Apart from the social deprivation measure, the data for the study schools demonstrated a close alignment with the figures for Scottish schools as a whole which encouraged inferences to be drawn, with some caution, across the board.

5.2.1.3 Question 3:

What are the characteristics of effective school gardens in Scotland?

The Report for the Food Growing in Schools Taskforce (2011) used a literature review to define the school garden environment which achieves optimal benefits. These include that gardening needs to be:

- incorporated into the school ethos, (i.e. involving a large proportion of the school population)
- have support from management and from parents and the local community
- have one person with main responsibility for the garden
- be used in many ways in the school

The findings of this study can be seen to reinforce the four factors above in that the Gardening group of schools had been gardening for longer; were more likely to have the support of managers; involved a higher proportion of pupils and staff; used the garden as part of academic work as well as an extra-curricular activity; had the garden integrated into the school’s policy and used support from families, local businesses and other sources.
The integration of the garden into the school’s day-to-day operations by using the garden in different types of academic work and, for some, in cooking, and was also mentioned in the Comments made by respondents, where many also listed achievements in collaborating with local organisations to develop and sustain their gardens as a major benefit. The Comments also drew attention to the importance of management support and the need for a designated person to take responsibility for the garden. All of these are consistent with what is recommended for successful school gardens and provided reassurance that the schools that are currently growing food are doing so in ways that are most likely to be effective. Problems arising from the short growing season in Scotland were presented in the responses to the questionnaire and in the Comments. A means of enhancing the chances of success in school gardens in Scotland was mentioned several times in the Comments section and that was to provide schools with a polytunnel. This was a very practical suggestion based on the evidence of the schools’ experience and not one that is reported in other studies. Choice of vegetables and sowing seeds early and using “starter plants” were also found to help.

5.2.1.4 Question 4:

What are the characteristics of school gardens which successfully integrate a theory of behaviour change with features of effective school gardening?

Social Cognitive Theory suggests that criteria for successful dietary change include exposure, taste, self-efficacy, and modelling.

Providing opportunities for children to experience growing and tasting a wide range of fruit and vegetables is an important way to create behaviour change and is inherent in school gardening. They are exposed to new tastes and textures and through this they build self-efficacy in their ability to eat and enjoy new foods. Combining this experience with modelling the actions of others in trying different foods – peers (real and virtual, as in television advertising and social media) and teachers (or other trusted adults) all increase the likelihood of behaviour change as suggested by Bandura.
Schools are therefore meeting the criteria that support dietary change although no attempt to assess dietary change was made in this study.

5.2.1.5 Question 5:

*What factors do school gardeners consider to be motivating factors for school gardening?*

The Scottish schools with gardens considered “to teach where food comes from” as the main factor in the decision to have a school garden, with “to teach about the environment” and “to teach about gardening” equal in second place.

Teaching about food and its provenance, production and preparation at an early stage is an important element in educating children about healthy eating and the health benefits it brings. This is recognised in the Scottish Government’s document “Becoming a Good Food Nation” published in 2018 (Scottish Government, 2018a) which includes a section on Food and Drink Education and which promises substantial funding for projects aimed at raising awareness about where food comes from and teaching about food in the curriculum. This is encouraging for the future development of school gardens and schools may be able to build on the findings of this study to support the case for such development.

“Teaching about gardening” was rated highly by the respondents in the Gardening group. This was an encouraging, but unexpected finding, but it may be due to response bias. The decision by staff to complete the questionnaire may have been determined by their own interest and enthusiasm for gardening and, if this is the case, it is unlikely to reflect the true picture across the board. However, it implies that the value of gardening as a skill is appreciated and confirms the findings from the study of adults which indicated that gardening in childhood had a long-term influence on their behaviour and their decision to grow food in adulthood.
Food-growing in schools

5.2.1.6 Question 6:
What factors do school gardeners consider to be barriers to school gardening?

The Barriers to food growing in Scotland were ranked as “time in the curriculum” in first place with “personnel to co-ordinate” and “personnel to supervise the activities” then “growing seasons” and “materials”.

These are all areas of difficulty which are reported in other studies of school gardening (Nelson et al, 2011, Orme et al, 2011) and are perceived as part of the need for strong management support and a “whole school” approach to gardening with use of the garden across the curriculum, to all age groups and with as many teachers involved as possible. Volunteers from the local community and engagement of parents are also means to tackle the staffing pressures and are used to great effect by many schools and this was true for the study group.

5.2.1.7 Question 7:
Are there specific factors relevant to the development of school gardens in Scotland compared to England?

This question was included to identify factors which disproportionately affect food-growing in schools in Scotland.

The length of the growing season was rated more highly as a Barrier in Scotland than in England. There is an earlier start to the growing season in England (at least 3 weeks, (and much more if comparing the south of England and the north of Scotland) and the summer term in Scotland finishes at the end of June compared with the end of July in England, further reducing the available growing time. As well as that, there are problems due to the structure of the school year in some Scottish schools as illustrated by the following quote from a teacher in the Comments section of the questionnaire:

“….the way the school calendar is structured means all the busy gardening times the pupils are not in school. Summer holidays everything goes wild and its hard work to get on top of weeding, the timetable is suspended for exams all through May so I don't see my
Food-growing in schools

To counteract these problems, local knowledge of what grows best in the soil and climate conditions in different areas would be beneficial to schools and is a further argument for canvassing support for the school garden from local gardeners. For those using the RHS Campaign for School Gardening the materials provided require some adaptation for use in Scottish schools.

As well as considering the contribution of this study to the questions above, other issues were addressed as shown below.

5.2.1.8 Reasons for giving up gardening
The question to the Past Gardening group about the reasons for giving up gardening revealed that “lack of time in the curriculum” and “lack of interest from staff” were the main reasons. This supported the premise that having a lead person who is responsible for the garden and can drive forward the project and support the other staff who are involved is essential to success. The importance of this lead person having “protected time” for professional development training and for planning and preparing lessons is emphasised by Nelson et al 2011.

The Past Gardening group reported that the changes that would encourage them to restart are “funding”, and “training for staff”, which again highlighted the importance of training for the future development of gardening in schools and is an area where the Scottish Government’s promise of funding for Food and Drink Education in “Becoming a Good Food Nation” (Scottish Government, 2018a) may come into play.

5.2.1.9 Increasing consumption of fruit and vegetables:
Studies designed to increase children’s consumption of fruit and vegetables have shown that the most effective interventions include:
Food-growing in schools

- involving teachers (or other trusted adults or older peers) acting as role-models and being directly involved in delivering the intervention (Lambrinou, 2020)
- school policies which support the initiative by ensuring that healthy food is available in the school and that unhealthy snacks are discouraged (Passy, Morris and Reed, 2010)
- involving parents and families by providing information about healthy eating that they can use at home (Nelson et al, 2011)

Also, having an experiential element to the intervention increases the effectiveness of the intervention and children are more likely to eat fruit and vegetables if they have been involved in growing them (Morris and Zidenberg-Cherr, 2002; Morgan et al, 2010).

Increasing children’s consumption of fruit and vegetables is not, in itself, a target for the education system, but there is increasing acknowledgement of the value in teaching children about the sources of food and the importance of healthy eating and many school gardens are set up with dietary change as a goal. The results of this study indicate that the Gardening schools in Scotland meet these criteria and are therefore in a position to use the gardens as a basis for changing school children’s eating habits – at least in the school environment.

Although school gardening can support behaviour change at the microenvironmental level (individual, family and school) it needs to be supported by changes at the macro-environmental level (regional and national). This is particularly true for children in deprived areas. The awareness of the need for change is evident in the publication of the National Food Strategy (Dimbleby, 2021), which strongly recommends measures to ensure that “our most disadvantaged children do not get left behind”.

Eating well in childhood is the very foundation stone of equality of opportunity. It is essential for both physical and mental growth. A poorly nourished child will struggle to concentrate at school. An obese child is extremely likely to become an obese adult, with the lifetime of
Such major change requires new thinking and changes at the macro-level, including political action. Research is on-going by nutritionists, microbiologists and others to demonstrate the impact of ultra-processed foods on health and particularly on obesity, but this will take considerable time to have an effect. In the meantime, any efforts to improve the diets of children by increasing their consumption of nutrient-dense foods such as fruit and vegetables should be encouraged.

Some examples of the changes required include

- change to the physical environment near schools so that unhealthy foods are more difficult to obtain
- considering the pricing of healthy versus unhealthy food
- consideration of family financial circumstances with support for those who cannot provide healthy food for their children
- mass media and advertising designed to promote unhealthy foods

All of these issues shape our food environment, as well as changes to the food eaten by children at school and the experience that they can gain there of growing and eating, healthy food. The findings of this study show that school gardens are valued for the opportunity to introduce children to healthy food but that there needs to be more focus on areas of social deprivation and on training and support for staff to really maximise the benefits of the garden.

5.3 Limitations

The major limitation of the value of this study is the small number of responses to the main questionnaire. This made analysis of the data problematic although the consistency of the findings with the results of other
studies suggests that the information provided by the Gardening group is credible.

It was particularly hoped that the study would provide useful guidance about the reasons for not having, or for stopping gardening, but the very small numbers in the Past Gardening and Non-Gardening groups means that the results from these groups may not be representative of such schools across Scotland.

Although a main focus of the study was to explore school gardening as a means to increasing the consumption of fruit and vegetables in children, the study did not attempt to tackle the assessment of dietary change at this stage. There are many issues associated with the measurement of diet, including establishing reliable data collection and measurable outcomes which are outlined in the literature review and it was considered that establishing that the gardens which are developing are doing so in a manner likely to achieve the desired outcomes was a first step and that the assessment of changes in consumption of healthy food could follow.
Chapter 6 Conclusions and Recommendations

This chapter explains how the research findings detailed in Chapter 4 and discussed in Chapter 5 meet the objectives of the thesis and answer the research questions posed in 2.6 and suggests areas for future work.

6.1 Conclusions

6.1.1 Setting the scene

There has been an observable increase in overweight and obesity in the population over the past 20 years and the proliferation of fast-food outlets; easy availability of unhealthy snacks and 'ready meals' with high levels of sugar and salt; and extensive advertising of sugary drinks are apparent in the street and in the media (Lang, 2020). An initial examination of the popular literature provided some evidence of the extent of the problem and of the lack of knowledge about healthy eating and directed thinking towards ways to improve dietary intake, especially in children.

Gardening provides ready access to fruit and vegetables as well as time in the outdoors and moderate exercise (and enjoyment) and, as a gardener of long-standing, the realisation that this could provide children with nutritional, educational and health benefits in the short, medium and long-term was very appealing and, potentially, important for their future development. Access to gardening staff at Royal Botanic Gardens Edinburgh to discuss the issues and discovering the RHS Campaign for School Gardening confirmed that the value of edible gardening in schools was realised, but there was little information about what was happening in Scotland.

A literature review led to better understanding of the association of diet with health and the impact of these, particularly obesity, on child development.

The review drew on research from many areas:
• the impact of nutrition on child development, in particular the effect of poor diet on the brain (Benton, 2008), especially in the early years, and on academic achievement in later years (Burrows et al, 2017)
• the prevalence of ultra-processed foods which lack the vitamins and micro-nutrients needed for health (Pacheco and Carolina, 2020)
• the factors which influence dietary intake and which are not under the control of the child and the family (economic, political and cultural factors) but which can make a healthy diet difficult to achieve (Griffith, O’Connell and Smith, 2013)
• theories of child development highlighting the importance of cultural elements in child development (Bronfenbrenner, 1986)
• the importance of establishing good dietary habits in the early years as these tend to endure through to adulthood (Mikkilä, et al, 2005)
• theories of behaviour change which can be applied to diet (Social Cognitive Theory, Bandura 1986)
• the use of interventions based on Social Cognitive Theory to maximise the learning potential of gardens - exposure to fruit and vegetables, modelling the behaviour of teachers and peers involved in the garden, Venter and Harris, 2009)
• research into school gardens – their establishment, how they can be used, the benefits to pupils, school and families
• the use of gardening as a means to make healthy food more available and for other benefits such as exercise and time in the natural environment (de Bell, 2020)
• factors that are shared by successful school gardens

Understanding more about the problem and considering how to support the development of school gardens, as a means of counteracting the problem of poor diet, was the underlying motivation for the project and the planning process then followed the outline in Figure 6.1 below.

6.1.2 Planning
6.1.3 School gardens - the wider context

The literature review demonstrated the extent of the problems associated with eating unhealthy food, the impact on child development and the health effects that extend into adulthood. It reinforced the importance of a sufficient and healthy diet for children’s developing bodies and brains and highlighted the fact that this is not always available to children in our society.

In devising the study, it was important to understand how school gardens could usefully contribute to what is a complex issue, so setting the context for school gardens was the next step.

The ANGELO system (Swinburn, 1999) provided a framework to conceptualise the cultural contexts in which children exist – at the micro-level of the family and school, at the macro-level of the community and the country and the ways in which physical, financial, political and cultural factors at each level can influence what a child eats. This was relevant to understanding how growing food at school can be beneficial.
Seeing school gardens in this context was vital for recognising that changing dietary habits requires interventions at many levels and that focussing on ‘getting it right’ at the level of the school garden (micro-level) is an important foundation. This study contributes by providing a snapshot of edible gardening in Scottish schools, where they are, how they are used and the ways in which they show the features required for school gardens to be successful (Passy, 2010, Nelson et al 2011).

6.1.4 The study

The absence of existing information about school gardens in Scotland led to the plan to survey all schools, with the objective of classifying them into three groups – schools with gardens, schools without gardens and schools which had gardens in the past, but no longer do so and making comparisons across the groups.

The aim was to collate detailed information about the schools and the gardens and, using criteria based on previous studies, to see if the way in which they were functioning was likely to be successful and would ultimately increase the consumption of healthy food.

The results, which are presented in Chapter 4 and discussed in Chapter 5, showed that, although the numbers were not high, there were active and successful gardens in Scottish schools and that they had in place the features required for school gardens to be successful:

- the garden was incorporated into the school ethos, (i.e. involving a large proportion of the school population)
- the garden had support from management and from parents and the local community
- there was one person with main responsibility for the garden
- the gardens was used in many ways in the school (Passy, 2010, Nelson et al, 2011)
The main research question – comparing the number of schools in each category was difficult to address because of the small numbers in the Past Gardening and Non-Gardening groups, but the study provided substantial information about the schools that did respond and the gardens they had developed which can inform future planning for school gardens in Scotland.

The schools in the Gardening group were mostly in areas where levels of deprivation are low, and most were organised by mature teachers who were experienced gardeners and who were enthusiastic about the garden and keen to pass on their knowledge and skills to the pupils. There were also younger teachers who wanted to learn and who recognised the need for further training and support to help them establish and maintain the school garden.

The relatively low number of gardens in areas of high deprivation where need is high was disappointing, but the information that that is the case contributes to the evidence for increased efforts to be made in these areas, and for additional support to be made available to ensure that this situation is changed.

Many of the schools were not using training which is available and, while many had developed innovative support networks and links with colleges and local volunteers, there were also existing sources of support which were not being used. Increasing awareness of what is available through the RHS Campaign for School Gardening with its teaching aids (although some of these need to be revised for use in Scotland), and through other groups such as RBGE and Dundee Botanic Gardens, would be a ‘quick fix’ for some and could be undertaken through the schools social media connections.

Some schools reported that they lack the necessary support from management to develop gardens and to allow time for staff training and maintaining the garden. Links with schools which have successfully established gardens and from training organisations which are prepared to work with schools, would help to counteract this resistance and build
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confidence. Evidence that a garden contributes to academic learning, benefits children’s health and well-being from being outdoors and can change dietary habits, adds further weight to the argument. Many of the gardens in the study were doing all of these things.

Several barriers to school gardening were raised by respondents, but these were not insurmountable. The problems of the short growing season could be tackled with more knowledge of the local area and what vegetables are suitable for that region. Seeds can be sown in autumn for use in spring so that they have a head-start and the same applies to the difficulties with term dates – if the garden is in use all year round then pupils will not miss out on experience of sowing or planting out, or any other task. Establishing links in the local community may make it possible to find volunteers for watering and weeding during the summer holiday. The incorporation of a polytunnel in a school garden was suggested by several respondents and would not only be an advantage with growing, but would enable the garden to be used at all times of year, whatever the weather.

Time in the curriculum was mentioned by some schools as a problem whereas others said that the garden was useful in all areas of the Curriculum for Excellence. This suggested that there was a need for a network of schools learning from each other how this can be done and would overcome some of the hesitancy of staff and managers.

The study produced substantial information which confirms that school gardens in Scotland are meeting the criteria for successful school gardens. Focussing on the present situation of these gardens provided information which can be used to promote the arguments to increase gardening in Scottish schools in the knowledge that the work being done in the gardens will be successful in contributing to the academic work of the school, getting children outdoors, and increasing children’s consumption of healthy food which they have grown. The information obtained in this study will be useful to schools and to organisations seeking to support further expansion of school gardens.
6.2 Recommendations

The recommendations arising from this study fall into a number of areas.

1. Social Deprivation

The finding that the schools which responded to the questionnaire were mainly in areas with low levels of social deprivation is important in view of the link between obesity and high levels of deprivation (Goisis, Sacker and Kelly, 2015) and the significantly higher relative proportion of family income needed to support a healthy diet in low income families (Jones et al 2014). As a result of this finding, it is recommended that schools in low SES areas are targeted for support in developing school gardens as they are likely to have:

   • a higher prevalence of obesity and other diseases linked to poor diet
   • less access to affordable healthy food, especially fruit and vegetables

The evidence from the study suggests that, at present, the opposite is happening with fewer gardening schools in areas of low SES.

2. Assessment of nutritional change

Assessment of nutritional change is an important next step. If school gardens are available and have the conditions necessary to increase consumption of fruit and vegetables, it is important to determine if they are they actually doing this, as the overall objective is to replace ultra-processed foods with more nutrient-rich fruit and vegetables and to reduce obesity in children.

3. The nature of the gardening experience

The nature of the gardening experience provided varies from school to school – there is no consistency in the amount of gardening time offered, in the content of gardening programmes, or whether the gardening takes place at the school or elsewhere, as well as other factors. This variation makes it difficult to precisely attribute success in school gardening to one or more of
Food-growing in schools

these elements. Further exploration of the relevance of different elements should be carried out.

4. **Supervision, support and training**

The results suggest that staff are aware that training, supervision, and support are all required, but many schools are not aware of training schemes which are available, so improving dissemination of information about existing schemes through networking and using established education authority communication systems is an essential part of supporting school gardening, especially in schools not involved in gardening at present.

5. **Eco-schools**

Several schools mentioned the importance of eco-schools project and speculated about the possibility of closer collaboration of school gardens with the eco-schools initiative and this too should be investigated.

6. **Involving parents**

The study shows that many schools already benefit from the involvement of parents who provide practical help in the garden. Research suggests that the educational benefits of this is likely to be beneficial to the parents and the rest of the family as well as to the pupils (Nelson *et al*, 2011).

7. **Long-term health benefits**

Investigating the impact of increasing consumption of a healthy diet on children's health, especially on obesity, was the underlying driver of the study. Making food-growing in school available to all, particularly in areas of social deprivation, providing training and support for the garden and opportunities for schools to learn from each other, which are all currently occurring in some Scottish schools, can provide a first step in increasing the availability of healthy food for children and opportunities for them to eat and
Food-growing in schools grow fresh food which is essential for their healthy development in the short and long-term.
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APPENDICES

APPENDIX 1 - Literature Map

- Nutrition and healthy development
  - Modern diet
    - Influences: price, convenience
    - Effects of modern diet
      - Obesity, Malnutrition, Long-term health problems
      - Interventions and effects
        - Increase intake of F&V
      - What we know
    - Change needed

- Gardening
  - Interaction with nature
    - Benefits physical and mental health
  - Learning Benefits F&V

- Changing dietary behaviour
  - ANGELO Micro & Macro levels
  - Practice-Interventions
    - What works?
  - Criteria for change
    - Self-efficacy, outcome expectations, availability, preferences

SURVEY
Food-growing in Scottish schools

What works?

What we know

Change needed

Modern diet

Effects of modern diet

Interventions and effects

Increase intake of F&V

Nutrition and healthy development

Gardening

School gardening and impact on F&V

Benefits physical and mental health

Learning Benefits F&V

Interaction with nature

APPENDIX 2 - Pilot Of Questions

Pilot study of the questions for the study questionnaire.

Please read all questions as if completing the questionnaire as a Gardener, Past Gardener and a Non-gardener (i.e. you need to read through the questionnaire three times) and then answer the questions below:

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<tr>
<td>Omissions</td>
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<tr>
<td>Comments</td>
<td></td>
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</tbody>
</table>

Additional information about you:

Name:
Age:
Sex:

Occupation and/or other relevant experience. e.g. Teacher, research design, data analysis, work with children etc.

Gardening experience: Long-term, Short-term/little, None

Time taken to complete the questionnaire:
## APPENDIX 3 - Questionnaire For Adult Gardeners

**Where do you grow?** *(please tick all that apply)*
- Own garden
- Allotment
- Community garden
- Help someone else
- Neglected spaces (guerrilla gardening)

**I grow food because:** *(please tick all that apply)*
- flavour
- I can grow things that I can’t buy locally
- growing my own food reduces food miles
- I have fond memories of growing food when I was young
- it is something I have always done
- I enjoy the physical and mental effort
- Other reasons, please list

**What I gained from this childhood experience?** *(please tick all that apply)*
- gardening techniques (seed sowing, watering, feeding etc)
- knowledge about food and where it comes from
- tasting food straight from the garden
- enjoying being in the natural environment
- spending time with parents/ grandparents is fun
- inspiration
- getting my hands in soil
- Other things, please specify

**Did this early experience contribute to you becoming a gardener as an adult?**
- Yes  
- No  
- Impossible to say
APPENDIX 4 - Ethics Form

The University of Edinburgh

Edinburgh College of Art

RESEARCH, ETHICS AND KNOWLEDGE EXCHANGE COMMITTEE

Self-Audit Checklist for Level 1 Ethical Review

The audit should be carried out by the Principal Investigator, except as follows:

- Postdoctoral Research Fellowships: the applicant in collaboration with their mentor

- Postgraduate Research (MSc, MScR and PhD): the student in collaboration with their first supervisor

- Undergraduate dissertations and student projects: the student in collaboration with their dissertation/project supervisor

Title of Project: Edible Gardening in Schools

Funding Body (if applicable): N/A

Principal Investigator/Supervisor Name: Prof Catharine Ward Thompson

Appendices
Student Name and Matriculation Number: Terry Griffiths
s1270773

Type of Student: PhD ✓
Masters by Research
Taught Masters Honours

1. Protection of research subject confidentiality

Are there any issues of confidentiality which are not adequately handled by the normal tenets of ethical academic research?

NO ✓ YES (If yes, Level 2 assessment required)

These include mutually understood agreements about

- Non attribution of individual responses

- Individuals and organisations being anonymised in publications and presentations, if requested

- Feedback to collaborators, rights to edit responses, and intellectual property rights and publication

2. Data protection and consent
Food-growing in schools

Are there issues of data handling and consent which are not adequately dealt with and compliant with academic procedures?

NO ✓ YES (If yes, Level 2 assessment required)

These include well-established sets of undertakings for example, regarding

- Compliance with the University of Edinburgh’s Data Protection procedures (www.recordsmanagement.ed.ac.uk)

- Respondents giving consent regarding the collection of personal data

- No special issues arising confidentiality/informed consent

3. Moral issues and Researcher/Institutional Conflicts of Interest

Are there any special moral issues/conflicts of interest?

NO ✓ YES (If yes, Level 2 assessment required)

For example

- might the researcher compromise the research objectivity or independence in return for financial or non-financial benefit for themselves, a relative or friend?

- are there any particular moral issues or concerns which arise, for example, where the purposes of research are concealed, where respondents are

Appendices
Food-growing in schools

unable to provide informed consent, or where research findings impinge negatively/differentially upon the interests of participants

4. Potential physical or psychological harm, discomfort or stress

Is there a significant foreseeable potential harm or stress for those involved in your research?

NO ✔ YES (If yes, Level 2 assessment required)

Is there significant foreseeable potential for physical harm or stress for those involved in your research?

NO ✔ YES (If yes, Level 2 assessment required)

Is there significant foreseeable risk to the researcher?

NO ✔ YES (If yes, Level 2 assessment required)

5. Bringing the University into disrepute

Is there any aspect of the proposed research which might bring the University into disrepute?

NO ✔ YES (If yes, Level 2 assessment required)

6. Vulnerable participants

Appendices
Food-growing in schools

Are any of the participants or interviewees in the research vulnerable, e.g. children and young people?

| NO | YES ✔ (If yes, Level 2 assessment required) |

**Overall assessment**

If all answers are No, the Self-assessment has been completed and confirms the absence of reasonably foreseeable ethical risks. The following text should be emailed to the relevant person below:

Text “I confirm that I have carried out the School Ethics self-audit in relation to my proposed research project [insert name and funding body] and that no reasonably foreseeable ethical risks have been identified.”

Research grants, Postgraduate Research and Undergraduate Research – PI should email the text to the School Research Office and provide either an electronic or paper copy of their completed form.

If one or more answers are Yes, Level 2 assessments is required.

Signed……………………………….

Date…………………………..
APPENDIX 5 - Data Management Plan

ADMINISTRATIVE DATA

1.1 Project Name: Food-growing in Scottish schools: An analysis of the present position and indicators for the future.

1.2 Project Description: This project comprises a detailed examination of the current status of edible gardening in Scottish schools, with a focus on circumstances that may encourage or deter the development of school

1.3 Basic project information

A web-based survey of all Scottish schools with questions designed to clarify the present position. This will be sent by email to all schools in Scotland.

There will also be a paper-based questionnaire study of some adults who grow food to determine the importance of childhood experience on gardening in adulthood.

1.4 Principal Investigator and supervisors

Investigator: Terry Griffiths

email: s1270773@ed.ac.uk
tel: 07754 493155

Supervisors: Professor Catharine Ward Thompson ESALA, Edinburgh School of Art, Edinburgh University

Dr Greg Kenicer, Royal Botanic Garden, Edinburgh (RBGE)

1.5 Funding

The project is funded by the principal investigator.
1.6 **Budget**

University fees; Travel to eca and RBGE bases; attendance at RHS (Royal Horticultural Society, Scotland) training days (3); travel to RHS and RBGE training days for teachers for preliminary enquiries will be met by the principal investigator.

1.7 **Duration**

This part of the PhD is expected to take 9 months during the second part of my second year. The total PhD timeline is 1st year full-time, 2nd year part-time, 3rd year full-time = total of 4 years, + 1 year to write up.

1.8 **Relevant policies**

- University of Edinburgh College of Art Research Ethics Policy
- University of Edinburgh Data Management Policy

1.9 **Date of plan**

22/07/2015

2 **DATA COLLECTION**

2.1 **Type of data**

Data will be collected as responses to an email survey on Google forms. This is a format which is attractive to users, enables rapid circulation of a large number of survey forms, allows for different question types and logic branching and enables easy transfer of data for analysis. The survey will use closed questions for ease of analysis.

2.2 **Format of data**

Data will be stored in a file format compatible with Excel and SPSS use and to ensure suitability for long-term storage.
2.3 **Volume of data**

Survey forms will be sent to all schools in Scotland (2652). Forms have up to 17 questions, some with up to 18 optional responses.

2.4 **Methods of collecting data**

The survey form will be sent electronically to the schools’ email address and responses will be received electronically. Data will then be translated into a format suitable for analysis using Excel and SPSS and for long-term storage.

2.5 **Standards and methodologies**

Google Forms will be used to collect data which will then be transferred to Excel and SPSS, or other statistical package, as required for analysis.

2.6 **Structure of folders and files**

Naming conventions will be standard and used as recommended by the University of Edinburgh Records Management Section.

www.recordsmanagement.ed.ac.uk/InfoStaff/RMstaff/RMprojects/PP/FileNam

2.7 **Versioning**

A data log, including information about data versioning will be maintained in Microsoft Excel.

2.8 **Quality assurance**

Consistency will be checked using review of the data by the investigator.

3. **DOCUMENTATION AND METADATA**

3.1 **What will be needed for the data to be read in future?**

All data will be available in Excel spreadsheets with comparisons illustrated in tables and charts. Secondary users will have access to this and to

Appendices
accompanying information about the study including definitions of variables and reasons for particular comparative analyses are available in the body of the thesis.

3.2 How this data will be captured?

The investigator will be responsible for the collation and presentation of all data and accompanying information.

4. ETHICS

4.1.1 Consent for data preservation and sharing

The survey form will provide details of how data will be stored and to whom it may be made available.

Consent to sharing information will be sought as part of the information sheet accompanying the email survey form sent to schools. Responses will be anonymised by using a numerical code so that individual schools will only be identifiable to the Principal Investigator unless the person completing the form agrees otherwise. The code will only be made available for further examination of results with the agreement of the principal investigator or successor within the organisations to whom data will be made available ie RBGE, RHS, RCHS (Royal Caledonian Horticultural Society).

4.1.2 Anonymisation

Schools will not be identifiable by name in any data made available unless they agree to this.

4.2.1 Copyright issues – who owns the data?

4.2.2 How will data be reused/shared?

It is anticipated that the data may be reused and/or augmented by the RHS at intervals to retain current information and to assess the impact of work
Food-growing in schools currently underway to increase the uptake of the RHS Schools Gardening Campaign.

5. **STORAGE AND BACKUP**

5.1 **Data storage – short and long-term**

5.1.1 **Short-term**

During the lifetime of the project data will be stored on the University of Edinburgh filestore which ensures that data are held securely and regularly backed-up. The filestore has disaster facility backup off-site and a 60-day retention period, with 10 days of history online. (Source: University of Edinburgh guidance [http://www.ed.ac.uk/is/data-management](http://www.ed.ac.uk/is/data-management). Data will be inputted by the principal investigator.

5.1.2 **Backing up data during the project**

Using the University of Edinburgh system means that data will be regularly backed-up (see 5.1.1).

5.2 **Security in the long-term**

When the project is complete the data will be stored at the University of Edinburgh DataStore and at RBGE.

5.3 **What are the risks?**

Schools may have some sensitivity about the data, but, as it will be anonymised and as school gardening is not an area on which school performance is measured, any unauthorised access to the data is unlikely to cause a problem.

5.4 **Foreseeable uses for the data in the future**

Organisations involved in promoting and supporting school gardening may wish to refer to the data and to update it in order to assess change over time.

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Food-growing in schools

and/or the impact of their input. Education researchers may be interested in assessing the impact of school gardening on learning and behaviour.

5.5 **How long will the data be preserved?**

I would suggest a period of 10 years to enable assessment of change to be made. At the end of that period it is likely that changes in the education system will make comparative assessment difficult.

6. **DATA SHARING**

6.1 **How will potential users find out about the data?**

Information about the data will be available in the thesis and in reports produced as part of the writing-up process.

6.2 **Who will data be shared with and how?**

Data will be shared with the Royal Horticultural Society (RHS) and with Royal Botanic Gardens Edinburgh (RBGE), on request, for use in planning the services they offer to schools. It will also be available to Education planners, on request, if appropriate.

6.3 **When will the data become available?**

Data from the schools survey will be available from the completion of the study.

6.4 **Restrictions on data sharing**

No restrictions are anticipated with statutory bodies such as RHS and RBGE. Release of data in which individual schools are identifiable to parents and the public is not recommended.

7. **RESPONSIBILITY FOR DATA SHARING**

7.1 **Short-term**

Appendices
During the project this will be the responsibility of the principal investigator: Terry Griffiths

**7.2 Long-term**

RBGE and RHS

**8. RESOURCES**

No additional resources beyond those provided by the University of Edinburgh computing services are required.
APPENDIX 6 - Scottish Educational Establishment Database

A rolling and annual survey to maintain up-to-date a database of all the schools in Scotland.

The details of all schools (and other educational establishments) are held by the ScotXed Unit on the Scottish Educational Establishment Database.

APPENDIX 7 - Urban/Rural Classification, 8-Fold

https://www2.gov.scot/Topics/Statistics/About/Methodology/UrbanRuralClassification

The urban/rural classification is a methodology which allows every postcode in Scotland to be classified into eight different urban and rural categories. Every school can be allocated to one of these categories based on its postcode.

A 'rural school' is defined as those located within any of three rural categories. This means that a school which, according to the urban/rural classification, is located in a settlement of under 3,000 people is classified as a rural school. In 2017, 34% of Scotland's schools are classified as rural schools.

<table>
<thead>
<tr>
<th>Class</th>
<th>Class Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Large Urban Areas</td>
<td>Settlements of 125,000 people and over.</td>
</tr>
<tr>
<td>2</td>
<td>Other Urban Areas</td>
<td>Settlements of 10,000 to 124,999 people.</td>
</tr>
<tr>
<td>3</td>
<td>Accessible Small Towns</td>
<td>Settlements of 3,000 to 9,999 people, and within a 30 minute drive time of a Settlement of 10,000 or more.</td>
</tr>
<tr>
<td>4</td>
<td>Remote Small Towns</td>
<td>Settlements of 3,000 to 9,999 people, and with a drive time of over 30 minutes but less than or equal to 60 minutes to a Settlement of 10,000 or more.</td>
</tr>
</tbody>
</table>
## Food-growing in schools

<table>
<thead>
<tr>
<th></th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td><strong>Very Remote Small Towns</strong></td>
<td>Settlements of 3,000 to 9,999 people, and with a drive time of over 60 minutes to a Settlement of 10,000 or more.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Accessible Rural Areas</strong></td>
<td>Areas with a population of less than 3,000 people, and within a drive time of 30 minutes to a Settlement of 10,000 or more.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Remote Rural Areas</strong></td>
<td>Areas with a population of less than 3,000 people, and with a drive time of over 30 minutes but less than or equal to 60 minutes to a Settlement of 10,000 or more.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Very Remote Rural Areas</strong></td>
<td>Areas with a population of less than 3,000 people, and with a drive time of over 60 minutes to a Settlement of 10,000 or more.</td>
</tr>
</tbody>
</table>
APPENDIX 8 - Schools Edible Gardening Survey

We know from existing studies in the UK and in other countries that there are diverse benefits to learning, social and emotional development associated with Edible Gardening in Schools. Barriers to the development of school gardening have been recognised in these other studies, but the picture in Scotland has not yet been clarified.

This survey is part of a PhD study into Edible Gardening provision in Scottish Schools.

It will take less than 10 minutes to complete
* Required

1. **Is your school involved in gardening?**
   * Please choose ONE
   * Mark only one oval.
   * Yes
   * Skip to question 5
   * No, but has been in the past
   * Skip to question 19
   * No
   * Skip to question 2

**Non-Gardening**

2. **If your school is not currently involved in growing food, will your school take part in growing food in the future?**
   * Mark only one oval.
   * Definitely
   * Probably
   * Possibly
   * Probably not
   * Definitely not
   * Not sure

3. **What would encourage you to consider starting a food growing scheme in your school?**
   * (Please choose all that apply)
   * Mark only one oval.
   * Funding for equipment etc
   * Clearer links with Curriculum for Excellence
A mentoring scheme with schools with well-established food growing
Training for staff
None of these
Other:

4. **Based on your experience what are the main barriers to food growing in schools in Scotland and which one factor do you think is the main barrier?**
Mark only one oval per row.

<table>
<thead>
<tr>
<th>Barriers (please tick all that apply)</th>
<th>Main barrier (please choose only ONE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of material support (e.g. equipment, seeds)</td>
<td></td>
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<tr>
<td>Lack of personnel to coordinate activities</td>
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<tr>
<td>Lack of personnel to supervise activities</td>
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<tr>
<td>Lack of outdoor space</td>
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<td>Lack of indoor space</td>
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<tr>
<td>Lack of support from senior leaders/managers</td>
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<tr>
<td>Lack of interest from staff</td>
<td></td>
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<tr>
<td>Lack of interest from pupils</td>
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<tr>
<td>Lack of support from community/parents</td>
<td></td>
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<tr>
<td>Lack of time in the curriculum</td>
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<tr>
<td>Health and Safety concerns</td>
<td></td>
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<tr>
<td>Lack of staff knowledge and skills</td>
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<tr>
<td>Different priorities and interests in your school</td>
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<tr>
<td>Difficulty synchronising the curriculum with growing seasons in Scotland</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

Skip to question 35

5. **For how long has your school taken part in growing food?**
(Please choose ONE)
Mark only one oval.
Less than 2 years
2 - 3 years
3 -4 years
More than 4 years
Not sure

6. **Nature of gardening in your school**
(Please choose ONE box)
Mark only one oval.

Appendices
Food-growing in schools

As a non-curricular activity e.g. a school gardening club
As part of classwork
As part of classwork and as a non-curricular activity
Other:

7. **Who is responsible for coordinating food growing activities at your school?**
(Please choose ONE box)
*Mark only one oval.*
- Teaching staff
- Non-teaching school staff
- Volunteers from the local community
- Parent helper
- Grandparent helper
- Nobody has responsibility, we all "muck in"
Other:

8. **Which of the following age groups of pupils are involved in food growing in your school?**
(Please tick all that apply)
*Check all that apply.*
- Under 5s
- Primary 1 - 2
- Primary 3 - 4
- Primary 5 - 6
- Primary 7
- S 1 - 2
- S 3 - 4
- S 5 - 6

9. **Which of the following statements is true about food growing in your school?**
(Please choose all that apply)
*Check all that apply.*
- We grow food in the school grounds in an outdoor plot/raised beds
- We grow food using a space in the local community (e.g. an allotment)
- We grow food in pots in the school
- We grow food in pots outside
- We grow all our food organically
- We make and use our own compost
- Food growing activities are part of our school’s overall policy
- Food growing activities have the support of senior leaders/managers
- Food growing is frequently planned into lessons
- Food growing is accessible to pupils through extra-curricular clubs/activities

Appendices
Food-growing in schools

Food growing is targeted at specific groups of pupils (e.g. year groups, SEN pupils etc). Food growing is taught "off-timetable" through one-off events or enrichment days/weeks. Food growing is part of a Skills for Work project.

10. **What proportions of the following groups are involved in food growing last year at your school?**

(Please choose ONE box in each row)

Mark only one oval per row.

<table>
<thead>
<tr>
<th>Less than 25%</th>
<th>25% - 50%</th>
<th>51% - 75%</th>
<th>More than 75%</th>
</tr>
</thead>
</table>

- Pupils
- Teaching staff (as participant or supervisor)
- Non-teaching staff (as participant or supervisor)

11. **Did your school have any of the following types of support for food growing activities in the last year?**

(Please choose all that apply)

Check all that apply.

- Funding
- Help with developing staff knowledge and/or skills
- Help with developing pupils' knowledge and skills
- Lesson planning
- Help with relevant off-site trips
- Material resources e.g. tools, seeds, buildings, plants
- Human resources e.g. volunteers, parent helpers
- Making local land available for growing
- None of the above
- Other:

12. **From which of the following has your school received support (either formally, or informally) to help with food growing?**

(Please choose all that apply)

Check all that apply.

- Business (local or national)
- A charity (local or national, such as Royal Horticultural Society, Botanic Garden, Royal Caledonian Horticultural Society)
- Local Authority - parks and gardens department
- Parents

Appendices
Another school
None of the above
Other:

13. **Which of the following training and support schemes do you use (if any.)**
Mark only one oval.
Royal Horticultural Society (RHS) Campaign for School Gardening
Royal Caledonian Horticultural Society (RCHS) Schools Gardening scheme
Royal Botanic Garden Edinburgh (RBGE) Gardening for Schools sessions
None
Other:

14. **Use of the Royal Horticultural Society Campaign for Schools Gardening, if relevant.**
(Please complete if your school makes use of this scheme. Please choose ONE)
Check all that apply.

<table>
<thead>
<tr>
<th>Current Level</th>
<th>Highest level attained, if different</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
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<tr>
<td>Level 2</td>
<td></td>
</tr>
<tr>
<td>Level 3</td>
<td></td>
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<tr>
<td>Level 4</td>
<td></td>
</tr>
<tr>
<td>Level 5</td>
<td></td>
</tr>
</tbody>
</table>

15. **What motivates your school to grow food and which one factor motivates your school the most?**
Mark only one oval per row.
This factor was a motivation (please choose all that apply)
Main motivation (please close only ONE box)

To teach about the environment
To teach about nutrition
To teach about where food comes from
To support the delivery of an outdoor curriculum
To teach about gardening
To encourage pupils to exercise
To support the science curriculum
To support the food technology curriculum
Food growing was a personal interest of a member of staff
Pupils' request
To subsidise school dinners with self-grown produce
Parents request
Food-growing in schools

To interest pupils in the possibility of a career in horticulture
We were given the opportunity to join a food growing scheme (by a charity, local
council, supermarket or other organisation
To help develop skills for a healthy adult life

16. Based on your experience what are the main barriers to food growing in
schools in Scotland and which one factor do you think is the main barrier?
Mark only one oval per row.

   Barriers (please tick all that apply)
   Main barrier (please choose only ONE)

   Lack of material support (e.g equipment, seeds)
   Lack of personnel to coordinate activities
   Lack of personnel to supervise activities
   Lack of outdoor space
   Lack of indoor space
   Lack of support from senior leaders/managers
   Lack of interest from staff
   Lack of interest from pupils
   lack of support from community/parents
   Lack of time in the curriculum
   Health and Safety concerns
   Lack of staff knowledge and skills
   Different priorities and interests in your school
   Difficulty synchronising the curriculum with growing seasons in Scotland
   Other

18. Which of the following statements best describes the plans for food growing
in your school in the next few years?
(Please choose ONE)
Mark only one oval.

   We plan to stop offering any food growing activities
   we plan to reduce our food growing activities
   We plan to continue food growing at the present level
   We plan to increase our food growing activities
   Other:
   Skip to question 35

Gardened in the Past

19. How long ago did food growing stop in your school?
(Please choose ONE)
Mark only one oval.

Appendices
Food-growing in schools

Less than 1 year
1 - 2 years
2 - 3 years
3 - 4 years
More than 4 years
Not sure

20. How long had your school been involved in growing food?
(Please choose ONE)
Mark only one oval.
2 years or less
2 - 3 years
3 - 4 years
More than 4 years
Not sure

21. Nature of gardening in your school
(Please choose ONE box)
Mark only one oval.
As a non-curricular activity e.g a school gardening club
as part of classwork
as part of classwork and as a non-curricular activity
Other:

22. Who was responsible for coordinating food growing activities at your school?
(Please choose ONE)
Mark only one oval.
Teaching staff
Non-teaching school staff
Volunteers from the local community
Parent helper
Grandparent helper
Nobody has responsibility, we all "muck in"
Other:

23. Which of the following age groups of pupils were involved in food growing in your school?
(Please tick all that apply)
Check all that apply.
Under 5s
Primary 1 - 2

Appendices
Food-growing in schools

24. What were the reasons for stopping food growing in your school? (Please choose all that apply)
Check all that apply.
Lack of staff time
Lack of interest from pupils
Lack of support from the local community
Lack of interest from staff
Lack of money for equipment etc
Practical issues, like watering during school holidays
Other:

25. What would encourage you to consider restarting food growing activities in your school? (Please choose all that apply)
Check all that apply.
Funding for equipment etc
Clearer links with Curriculum for Excellence
A mentoring scheme with schools with well-established school gardening schemes
Training for staff
Other:

26. Which of the following statements was true about food growing in your school? (Please choose all that apply)
Check all that apply.
We grew food in the school grounds in an outdoor plot/raised beds
We grew food using a space in the local community (e.g an allotment)
We grew food in pots in the school
We grew food in pots outside
We grew all our food organically
We made and used our own compost
Food growing activities were part of our school's overall policy
Food growing activities had the support of senior leaders/managers
Food growing was frequently planned into lessons

Appendices
Food-growing in schools

Food growing was accessible to pupils through extra-curricular clubs/activities
Food growing was targeted at specific groups of pupils (e.g. year groups, SEN pupils etc)
Food growing was taught "off-timetable" through one-off events or enrichment days/weeks
Food growing was part of a "Skills for Work" project

27. **What proportions of the following groups were involved in food growing at your school?**
(Please choose ONE box in each row)
Mark only one oval per row.

<table>
<thead>
<tr>
<th>Group</th>
<th>Less than 25%</th>
<th>25% - 50%</th>
<th>51% - 75%</th>
<th>More than 75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupils</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching staff (as participant or supervisor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-teaching staff (as participant or supervisor)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

28. **Did your school have any of the following types of support for food growing activities?**
(Please choose all that apply)
*Check all that apply.*

- Funding
- Help with developing staff knowledge and/or skills
- Help with developing pupils' knowledge and skills
- Lesson planning
- Help with relevant off-site trips
- Material resources (e.g. tools, seeds, buildings, plants)
- Human resources (e.g. volunteers, parent helpers)
- Making local land available for growing
- None of the above
- Other:

29. **From which of the following did your school receive support (either formally, or informally) to help with food growing?**
(Please choose all that apply)
*Check all that apply.*

- Business (local or national)
- A charity (local or national, such as Royal Horticultural Society, Botanic Garden, Royal Caledonian Horticultural Society

Appendices
Food-growing in schools

Local Authority - parks and gardens department
Parents
Another school
None of the above
Other:

30. Which of the following training and support schemes did you use (if any)
Mark only one oval.
Royal Horticultural Society (RHS) Campaign for School Gardening
Royal Caledonian Horticultural Society (RCHS) Schools Gardening scheme
Royal Botanic Garden Edinburgh (RBGE) Gardening for Schools sessions
None
Other:

31. Use of the Royal Horticultural Society Campaign for Schools Gardening, if relevant
(Please complete if your school made use of this scheme. Please choose ONE)
Mark only one oval per row.

<table>
<thead>
<tr>
<th>Current Level</th>
<th>Highest level attained, if different</th>
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<tbody>
<tr>
<td>Level 1</td>
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<td>Level 2</td>
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<td>Level 3</td>
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<td>Level 4</td>
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<tr>
<td>Level 5</td>
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</tbody>
</table>

32. What motivated your school to grow food and which one factor motivated your school the most?
Mark only one oval per row.

This factor was a motivation (please choose all that apply)
Main motivation (please close only ONE box)

To teach about the environment
To teach about nutrition
To teach about where food comes from
To support the delivery of an outdoor curriculum
To teach about gardening
To encourage pupils to exercise
To support the science curriculum
To support the food technology curriculum
Food growing was a personal interest of a member of staff
Pupils’ request

Appendices
Food-growing in schools

To subsidise school dinners with self-grown produce
Parents request
To interest pupils in the possibility of a career in horticulture
We were given the opportunity to join a food growing scheme (by a charity, supermarket or other organisation
To help develop skills for a healthy adult life

33. Based on your experience what are the main barriers to food growing in schools in Scotland and which one factor do you think is the main barrier? Mark only one oval per row.

- Barriers (please tick all that apply)
- Main barrier (please choose only ONE)

- Lack of material support (e.g equipment, seeds)
- Lack of personnel to coordinate activities
- Lack of personnel to supervise activities
- Lack of outdoor space
- Lack of indoor space
- Lack of support from senior leaders/managers
- Lack of interest from staff
- Lack of interest from pupils
- Lack of support from community/parents
- Lack of time in the curriculum
- Health and Safety concerns
- Lack of staff knowledge and skills
- Different priorities and interests in your school
- Difficulty synchronising the curriculum with growing seasons in Scotland
- Other

34. Which of the following statements best describes the plans for food growing in your school in the next few years? (Please choose ONE) Mark only one oval.

- We do not plan to offer food growing activities
- We plan to restart food growing activities
- Other:

Skip to question 35

About Your School

35. Name

36.
Food-growing in schools

Address and Postcode
37.

Phone number:
38.

Best contact email
39.

Any additional comments about school gardening would be welcome

Skip to question 40

About You
You have been chosen to complete this survey on behalf of your school. Please complete the following information about yourself.

40.

Your role in the school garden
Mark only one oval.
Headteacher
Teacher
Non-teaching school staff
Parent/grandparent helper
Volunteer from the local community
Representative of a horticultural body, such as a local allotment group, the Royal Horticultural Society, please specify below
Other:

41.

Age
Mark only one oval.
20 - 29 years
30 - 39 years
40 - 49 years
50 - 59 years
60 - 69 years
70 - 79 years
80+ years

42.

Sex
Mark only one oval.
Male
Female
Prefer not to say
43. 

*Gardening Experience*

Please indicate if you have had personal experience of gardening

*Mark only one oval.*

None
Since childhood
As an adult
I'm learning as part of the school gardening project
Other:

*Skip to question 44*

---

**Thank you for your help**

A report of the findings of this survey will be sent to each Education Authority as soon as possible.
If you would like a copy to be sent directly to your school, please enter your email address below.

44. 

email address

If you want to contact me directly, please email [s1270773@sms.ed.ac.uk](mailto:s1270773@sms.ed.ac.uk)

With many thanks, Terry Griffiths
APPENDIX 9 - Screen Shots of Questionnaire

Question 1 of the survey

It is this question that determines which form of the questionnaire is presented to the respondent. It uses logic branching to determine which version of the questionnaire is presented to the respondent.
Non-gardening group

If the respondent indicated that their school was not involved in gardening, the following questions were then presented.

Schools Edible Gardening Survey

Non-Gardening

If your school is not currently involved in growing food, will your school take part in growing food in the future?
- Definitely
- Probably
- Possibly
- Probably not
- Definitely not
- Not sure

What would encourage you to consider starting a food growing scheme in your school?
(Please choose all that apply)
- Funding for equipment etc
- Clearer links with Curriculum for Excellence
- A mentoring scheme with schools with well-established food growing
- Training for staff
- None of these
- Other: [__] [__]

Questions 2&3 for Non-gardening group
Based on your experience what are the main barriers to food growing in schools in Scotland and which one factor do you think is the main barrier?

<table>
<thead>
<tr>
<th>Barriers (please tick all that apply)</th>
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<tbody>
<tr>
<td>Lack of material support (e.g. equipment, seeds)</td>
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<td>Health and Safety concerns</td>
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<td>Lack of staff knowledge and skills</td>
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<tr>
<td>Different priorities and interests in your school</td>
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<td>Difficulty synchronising the curriculum with growing seasons in Scotland</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

37% completed

Question 4 – Non-gardening group
Food-growing in schools

Gardening group

If the respondent indicated that their school was involved in gardening, the following questions were presented.
Schools Edible Gardening Survey

Gardening

For how long has your school taken part in growing food?
(Please choose ONE)
- Less than 2 years
- 2 - 3 years
- 3 - 4 years
- More than 4 years
- Not sure

Nature of gardening in your school
(Please choose ONE box)
- As a non-curricular activity e.g. a school garden club
- As part of classwork
- As part of classwork and as a non-curricular activity
- Other

Who is responsible for coordinating food growing activities at your school?
(Please choose ONE box)
- Teaching staff
- Non-teaching staff
- Volunteers from the local community
- Parent
- Grandparent
- Nobody has responsibility, we are mucking in
- Other

Questions 2, 3, 4 Gardening group

Appendices
Food-growing in schools

Which of the following age groups of pupils are involved in food growing in your school?
(Please tick all that apply)
- Under 5s
- Primary 1 - 2
- Primary 3 - 4
- Primary 5 - 6
- Primary 7
- S 1 - 2
- S 3 - 4
- S 5 - 6

Which of the following statements is true about food growing in your school?
(Please choose all that apply)
- We grow food in the school grounds in an outdoor plot/raised beds
- We grow food using a space in the local community (e.g. an allotment)
- We grow food in pots in the school
- We grow food in pots outside
- We grow all our food organically
- We make and use our own compost
- Food growing activities are part of our school's overall policy
- Food growing activities have the support of senior leaders/managers
- Food growing is frequently planned into lessons
- Food growing is accessible to pupils through extra-curricular clubs/activities
- Food growing is targeted at specific groups of pupils (e.g. year groups, SEN pupils etc)
- Food growing is taught "off-timetable" through one-off events or enrichment days/weeks
- Food growing is part of a "Skills for Work" project

What proportions of the following groups are involved in food growing last year at your school?
(Please choose ONE box in each row)

<table>
<thead>
<tr>
<th></th>
<th>Less than 25%</th>
<th>25% - 50%</th>
<th>51% - 75%</th>
<th>More than 75%</th>
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<tbody>
<tr>
<td>Pupils</td>
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<tr>
<td>Teaching staff (as participant or supervisor)</td>
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<tr>
<td>Non-teaching staff (as participant or supervisor)</td>
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</table>

Did your school have any of the following types of support for food growing activities in the last year?
(Please choose all that apply)
- Funding
- Help with developing staff knowledge and/or skills
- Help with developing pupils' knowledge and skills

Questions 5, 6, 7, 8 Gardening group

Appendices
Food-growing in schools

Questions 9, 10,11 Gardening group

Appendices
### Questions 12, 13 Gardening group

#### Food-growing in schools

<table>
<thead>
<tr>
<th>Objective</th>
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<tbody>
<tr>
<td>To teach pupils about the environment</td>
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<tr>
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<tr>
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<tr>
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<tr>
<td>To support the food technology curriculum</td>
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<td>Food growing was a personal interest of a member of staff</td>
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<tr>
<td>Pupils’ request</td>
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<td>Parents request</td>
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<tr>
<td>To help pupils develop skills for a healthy adult life</td>
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</table>

Based on your experience what are the main barriers to food growing in schools in Scotland and which one factor do you think is the main barrier?

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<tr>
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<th>Main barrier (please choose only ONE)</th>
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<tr>
<td>Lack of support from community/parents</td>
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</tbody>
</table>
Food-growing in schools

What do you think are the main barriers to food growing in schools in Scotland and which one factor is the main barrier for you?

<table>
<thead>
<tr>
<th>Barriers (please choose all that apply)</th>
<th>Main barrier (please choose only ONE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of material resources (e.g. equipment, seeds)</td>
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<tr>
<td>Lack of personnel to coordinate the activities</td>
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<td>Difficulty synchronising the curriculum with food growing seasons</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

Which of the following statements best describes the plans for food growing in your school in the next few years?
(Please choose ONE)

- We plan to stop offering any food growing activities
- We plan to reduce our food growing activities
- We plan to continue food growing at the present level

Question 14 Gardening group

Appendices
Questions for all schools

Further sections about the school, and the respondent were asked of all groups:

<table>
<thead>
<tr>
<th>About Your School</th>
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<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Address and postcode</td>
</tr>
<tr>
<td>Phone number</td>
</tr>
<tr>
<td>Best contact email</td>
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</tbody>
</table>

Additional comments about school gardening would be welcome
### About You

You have been chosen to complete this survey on behalf of your school. Please complete the following information about yourself.

**Your role in the school garden**
- Headteacher
- Teacher
- Non-teaching school staff
- Parent/Grandparent helper
- Volunteer from the local community
- Representative of a horticultural body, such as a local allotment group, the Royal Horticultural Society, please specify below
- Other

**Age**
- 20-29 years
- 30-39 years
- 40-49 years
- 50-59 years
- 60-69 years
- 70-79 years

**Sex**
- Male
- Female
- Prefer not to say

**Gardening Experience**
- None
- Since childhood
- As an adult
- I’m learning as part of the school gardening project
- Other
APPENDIX 10 - Comments (96 Received)

At the end of the questionnaire participants were given the opportunity to make comments. The responses are listed below with the role of the informant written in green.

**Qu. Any additional comments about school gardening would be welcome** (96 responses)

We have built an eco bottle greenhouse this session. The P6 and P7 planned and built it with the help of parent helpers. We have just planted 30 strawberry plants which will be used for next year's smoothie making challenge (local produce) **Teacher**

We are a very small rural school with land to grow things. It is the funding to continue this activity that is the most difficult to achieve. **Non-teaching school staff**

The eco garden has been a real benefit to the school. **Teacher**

We often leave it too late when planning for a crop that can be harvested before the summer holidays so some advice on the best plants and methods would be great. **Teacher**

We are really pushing all areas mentioned as motivation for gardening - responsibility for environment /health, promotion of outdoor learning, emotional health and wellbeing, creativity, learning and sustainability. (School and nursery classes) **Teacher**
Food-growing in schools

Lack of funding and lack of support from local authority is a big issue, there are so many boxes to tick before you can put a seed in the ground and this has been very challenging when we have been trying to establish our garden with our ASD and nurture pupils for whom the garden offers an alternative curriculum, social and emotional and life skills.  *Teacher*

Resources and funding is our major issues.  *Non-teaching school staff*

Eco Committee are in charge of this.  *Teacher*

We started gardening and food growing about 10 years ago as part of our Eco Schools work and expanded around 7 years ago when we took part in Phase 1 of Crofting Connections. There was also funding available at this time for polytunnels and gardening equipment. We were also able to access Awards for All funding to buy hot composting units to be able to make our own compost faster. We teamed up with our local garage to reuse the tyres as planters for potatoes. Parents water and weed our raised beds and poly tunnels over the summer holidays. Some of the produce is used in school and some is sold to parents and community which pays for the seeds for next year. Pupils are fully involved in the research into the soil and selecting the seeds appropriate for it. It has been a good experience for the children and is well supported by parents and community. It has encouraged some pupils to start growing food at home and to look at where the produce comes from in supermarkets. We are now part of Kenyan Connections looking at what is grown there and comparing it to what we grow here and how we use some of the same plants/foods in both countries.  *Teacher*

We have a great allotment but staffing does not allow to work more closely with small groups. People to help/drive forward are the barriers.  *Teacher*

Appendices
We currently use a supply member of staff (who is a keen gardener) to allow 1 person to co-ordinate and take the pupils to the allotment. If any future initiatives were to be extended to schools then a fund where extra staff (teaching or non-teaching), who have gardening knowledge, could be bought in rather than a half-hearted job done by staff who are not gardening enthusiasts. Another idea is that local authority gardeners could be trained to oversee the gardening part while teachers simply deliver the curriculum guiding the gardeners and the children through the curriculum. Teacher

We would not be as good at growing in our garden without our parent/grandparent volunteers!!! Teacher

I believe that gardening is very good for mental well-being / mental health. Teacher

We are very lucky to have non-teaching staff who are enthusiastic about gardening and keen to involve children in gardening projects. I have just been in post as Head Teacher here for 1 year and through professional studies in Nurture, I am keen to use gardening (and baking) clubs as tool to enhance pupils confidence and self-esteem and encourage positive relationships. I strongly belief that involving children in planting, growing, cooking and selling produce has given some of our pupils real purpose and enabled them to develop real life skills. Teacher

We only started growing food this year as received funding from Education Scotland Food for Thought grant. Non-teaching school staff

Any advice or suggestions would be welcome Teacher

Appendices
Food-growing in schools

Gardening is a lifeskill which we teach as part of our Learning Support curriculum. It is really enjoyed by our young people as they can get out of the classroom and enjoy the fresh air. They can also see results when their veg grows! It also teaches many other skills - numeracy, literacy and helps with social skills. We had a plant sale yesterday which the young people manned and they thoroughly enjoyed it. We have had volunteers across the school to help with the digging/weeding etc. and they have enjoyed the experience too. We finish the season with a barbecue which is another social opportunity plus a chance to eat some of the produce. **Teacher**

Currently having a new school built so polytunnel and growing space will eventually be relocated **Teacher**

Having a garden for the young people to learn about the environment, food and exercise, and also to use as a for of relaxation tool has greatly helped them with their self-esteem, confidence as they feel part of something. **Non-teaching school staff**

I teach rural skills Horticulture level 4 and it is in these classes that we grow food. It is challenging because the pupils are not that enthusiastic about it and the way the school calendar is structured means all the busy gardening times the pupils are not in school. Summer holidays everything goes wild and its hard work to get on top of weeding, the timetable is suspended for exams all through May so I don't see my group at all and the new group starts at the beginning of June for 4 weeks before the summer - so they have no skills necessarily and there is loads of work to be done! Easter holidays are often a time to get things in but there is no school and when the kids get back there is only a few weeks before timetable suspended for exams. **Teacher**

Appendices
Food-growing in schools

We enjoy growing our produce from seeds and using it to create soups and stews etc. We planted an orchard with help from the Cairngorms National Park last year and look forward to a fruit harvest in years to come. *Teacher*

Any support that can be provided to promote the value of school gardening in the curriculum to our school management team will be very gratefully received! Gardening is not seen as a either a priority or an opportunity for our pupils at present.

Our parent and toddler group have joined in our gardening activities this spring. We have allocated one of our growing beds to them and they are enjoying the opportunities this is giving them. *Teacher*

Maintaining the garden over the summer break is a big difficulty. If we have a warm summer there is no one available to water plants and food crops we have planted and most things need the summer to grow as we often can’t plant veg etc until May because of late frosts etc. *Teacher*

I run a very successful horticulture department which involves every student at some point in their school career. However this takes a LOT of my time and energy and most teachers would not be prepared to do this. My biggest problems are CfE and the lack of horticultural skills and KU in the E’s and O’s. This has curtailed the courses I used to run so students get less time outside gardening. Another problem is the change of timetable in June since it comes just when we should be in the middle of planting but we have to be starting preparing the allotments. I receive funding (per capita) as a school course but this is added to by running a plant sale each year raising up to £1,000 each year for purchase of tools and equipment. *Teacher*

Appendices
Ochil Tower was established in 1962 and horticultural and environmental activities are at the heart of the work of the school. Please feel free to come for a visit and experience a model garden!  

Teacher

The pupils that I work with are from the Dept. of Additional Support Needs, my pupils love the outdoors and have planted seedlings for: Carrots, Leeks, Parsley, Basil, Tomatoes, Pumpkins, we plan to grow them all in our school garden. we will be adding potatoes to our crop as well. Pupils have also cleared weeds from two flower beds and have planted flowers, they are very proud of their work.  

Teacher

We are a small rural school of 24 pupils and have this term just started out on our journey to develop our outdoor space for growing. We would appreciate information and support to take our project forward.  

Teacher

Hazlewood School is a Special School and has a sensory garden with space for growing fruit and vegetables. We have support from a local Rotary Club to maintain the garden and keep down the weeds and children use the garden as part of the Garden Club and during curriculum time.  

Teacher

We erected a commercial sized polytunnel in the school grounds for the purpose of food growing. You make no mention of this important option for growing in your survey, yet we feel it is the key to successful growing in Scotland.  

Teacher

We grow our produce and sell at our local Farmers Market  

Teacher

We are developing a science sensory garden in the school grounds.  

Teacher

Appendices
Our children enjoy getting out and growing their own food and then eating/cooking it. It is a good social experience and is very compatible with Curriculum for Excellence.  

Teacher

We are a small rural school and are working towards our 5th Green Eco Flag. Gardening is something we enjoy and all pupils experience gardening as part of our outdoor learning.  

Teacher

It's great getting started but the main difficulty is keeping the pupils interested year after year. There has to be something new to reel them in, or it becomes old hat and 'boring'!  

Teacher

Those of us involved really enjoy the activities. It's hard work and generally undervalued. After all, without food what do we have?

I believe that working in the garden is a very therapeutic activity for the children and one that should be offered in all schools. affording equipment/plants is always a problem as other areas of the curriculum are considered more important.  

Teacher

We are planning to build a 'Grow, Eat, Make, Sell' initiative for S4 pupils who will have difficulty accessing a full curriculum next session, 2015-2016. We are building a raised bed area and will install a polytunnel. Pupils will spend 2 periods a week gardening/growing food supported by staff from SRUC, Elmwood Campus. They will spend a further 2 periods a week cooking with produce that they have grown. They will spend a further period a week doing Employability studies.  

Teacher

Ours is a memorial garden, the Craig Hepburn Memorial Garden and outdoor Learning Centre. We are currently the school featured on the CfSG website  

Teacher

Appendices
Like lots of things schools do gardening does depend on a member of staff or a group of volunteers to take it forward. *Teacher*

We have a major problem with rabbits eating all our plants despite having a rabbit proof fence round our garden area. It would be really helpful to have some ideas about what plants to grow that rabbits won't eat! We hold an annual garden open afternoon and sell plants to generate income to purchase the following years seed/plants. *Teacher*

We have a tradition of children keeping their own gardens in groups but want to start to develop this more into food production etc... *Teacher*

We are pro-active school and have a hot box composter and like to experiment with our garden and have different areas including a pond, orchard, sensory, bee, butterfly, herb gardens. Have approached the RHS with a view to being a school in the NE of Scotland where courses can be held due to our extensive and heavily utilised grounds. We have 5 rose awards from the local council (the highest level for Aberdeen in bloom) a gold award for wildlife gardening and our gardener is here full time to ensure it is a focus of our school. *Teacher*

Time and weather are our biggest constraints *Teacher*

growing food and caring for the garden during the summer holidays is a problem. *Teacher*
We have 10 raised beds, enthusiastic pupils, but timetables become more full every year, teachers need support to take out a class and ‘weed the carrots' otherwise everything is removed. The holidays come in the middle of the growing and 'eating' season. The best year we had was when Vogrie Park gardeners gave us a large number of veg in pots ready to be transplanted. It is difficult to successfully grow seeds here. *Teacher*

The survey does not really capture the essence of this topic. Logistics, motivation, incentives, investment are the key issues. *Teacher*

We started our school gardening because of the Eco Schools programme and we focused on Food and the Environment. Growing food is great fun for those involved, though I have to be creative in lessons to allow time to actually do the gardening, or it is always in lunchtimes. *Teacher*

This is our first growing season and it is a bit trial and error so far. I have grown veg myself and am very enthusiastic to encourage students. *Teacher*

We have signed up for free tools from Saughton Prison's tool recycling project. A lack of suitable tools and equipment was initially a main deterrent. We have also managed to get lots of freebies from our local recycling centre. Internet searches have yielded free seeds from Kew gardens and a number of other resources. *Teacher*
We started around 8 years ago having secured a grant from the Gwen Mayor Trust money to build a polytunnel. We find it meets so many of the Learning outcomes for the Curriculum for Excellence that makes it worthwhile putting the effort in. It is essential to have someone driving the programme.  

*Teacher*

We enjoy using our Eco garden for a Gardening Club (Co-ordinated at lunch times by the Depute Head Teacher) and as part of curricular/Sciences activities. Although we try our best, this can sometimes be a difficult task due to the garden being vandalised from time to time.  

*Teacher*

Good idea. However there are a lot of restrictions on the canteen staff to allow them to use what is grown which is a shame.  

*Parent/Grandparent helper*

The pupils really enjoy gardening especially seeing plants grow from seed to eat. More support would be beneficial to highlight the benefits of gardening within schools and how it links to CfE.  

*Teacher*

We are fortunate to be a small school with excellent parental support and plenty of outdoor space. We have various growing activities throughout the year, some of which are linked with our Eco Schools work.  

*Teacher*

I think this would be an excellent opportunity not only to engage pupils who would otherwise not be engaged in the 'normal' curriculum, but also I can see its relevance as an inter-disciplinary learning project.  

*Teacher*

Appendices
Food-growing in schools

We would love to have specialist advice and support for staff to ensure that they know what to do and when to keep the garden tidy/maintained and ensure that we are making the most of our garden and linking it well to our school learning kitchen. **Teacher**

It is with regret that we have decided to withdraw significantly from our commitment to our Edible Garden due to difficulties in maintaining it. **Teacher**

Gardening is a very positive thing for young people, especially growing food. To get out of the classroom and engage in valuable meaningful activity is vital. Being able to feed yourself is even more important than literacy or numeracy - if you have no food, what good are words and numbers? **Teacher**

We are very new to school gardening and look forward to taking it forward with the children seeing what we have grown this year. Also I feel we need to incorporate it more into our curriculum so that everyone is involved and maybe could set wee challenges for growing at home. **Teacher**

Most of the gardening is extra-curricular, but this year we have started a transition project "Grow your own Soup" **Volunteer from the local community**

Appendices
Food-growing in schools

Schools need head teachers that are committed to growing food otherwise it won't happen! **Teacher**

We started off on a small scale with a small Garden Club of around 8 children. We had several small raised beds and 2 parent helpers. Initially we wanted to identify if the children would be interested in food growing. That was 5 years ago. We now have 6 parent/grandparent helpers, 10 raised beds, and a new Greenhouse. We are growing food for the School canteen to use the number of Garden Club members continue to grow each year with our present membership being around 25 very enthusiastic children. School gardening provides an interesting and fun learning experience for kids and our School is actively promoting this. **Parent/Grandparent helper**

Seasons/holidays make growing frustrating both for pupils and myself. 6 weeks without care leads to poor results! **Non-teaching school staff**

Main issue is maintenance of school allotment over summer holidays when much of the harvest is also needing to be collected. **Teacher**

We have a grandparent who has kept the school growing food for a great length of time but is growing older. We would very much like the school to do more to prepare for the day when he is no longer able but we have huge time restrictions and teacher knowledge restrictions. **Teacher**

Appendices
Food-growing in schools

We have done some development work with staff on outdoor learning and using the garden and interest and confidence is gradually building up, but we could not do this without the support of an experienced gardener.  

Teacher

We are lucky enough to have worked with Mairi Coxon from RHS  

Teacher

We pay an ex staff member (who is a keen gardener) to come in every Friday morning from March to October to take over the running of our school allotment. Without paying for this staff member we would be unable to provide any experiences of this kind.  

Teacher

Our biggest hurdle is vandalism - we have even tried to make the youth welcome - leave the greenhouse unlocked and a bin for the empties etc but they still vandalise  

Teacher

This is an area I am keen to develop.  

Teacher

Need trainers to come to us as we cannot allow staff to go out for training with so little supply cover available  

Teacher

We have just established a gardening club in school 6 weeks ago. Our aim is to tidy a very dilapidated garden and make it a social and learning space for pupils. So far we have only planted herbs but we hope to further develop this.  

Teacher

Appendices
Food-growing in schools

We are moving to a new building in October, so planting this year has been limited. We hope to have better facilities etc once we move, so hopefully next year we will do much more.  

Teacher

It is difficult to fit into the school day and our outdoor area is locked, we have to get the janitor to get the key for us when we need it which makes it quite awkward.  

Teacher

I have always been motivated to garden with children. All children participating in such activities benefit from this for many reasons.  

Teacher

Our school has a large outdoor space with numerous raised beds and plenty of funding for planting. We have recently planted an orchard of apple, pear and cherry trees with support from William Grant Ltd.  

Teacher

We would welcome the opportunity to access more gardening activities but are constrained due to lack of funding available to transform our outdoor spaces.  

Teacher

We have plans to start a project to involve Eco schools, Rural skills and the local primary but timetable restraints in secondary schools make this sort of project very difficult.  

Teacher

Pupils are keen to do gardening with the school curriculum; however, there is so much competition between clubs at lunchtime that numbers for gardening
Food-growing in schools

club are small, and there is little time in the school curriculum for gardening, even in relevant areas such as food technology. Teacher

We have a large polytunnel but need ideas of easily grown plants. Only a small group of children are part of the gardening committee. Non-teaching school staff

We carry out gardening activities but not food growing. Need something that requires low maintenance and fits in term time. Teacher

The season is very short and we don't have anyone to maintain the garden in the holidays. Teacher

We enjoy school gardening here at Bothkennar and continue this throughout the year where possible, linking it into curricular topics as well as operating it under our Eco Schools Programme. Teacher

The gardening in our school will take of next year, as we are currently developing a small annex space, and have a small allotment we will be running in conjunction with the science department. Non-teaching school staff (janitor)

We have introduced SCQF level 4 and 5 Horticulture as the remit of a Principal Teacher of Sustainabilty post. Teacher

Appendices
Food-growing in schools

Holidays often mean plants are neglected - not fed, watered or weeded- or vandalised over summer months. Some produce may be too late to be harvested.  

*Teacher*

any help would be welcome  

*Teacher*

We do gardening because of the course Rural Skills.  

*Teacher*

The pupils and staff at Ulva Primary are trying to establish an all year round garden to provide vegetables to make into our one hot meal of the week (no school dinners at our location) as well as learning more about our environment and life skills.  

*Non-teaching school staff*

Our main problem is trying to protect our garden and crops from being vandalised.  

*Teacher*

We have recently moved into a new school building and our school grounds are still being developed so we are in a hiatus period, though we have done a lot of gardening in the past. We hope to increase this significantly over the next few years.  

*Teacher*

Lots of big organisations (especially supermarkets) out there who make financial and/or practical "help" difficult to obtain because of form filling and/or bureaucratic obstacles (no contact/difficulty contacting etc etc)  

Farmers should be more in touch with schools (all sorts of farmers not just
Food-growing in schools

Governments need to lead this - it after all fits with a sustainable future. **Teacher**

The pupils all love to be out in the garden and enjoy planting, seeing things grow and harvesting crops. We need to be better organised in terms of storing and accessing tools, gardening gloves etc and labelling what is in the ground. **Teacher**

Supermarkets and businesses connected to food/growing (eg restaurants/fast food outlets/garden centres/farms/wholesalers/factories and processing plants) - but not just those - could do a lot more in a proactive way rather than schools having to approach them and perhaps should now be expected to do so and evidence what they do to Governments via business plans/tax returns/accounts and reports which should now include what they are doing to contribute to improving and enhancing the health of our society. **Teacher**

Appendices
APPENDIX 11 - Information About The Respondents Who Made Comments

Age

There were many more comments from respondents who were 40 - 49 (33%, n=32) and 50 -59 years old (48%, n=46) than from younger respondents (Figure 1).

Figure 1 Age of person who made Comments
Sex

Figure 2 Sex of those who made comments

- Nearly six times more comments came from female than from male respondents. This is consistent with the responses to the questionnaire as a whole.

Role in the school garden

Figure 3 Role in the garden of those who made comments

Appendices
Food-growing in schools

- 27% of those who made comments were headteachers and 57% were teachers which is consistent with the figures of 27% headteachers and 55% teachers who completed the questionnaire.

Gardening experience

![Gardening Experience of Respondents](image)

- Again, the results were proportionately similar to the proportions in each category responding to the questionnaire as a whole with 51%, n=49 having life-long gardening experience.
- 22% (n=21) were prepared to learn as they worked on the project

Schools from which comments were obtained

The proportions of comments from Local Authority, Independent and Grant- aided schools and between Primary, Secondary and Special schools mirrored the proportions of these schools which completed the questionnaire.
Food-growing in schools

School type

![Graph showing school type distribution: 66% Primary, 29% Secondary, 6% Special.]

*Figure 5 School Type - Comments*

66% of the schools are Primary schools, 29% Secondary schools and 6% Special schools as in *Figure 5*.

Funding type

![Graph showing funding type distribution: 85% Local Authority, 6% Independent, 3% Grant-aided.]

*Figure 6 Funding Type – Comments*

Appendices
Food-growing in schools

Of the schools which answered this question, 88% are Local Authority, 6% Independent and 3% Grant-aided.

Urban/Rural classification

![Figure 7 Urban-Rural Classification – Comments](image)

The majority of schools that made comments are from urban areas.
Social deprivation

The majority of responses came from schools with low numbers of pupils from deprived areas.