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Report submitted to Defra

Food Growing Activities in Schools

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November 2011

Contents

Acknowledgements

Executive summary

This summary outlines the findings of two complementary research activities 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: a review of relevant UK and international literature related to the impacts of food growing in schools activities (undertaken between June and September 2011); and a baseline survey of the extent and nature of food growing activities in schools and early years[1] settings (undertaken between August and September 2011). Both activities aimed to inform the work of the Food Growing in Schools Taskforce.

Research objectives:

The two research activities were undertaken to investigate the following objectives:

The review examined: the impacts of food growing in schools activity for pupils, schools and communities; indicators of how the potential of school-based food growing can be realised and sustained; and the cost benefits of food growing in schools activity.

The survey examined: the extent to which schools and early years settings are involved in food growing activities; the nature and extent of their involvement; and how embedded food growing is within institutions.

Research methods:

The review was underpinned by a systematic process for item searching, selection, screening, coding, appraisal and synthesis that resulted in 50 'key items' for review. Additionally, a panel of experts, comprising key members of the Taskforce, provided information on the impacts of food growing in schools, by means of an open-ended questionnaire. Within this summary, specific terminology is used to describe the robustness of the review evidence appraised[2]:

Research confirms – where there is strong evidence of impact.
Research indicates – where there is modest evidence of impact.
Research suggests – where there is only impressionistic evidence of impact.

The paper survey comprised a short questionnaire for senior leaders, which was piloted during August. The survey was sent to a total of 4479 institutions during the first full week of the new term (5th September 2011) and was in the field for two weeks. The anticipated response rate of 25 per cent was exceeded, with a final response rate of 29 per cent (1302 institutions). All responding primary and secondary schools and early years settings are representative of the population of the schools based on region, phase and urban and rural areas. As with all surveys,

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[1] Nursery schools are included in the early years settings sample.
[2] A full explanation of these terms is provided in Section 2 of the full report.

response bias could affect the data. However, a chi square significance test was carried out and found that the responding primary, secondary schools and early years settings are representative of the overall population based on region and type. Data were analysed using the statistical software package, SPSS, in order to consider differences in responses between educational phase, region and institutions in urban and rural areas.

Review findings:

The review considered the following impacts for pupils, schools and communities, and revealed various indicators for realising and sustaining growing potential:

Health impacts:

Research confirms that food growing programmes have positive impacts on pupil nutrition and attitudes towards healthy eating. The literature also indicates that various social wellbeing outcomes are associated with food growing programmes, especially for lower ability pupils or those who have become disengaged from learning. The research only suggests that food growing programmes can contribute to improved physiological, and physical fitness outcomes.

Educational impacts:

Robust academic studies confirm that the main educational impact of food growing activity is on pupils' scientific knowledge. A smaller number of studies also indicate improved mathematics and language outcomes, and educational impacts for particular types of pupils, including primary, SEN, lower ability, and disengaged, pupils. The literature suggests that there can be positive impacts on pupils' motivation for school and learning. A number of studies indicate the potential of food growing in schools to build links between schools and their local communities.

Knowledge, skills and behavioural impacts:

Research confirms that food growing in schools activity has a positive impact on students' horticultural and scientific knowledge. It also indicates that there can be an impact on pupils' environmental awareness. Very few studies provide insights into the extent to which pupils had developed practical gardening skills. There is also little evidence of an improved awareness of horticultural career options.

Cost benefits:

Evidence of the cost benefits of school-based food growing activity is extremely limited. Where studies report benefits and costs, they are limited by their design. No robust cost benefit analyses or value for money assessments have been undertaken.

Indicators for realising and sustaining the potential of activity:

A perceived lack of staff time currently stands as a major obstacle and a range of school support, including practical assistance, information and guidance would be beneficial. Support can be found within the local community, through specialist horticultural organisations, and through improved links with pupils' families. Senior leadership support is essential. Leadership must also be dispersed so that there is at

least one coordinator, and ideally, a staff team with dedicated responsibility for growing activity, in addition to their other school-level activities.

Food growing is also most successful where links are made between the growing activity and whole-school agendas, the academic curriculum, and desired pupil outcomes. Professional development opportunities for staff on approaches to integrating growing activities with existing curricular approaches would be beneficial.

Review conclusions:

Almost all appraised sources reported specific positive impacts for pupils, schools and communities. Only one study identified potential negative impacts. On the key measures that many programmes and evaluations were established to investigate (pupil nutrition, scientific attainment, and horticultural knowledge), there is strong evidence of positive impact. This makes a compelling case for food growing activity having a place within schools. Two caveats need to be noted, however. First, most evidence emanates from overseas, and will not necessarily be transferable to the UK. Second, most evidence relates to outcomes for primary-aged pupils. Less research has been conducted looking at impacts for secondary-aged pupils.

From an assessment of the current 'gaps' in the evidence base, the case for developing food-growing in UK schools could best be enhanced by boosting research in areas that are most likely to be persuasive to schools and/or potential funders. These are most likely to relate to: cost benefits; long-term health benefits (particularly in terms of improved consumption of fruit and vegetables);[3] improved environmental awareness; and enhanced knowledge of horticulture as a career.

Survey findings:

The majority (80 per cent) of surveyed schools and early years settings currently grow food to varying degrees. Primary schools are more like to grow food compared to secondary schools and early years settings. Institutions in urban areas are more likely to participate in food growing activities than those in rural areas. In nearly one fifth of institutions there was very clear evidence that food growing activities are well embedded, with high-level policies in place and effective and wide-ranging curriculum integration.

Coordination of and involvement in food growing:

Most institutions have the support of senior leaders for food growing activities. Most frequently, food growing is coordinated by teaching staff, as reported by over two-fifths of respondents, although in seven per cent of institutions there is reportedly no one with responsibility for coordinating food growing. Around one quarter of institutions report that all children are involved in food growing; all teaching staff are

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[3] A large-scale randomised control trial, funded by the National Institute for Health Research, and conducted by researchers at the University of Leeds is currently underway and is assessing the impact of gardening as a tool to improve children's fruit and vegetable intake. Results will be published in 2012.

involved in 15 per cent of institutions; and all non-teaching staff participate in food growing in nine per cent of schools and early years settings.

Reasons for getting involved in food growing and barriers against involvement:

The most popular motivations for getting involved in food growing were to teach children about: the environment; where food comes from; and nutrition. The most frequently identified barriers to food growing were a lack of: curriculum time; personnel to coordinate activity; and personnel to supervise food growing activities. For those who were currently involved in food growing, the main barriers were perceived to be a lack of time in the curriculum (20 per cent) and lack of material resources (12 per cent).

Support for food growing:

Around half of respondents (49 per cent) indicated that parents had offered either formal or informal help to aid food growing. Almost a third of respondents indicated that a business had supported them and almost a fifth had been supported by another type of organisation or partner. Respondents were asked to indicate what types of support they had received to help food growing in the last year. Most frequently, respondents indicated that their institution had received material resources (e.g. plants, tools, buildings) followed by human resources (e.g. volunteers, parents) and funding.

Details about the nature of food growing:

- Almost all responding institutions (92 per cent) grow food in an outdoor plot/raised bed/garden onsite.
- Food growing has the support of senior leaders in 82 per cent of responding institutions.
- Around half of respondents' schools and early years settings grow food organically (52 per cent) or make their own compost (51 per cent).
- Just over half of responding institutions (54 per cent) ensure that food growing is accessible to children through extra-curricular clubs.
- Food growing is targeted at specific groups of children and young people in a quarter of respondents' institutions (26 per cent).
- Only seven per cent of respondents overall indicated that their institution grows food using a space in the local community.

Survey conclusions:

In conclusion, it is encouraging to see that the majority of primary schools, secondary schools and early years settings surveyed currently participate in food growing and are committed to doing so in the future, with many planning on expanding their food growing activity. The data provides a useful picture of the extent and nature of food growing in schools and early years settings and will be a useful baseline for measuring progress in the future.

1. Study objectives

This report presents the findings of a literature review undertaken by the National Foundation for Educational Research (NFER) on behalf of the Department for the Environment, Food and Rural Affairs (Defra) between June and September 2011. The review has been undertaken to investigate a number of objectives related to the potential benefits of food growing activities in schools. These objectives are summarised below and outlined in more detail in the following sections:

- Benefits for pupils, schools and communities.
- Indicators of how potential can be realised and sustained.
- Cost benefits.

1.1 Benefits for pupils, schools and communities

The review focuses on the following specific themes:

Health benefits:

- Improvements in healthy eating and nutrition (such as increased fruit and vegetable consumption and better awareness of food taste and type).
- Physiological benefits (such as better physical fitness and less sedentary lifestyles).
- Psychological and 'wellbeing' benefits (including improved mental health, enhanced emotional development and improved social interaction).

Educational benefits:

- Improvements in pupil achievement (including subject-specific benefits, as well as impacts on pupils' broader learning).
- Better pupil motivation (such as an improved attitudes towards school and study, higher attendance and better behaviour).
- Improved school-community interaction (including a stronger interplay between different stakeholders in school life: teachers, pupils, parents and the wider community).

Knowledge, skills and behavioural benefits:

- Improvements in pupils' knowledge and understanding of horticulture (including knowledge about relevant career paths and employment sectors).
- Enhanced practical gardening and growing skills.
- Better environmental awareness (including an understanding of issues such as: environmental responsibility; sustainability; and ecology).

1.2 Indicators of how potential can be realised and sustained

The review team was initially charged with considering the challenges to success in food growing activity associated with delivery at a local and national level (for example, related to costs, time and capacity, and staff expertise).

However, in the interests of learning as much as possible from the review about the potential of food growing in schools, and about how to sustain success, the review instead focuses on the factors that best **enable** the potential of food growing in schools' activities to be realised and sustained.

1.3 Cost benefits

Finally, the review examines the evidence base related to the cost benefits of food growing in schools activities.

A range of terminology is used when discussing the cost-benefits of programmes (for example, cost-effectiveness, value for money, cost-benefit analysis and social return on investment). These terms are often used generically, but cost-benefit analysis is probably the most useful and all encompassing in this context. Cost-benefit analysis seeks to express in monetary terms as many of the costs and benefits associated with a programme as possible. It has the advantage of being able to assess in absolute terms whether a programme's benefits exceed its costs (rather than, for example, cost-effectiveness analysis which only compares the relative performance of different programmes or a given programme in different settings). Furthermore, it provides a common metric with which a programme's impact on a range of outcomes can be aggregated to give an estimate of overall impact.

Although the review team scrutinised a large number of literature sources for this review, we found very little evidence of the cost-benefits associated with food growing in schools activities. This illustrates that few such analyses have been undertaken, rather than that such activities do not have the capacity to have cost benefits.

1.4 Survey of food-based growing activity

Running alongside the literature review of food growing activity in schools, NFER also conducted a baseline survey of schools and early years[4] settings on behalf of Defra and Garden Organic during August and September 2011.

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[4] Nursery schools are included in the early years settings sample.

Prior to this survey, no national robust data existed on food growing activities in schools or early years settings. The baseline survey was therefore commissioned to find out the extent of current food growing activity in schools and early years settings with a view to addressing the evidence gap and supporting the Food Growing in Schools Taskforce and Defra in their work with education institutions.

The overall aim of survey was to establish:

- whether schools and early years settings are involved in food growing activities
- the nature and extent of their involvement
- how embedded food growing is within institutions.

Specifically, the survey sought information on:

- the length of time schools and early years settings have been involved in food growing
- the nature of food growing activities
- who, within the institution and its community, is involved in food growing activities
- the types of support institutions receive to help food growing
- the motivations for and barriers associated with food growing
- plans for future food growing activity.

2. Policy and research context

2.1 Policy context

In 2006 the, then, Department for Children, Schools and Families (DCSF) launched the Learning Outside the Classroom Manifesto (DCSF, 2006), which stated that '*every young person should experience the world beyond the classroom as an essential part of learning and personal development, whatever their age, ability or circumstances*'. The Manifesto, which built upon earlier initiatives in England such as *Growing Schools* (Department for Education and Skills, 2003), emphasised the benefits of learning outside the classroom (in areas including school grounds and gardens) to raising pupils' academic achievement, improving attitudes to learning, and increasing motivation.[5]

In 2009, Defra led a round table discussion to consider a strategy for increasing the domestic consumption of fruit and vegetables. One of the outcomes of this discussion was a manifesto, produced by the Children's Food Campaign, entitled *Every School a Food Growing School.* This manifesto aims to persuade the Department for Education (DfE) to ensure that all, not just some, children should be able to *'reap the benefits'* of involvement in food growing activity in schools (Sustain, 2010, p. 1). There is concern that some schools are making advances in food growing, with a number of positive benefits, but that children in other schools are missing out on such an opportunity. The report concludes:

> *The beacons of good practice highlighted in this report indicate how food growing would have major benefits for our society if it took place in every school. But for that to happen, we need help from government. We would like the Department for Education to discuss with us, in our expert capacity, how to provide food-growing opportunities in all schools* (Sustain, 2010, p. 13).

The Manifesto also called for the establishment of a Taskforce, to bring together relevant experts within the public, private and voluntary sectors, to identify, develop and promote solutions to enable every school to become a food growing school. A Food Growing in Schools Taskforce was established early in 2011, led by Garden Organic. This Taskforce is currently compiling evidence for a report that will be published in the autumn of 2011.

The pressure on governments to develop opportunities for food growing in schools is not unique to England. In 2010, the Food and Agriculture Organisation of the United Nations produced a report outlining the vital role that school gardens have to play,

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[5] An Ofsted evaluation of 2008, found that only six of 22 schools visited in England had a detailed knowledge of this manifesto (Ofsted, 2008).

across the globe, in promoting good nutrition, academic achievement and a range of wider skills. The report's authors comment:

> [School gardens] *have traditionally been used for science education, agricultural training or generating school income. Today, given the urgent need for increased food security, environmental protection, more secure livelihoods and better nutrition, perceptions of the potential of school gardens is changing…The belief is that school gardens can become a seed ground for a nation's health and security; this idea is increasingly backed up by experience and research* (Food and Agriculture Organisation of the United Nations, 2010, p. 3).

There have been a number of reports providing case-study examples of good practice in school-based food growing, with indications of benefits for schools, pupils and communities (for example, those produced in the Sustain, 2010 report). However, as yet, there has not been a comprehensive evaluation of the evidence base on the impacts of food growing in schools. In support of the work of the Food Growing in Schools Taskforce, and its wish to collate evidence of impact, Defra has now commissioned NFER to undertake this literature review on the benefits of food growing activity in schools for pupils, schools and the wider community.

2.2   Research context – a technical note

Within this review we use specific terminology to describe the robustness of the evidence appraised for the themes under discussion. The terminology used is outlined and explained below:

2.2.1 Strong evidence

In order to make statements about there being a 'strong' evidence base on a particular theme, we seek to ensure that a number of studies have been produced that concur in their findings. We expect these studies to be sufficiently large in scale (for example adopting adequate sample sizes to enable robust statistical analysis), or based on sufficiently in-depth case studies to allow a full explanation of findings. Typically, 'strong' evidence will include:

- **Quantitative research** that 'measures' changes in pupil or school outcomes as a result of a food growing activity. Such studies usually adopt quasi-experimental designs (QEDs) involving baseline and follow-up surveys, or treatment and control group designs, as well as statistical analysis.
- **Qualitative research** that provides data on perceptions of impact. The most reliable studies of this type are those that have conducted a number of in-depth case studies, across a number of locations, drawing on the views of a wide range of stakeholders, and 'triangulating' those views in order to assess the degree of agreement, or dissent, among different individuals in varying locations.

2.2.2 Modest evidence

The same types of evidence as those cited above are included in this category. The distinction between a theme being described as having a 'strong' or a 'modest' evidence base is related to the following points:

- **The weight of evidence** – themes with 'modest' evidence are likely to have only a small number of (typically two to three) studies that concur in their findings. There may also be some studies that present a contradictory view.
- **The quality of evidence** – themes with 'modest' evidence may include studies with rather small sample sizes (for example, QED studies based in only one or two schools), or qualitative studies that have drawn on the views of certain, but not a full range of, stakeholders.

2.2.3 Impressionistic evidence

As this title suggests, this category includes evidence that is based on the observation or opinion of those involved in food growing activities. Very often, we find impressionistic evidence of one particular pupil benefit within a study that was established to evaluate an entirely different benefit. An example of this might be that the authors of a QED study looking into the nutritional benefits of a school growing programme, also undertook an informal discussion with the school's Headteacher, who commented that children's self esteem appeared to have been raised as a result of their involvement. Such findings cannot be dismissed entirely, but they tend to be anecdotal, subjective or descriptive in nature.

In response to the categories above, the authors have, throughout this report, used the following statements:

- *Research confirms* – used where there is strong evidence of impact.
- *Research indicates* – used where there is modest evidence of impact.
- *Research suggests* – used where there is only impressionistic evidence of impact.

3. Methodological approaches

3.1 Review Methodology

Sections 4 and 5 of this report are based upon a systematic review of relevant UK and international literature related to food growing in schools activities. The review is underpinned by a systematic process for item searching, selection, screening, coding, appraisal and synthesis.

Details of the systematic search that was undertaken for this review are provided in Appendix B. Following searching, the review team adopted a four-stage process to filter the search results. This process is outlined in detail in Appendices C and D, but in brief, it consisted of the following:

- **Screening** – all identified items were uploaded into an Eppi Reviewer[6] database, then 'screened' for relevance on the basis of information provided in abstracts.

- **Coding** – based on a detailed coding frame, all items included as a result of the screening exercise were 'coded' in detail to establish whether or not they should be included in the review. Fifty 'key items' were identified as a result of this process.

- **Appraisal** – Using a detailed appraisal template for each selected item, the review team read and summarised each item under a number of key headings related to programme detail, research design, study findings, and relevance to the review. This helped us to assess the quality and relevance of each item.

- **Synthesis** - Having appraised the key literature items, the review team began synthesising the literature. This involved analysing the reviewed data in order to draw out emerging themes, patterns, and key messages. The synthesis was guided by the research objectives outlined in Section 1 of this report.

In addition to the literature review, Sections 4 and 5 of the report also draw upon information provided by a panel of experts – selected members of the Food Growing in Schools Taskforce, who have steered and supported the work of the review. The panel was asked to complete a questionnaire, during August 2011, which asked for their expert perceptions on all the themes covered by the study's objectives. Findings from this questionnaire are presented throughout this report, alongside evidence from the literature review. The expert panel was also consulted about the key items selected for the review and helped to steer the content of this report, based on a presentation of headline findings discussed in early September 2011.

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[6] Eppi Reviewer is a software system developed for the upload, screening and coding of literature items for review.

3.2 Survey Methodology

Section 6 of this report is based upon the baseline survey in schools. During August 2011, the research team designed a short paper-based questionnaire for senior leaders or other individuals with responsibility for food growing activities in schools and early years settings. The survey was piloted with a small number of practitioners representing primary and secondary schools and early years settings during August. The Advisory Group commented on the survey throughout this phase of the work. The survey was sent to a total of 4479 institutions during the first full week of the new term (5th September 2011) and was in the field for two weeks. During the survey period, a fax reminder and targeted telephone calls to institutions were carried out to help achieve the desired response rate of 25 per cent. An overall response rate of 29 per cent was achieved.

Data were analysed using the statistical software package, SPSS, in order to consider differences in responses between educational phase, region and urban and rural areas. Assuming that our data is representative of the population at large (and we have no evidence to suggest otherwise) we can calculate the precision of results from each of our samples based on the number of respondents. The smallest number of respondents is for the secondary school sample[7] where we have 376 respondents. In this case we can calculate that all results based on the full sample will be precise to within (at worst) plus or minus 5 percentage points. This means that we are 95 per cent sure that if we were to collect results from all secondary schools in the country the results we would get would be within 5 percentage points of the results presented in this report. We have marginally more respondents within the primary school and early year and nursery samples and hence can be even more confident about our results. For this reason, **within any of our samples[8], the precision of results based on all respondents will be precise to within, at worst, plus or minus 5 percentage points.**

Certain questions within the survey were filtered[9] and in these cases the number of respondents to questions may be much smaller. In these cases we may need to be more cautious about the precision of the percentages presented within the report. The table below gives a rough guide to the level of precision that can be attributed to each table based upon the total number of respondents. For example, if a table is based upon just 40 respondents we can only be sure that the percentages within that table are correct to within plus or minus 16 percentage points.

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[7] That is, the sample of schools with pupils in either year 8 or year 10. This includes a number of special schools.
[8] That is primary, secondary or early years and nursery.
[9] That is, only answered by a subset of respondents within each sample.

Number of respondents	Precision of estimates in percentage point terms
30	18
40	16
50	14
75	12
100	10
150	9
200	7
300	6
400	5
650	4

Table A below shows the numbers of surveys despatched, the number returned and the response rate for schools and early years settings. The anticipated response rate of 25 per cent was exceeded.

Table A   Number of survey respondents

Education phase	Number of surveys sent	Number of respondents	Response rate (%)
Early years settings	1519	506	33
Primary schools	1520	422	28
Secondary schools	1440	374	26
Total	4479	1302	29

Source: Food growing in schools and early years settings: baseline survey 2011.

All responding primary and secondary schools and early years settings are representative of the population of the schools regionally. There is no statistically significant difference in institutions' involvement in food growing across the three regions (north, midlands and south). However, statistically, primary schools are more likely than early years settings and secondary schools to grow food. Institutions in urban areas are significantly more like to be involved in food growing compared to those in rural areas.

Throughout the report, any noted differences in responses between early years settings, primary schools and secondary school respondents and those in urban and rural areas are statistically significant.

As with all surveys, response bias may affect the data. This means that survey respondents could differ from those who were sent a survey and chose not to respond. As a result, the data may suggest that a greater proportion of schools and

early years settings are involved in food growing than is true (i.e. respondents from institutions involved in food growing may have been more likely to respond to the survey than those not growing food). The issue of non-response bias has not been examined (due to resources) so we cannot be sure; however the authors of the report are confident that the data represents the overall population. We tried to minimise the potential risk of non-response bias by making explicit in all correspondence that we wanted a response from settings regardless of their current involvement in food growing.

4. Benefits for pupils, schools and communities

This systematic review of food growing activities in schools has shown that, across those topics on which evidence is available, the evidence base is almost entirely positive. Food growing is shown to be a worthwhile activity with the potential to lead to a number of impacts on, and benefits for, participants. The review focuses on the following specific themes: health benefits; educational benefits; knowledge, skills and behavioural benefits; and cost benefits.

Key findings

Distribution of evidence of impact across the literature

- **The strongest evidence of impact** relates to: health and educational outcomes (including healthy eating and nutrition) and academic attainment (especially science and horticultural knowledge)
- **Modest evidence of impact** relates to: psychological and well-being outcomes; enhanced pupil motivation for school; better school-community links; and improved environmental awareness
- **Impressionistic evidence of impact** relates to: physiological benefits; knowledge of horticultural careers; enterprise activity; practical food growing skills and cost benefits.

Health benefits

- Robust academic studies confirm that food growing programmes can have positive impacts on pupil nutrition and attitudes towards healthy eating, specifically related to willingness to try new foods and taste preferences.

- The literature suggests food growing programmes can contribute to improved physiological outcomes, as young people become more physically active. While much of this evidence is anecdotal, the small number of studies which have attempted to measure actual changes in physical exercise among children have indicated positive results.

- The literature indicates that various social wellbeing outcomes are associated with food growing programmes. These include improved social interaction, enhanced self-esteem, better interpersonal relationships and positive behavioural changes. There is little evidence from quantitative, peer reviewed studies in relation to these 'soft' (not easily measurable) outcomes.

- Much of the research into the psychological outcomes of food growing programmes indicates a particularly beneficial effect on lower ability pupils or those who have become disengaged from learning.

Educational benefits

- Around half of the research studies in this review refer to the impact, or the potential impact, of food growing programmes on pupils' academic attainment. Studies indicate that food growing programmes can help children make sense of concepts they have learnt elsewhere, enhancing their wider learning and improving attainment across the curriculum.

- Robust academic studies confirm that the main educational benefit of food growing in schools is on pupils' scientific knowledge and understanding. Improvements stemmed from: the ease with which food growing activities can be linked to the science curriculum; the ability for food growing activity to positively enhance the science curriculum; and the capacity for food growing to positively influence teaching and learning.

- A smaller number of studies also indicate improved mathematics and language outcomes, and the educational benefits of growing programmes for particular types of pupils, including primary aged pupils, pupils with SEN, lower ability pupils and young people disengaged from learning. Much of this evidence however is qualitative and includes varying sample sizes.

- The literature suggests that involvement in food growing activity can positively impact on pupils' motivation for school and learning. Impacts on pupil motivation were often perceived or observed by individuals involved in growing in school programmes and included increased enthusiasm and engagement for school and learning, increases in school attendance and better completion of homework.

- A number of studies indicate the potential of food growing in schools to build links between schools and their local communities. The evidence base is however generally qualitative and sometimes subjective.

Knowledge, skills and behavioural benefits

- A reasonably large body of literature confirms that food growing in schools programmes has an impact on students' horticultural and scientific knowledge. These outcomes, however, tend only to be observed where growing programmes have been established with a specific objective to develop horticultural knowledge.

- The literature also indicates that food growing activities can have an impact on pupils' environmental awareness. This literature tends to be based on individual case studies and often reflects the impressions of practitioners rather than offering objective measurement or evaluation.

- Very few studies provide insights into the extent to which pupils had developed practical gardening skills. This is not to say that pupils are not developing a range of relevant skills; rather that this has rarely been the subject of evaluation, or of practitioner comment or appraisal.

- There is also little evidence that participation in food growing in schools activities translate into an improved awareness of horticultural career options, or to an increase in the numbers of young people actually adopting horticulture as a career. Qualifications and subsequent careers in horticulture are generally referred to in the literature as routes for less academically engaged or able students.

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Cost benefits

- Evidence of the cost benefits that can accrue for schools and communities from involvement in school-based food growing activities is extremely limited. Where studies do report benefits and costs, they are limited by their design. No robust cost benefit analyses or value for money assessments have been undertaken.

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This chapter presents literature review findings of the impacts of food growing activities. Impacts have been categorised into the following themes:

- Health benefits
- Educational benefits
- Knowledge, skills and behavioural benefits
- Cost benefits.

These aspects are discussed in the following sections.

4.1 Health benefits

Given the problems of childhood obesity in Western society and concerns about children leading an increasingly sedentary lifestyle it is unsurprising that a large number of studies identified during this review examined the health benefits associated with food growing in schools. Blair (2009) notes that *'to decrease the threat of the obesity epidemic, children need to broaden their perspective on what foods are edible and to repersonalize food'* (p. 18). The main areas of interest to researchers were concerned with the effects of food growing programmes on knowledge and awareness of nutritional issues and healthy eating, including:

- pupils' willingness to try new foods and changes to their taste preferences
- pupils' recognition of fruit and vegetables
- pupils' actual consumption of fruit and vegetables.

A small number of studies have attempted to measure **physiological outcomes**, such as changes in the amount of physical exercise undertaken by children involved in growing activities. Many of the studies also identified **psychological or 'social wellbeing' outcomes** associated with food growing programmes, including improved social interaction, enhanced self-esteem, better interpersonal relationships and positive behavioural changes. These aspects are discussed in turn below.

4.1.1 Healthy eating and nutrition

There have been a number of studies, adopting quasi-experimental designs such as pre- and post-intervention analyses, treatment and control group approaches, or both, mainly in the USA and to a lesser extent in Australia that have looked at the impacts of food growing on pupil nutrition[10]. These studies confirm that there is positive impact in relation to: willingness to try new foods and broader taste preferences; and improved recognition of fruit and vegetables. Research also indicates that children's consumption of fruit and vegetables can be positively affected by involvement in growing activities. These findings are explored in greater detail below.

Willingness to try new foods and taste preferences

A study of 320 sixth grade students in the USA, involved in a food growing programme over a four month period (Ratcliffe *et al.,* 2011) found that **students were more willing to taste**, and ate a greater variety of, vegetables than those in the control group. Similarly, Lineberger and Zajicek (2000) reported more positive attitudes towards vegetables and an increased snack preference for fruit and vegetables amongst third and fifth grade students involved in a hands-on school gardening programme. In a study of 115 children in six second grade classes, Parmer *et al.* (2009) found that participants in nutrition education, and nutrition education and gardening groups exhibited significantly greater improvement in nutrition knowledge and taste ratings than did participants in the control group.

An Australian study of 127 11-12 year olds found that pupils who had received a 10 week nutrition education and a gardening programme were more willing to taste vegetables and rated the taste more highly than the control group, suggesting that '*garden-enhanced nutrition education can positively influence vegetable preferences at a crucial stage when life-long eating habits are being formed*' (Morgan *et al*., 2010, p. 8). Similarly, a well-designed quasi experimental study among 200 students (9 classes from 3 schools) found that fourth grade children's knowledge and preferences towards some, but not all, vegetables were greater in schools in which a school garden-enhanced nutrition education curriculum was implemented (Morris and Zindenberg-Cherr, 2002).

The longitudinal evaluation of the Stephanie Alexander Kitchen Garden (SAKG) Programme in Australia (Block and Johnson, 2009) also found an increased willingness to try new foods amongst participating pupils. The programme involved 770 children, their parents and teachers from six schools in a three year food growing and cooking programme. The programme outcomes were compared with those from six schools with food growing activities, but limited or no cooking programmes.

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[10] A large-scale study is currently underway in the UK, funded by the National Institute for Health Research, and conducted by researchers at the University of Leeds. Comprising two large-scale randomised control trials, this study aims to assess the impact of gardening as a tool to improve children's fruit and vegetable intake. The baseline activity has already been conducted for both trials, and results from the follow-up activity will be published in 2012.

Children in focus groups reported enjoying trying new foods and commented on freshness, better taste and organic growing. Parents reported a similar increase in children's willingness to try new foods (33 per cent at follow-up compared to 27 per cent at baseline) and to consume more vegetables. Child questionnaire data underlined this with an increase from baseline to follow-up in willingness to try (if they had grown it), from 26 per cent to 39 per cent. One other interesting finding was that children's ability to describe food in a sophisticated way increased vastly from 9 per cent at baseline to 53 per cent at follow up. This indicates that involvement in a **food growing and cooking** programme can contribute to developing children's palates and their ability to evaluate and appreciate a variety of foods.

Morris *et al.* (2001) found that at post-test, intervention students were more willing than a control group to taste spinach, carrots, peas, broccoli, zucchini and red bell pepper. A strength of this study was that it provided information about young children's willingness to taste vegetables grown in the garden. However, the authors stipulated that their limited number of taste-testing opportunities may have influenced preference results, although it is unclear how many taste testing opportunities children received.

Qualitative research into the effect of school food growing programmes on pupils' taste preferences and willingness to try fruit and vegetables also confirms the beneficial effects of such interventions. Recent evaluations of the Food For Life Partnership (FFLP) (Teeman *et al.*, 2011; Barratt Hacking *et al.*, 2011) report an increased willingness to try new vegetables and that schools involved in the programme made links between healthy lifestyle and their FFLP work. The positive experiences of schools involved in the project led researchers to conclude that:

> *the importance of being able to grow and taste crops cannot be overstated, as it plays a hugely significant psychological role in the story of good food, and represents an experience which is only available to a minority of children outside school.* (Barratt Hacking *et al.*, 2011, p. 21).

Recognition of fruit and vegetables

There is further confirmatory evidence that food growing programmes are effective in increasing children's recognition of different vegetables. With regard to fruit and vegetable identification, Parmer *et al.* (2009) found statistically significant gains in tested vegetables for participants in a nutrition education with gardening treatment group when compared to nutrition-education-only and control groups. These participants were better able to identify spinach and cabbage after participation than those in the other two groups. Somerset and Markwell (2009) reported similar results as regards recognition. The research team evaluated a 12-month intervention in an Australian primary school, in which food garden-based activities were integrated into the curriculum by a teacher co-ordinator, especially funded for the project, using a control group as comparison. They found an enhanced ability to identify individual vegetables, and changes to perceived consumption among the intervention group,

although, conversely they noted a decreased interest in trying new fruits amongst the same group. Reviewing the RHS Growit project, Woolner and Tiplady (2009) noted that responses to a pupil questionnaire in one participating school, administered at the beginning and end of an academic year, revealed a very clear increase in the numbers of vegetables that respondents could name and reported having tried.

Actual consumption of fruit and vegetables

An examination of the evidence of increased post-intervention vegetable consumption reveals a more mixed picture. A number of studies have demonstrated that increased consumption of vegetables can result from school-based food growing activities. An evaluation of the School Fruit and Vegetable scheme (SFVS) (Ransley *et al.*, 2010) found that, in schools running food growing clubs, children ate more vegetables and that intake was higher if parents were involved in the initiative. In a survey of 43 third and eighth grade, mainly Native American, students in the USA (Hermann *et al.*, 2006) who had participated in a food growing initiative, there was a significant self-reported increase in daily vegetable consumption (44 per cent compared with 21 per cent before the intervention). Similar results were reported by McAleese and Rankin (2007), where adolescents who participated in a garden-based nutrition intervention increased their servings of fruits and vegetables more than students in nutrition-education-only and control groups. Significant increases were also found in vitamin A, vitamin C, and fibre intake. Wang *et al.* (2010) and Joshi *et al.* (2008) also reported significant increases in vegetable consumption due to food-growing activities.

The UK quantitative evaluation of the FFLP (Orme *et al.*, 2011) found that the take-up of school meals increased over the period of the evaluation, with free school meal take-up increasing by 13 per cent. Children reporting eating an average of four or more portions of fruit and vegetables a day increased by 12 percentage points from 37 per cent to 49 per cent. However, it must be remembered that the food growing is just one element of the FFLP.

Other studies examined for this review (Ratcliffe *et al.*, 2011; Lineberger and Zajicek, 2000; Morgan *et al.*, 2010) found that vegetable consumption did not increase as a result of these otherwise successful food growing programmes. The researchers conclude that additional programmes and interventions would be required in order to change children's eating habits in the long-term. Nevertheless, they were encouraged by the increased preference for vegetables as this has *'been found to be one of the strongest predictors of future vegetable consumption.'* (Morgan *et al.*, 2010, p. 8).

Indeed, all the studies examined for this review only considered whether pupils' consumption habits had changed as an immediate effect of their involvement in growing and there is a lack of longitudinal evidence research confirming whether such programmes can change eating habits in the long term.

Overall, the evidence confirms that food growing programmes can have positive impacts on pupil nutrition and attitudes towards healthy eating, specifically related to willingness to try new foods and taste preferences. However, the most robust, quantitative evidence emanates from the USA and for the most part involves pupils of primary school age.

4.1.2 Physiological benefits

In contrast, the literature is only able to suggest that there can be positive physiological outcomes for pupils involved in food growing activities. The perceptions of those involved in the programmes are often that they contributed to making young people more physically active and facilitated access to fresh air and outdoor spaces. However, much of this evidence is, by nature, anecdotal and has not been robustly tested. A small number of studies have attempted to report on physical activity levels in relation to food growing programmes. An evaluation incorporating a survey of 1,300 teachers and an in-depth study of ten schools suggested that physical tasks such as digging and weeding taught children *'colourful new ways to stay active'* (RHS, 2010a, p. 12) and teachers said that children involved in school gardening activities took more responsibility for their own physical health. Children involved in an after-school gardening programme (Hermann *et al.*, 2006) self-reported a significant increase in physical activity levels (79 per cent at post-intervention compared to 51 per cent at pre-intervention).

While many of the studies consider physical activity alongside other outcomes, one piece of action research described in the case study below is an example of research solely focussed on physiological outcomes.

Vignette - Physiological benefits of food growing

The study (Phelps *et al.*, 2010) evaluated the effects of the Oklahoma Cooperative Extension Service after-school gardening programme on the self-reported physical activity levels of children in third to fifth grade using an activity self report instrument. The activity instrument described and demonstrated three physical activity levels: non-movement; moving; and fast moving. The gardening and education programme content was offered, throughout the school year, for three days after school each week. Children actively participated in planning, fertilizing, mulching, watering, weeding, and harvesting and used the garden equipment as a means to increase physical activity. Prior to and on days in which they were not participating in the gardening programme, children were able to indulge in free play outside or remain inside and do homework, visit friends or participate in other inside activities.

One week before the programme started, children participating in the after-school gardening programme completed a pre-test questionnaire. Following this, the level of activity during the after-school gardening programme was evaluated by means of a self-report instrument which assessed the previous day's physical activity levels during ten distinct periods. Each level was demonstrated in a short five second video clip. Eight weeks later, the same children completed a post-test questionnaire, the day after participating in the gardening programme for that week. The questionnaire asked the children to identify the physical activity level at which they participated during the identified period.

Results of the action research showed statistically significant differences between pre- and post-test scores of children's self-reported physical activity level. There were a greater number of children moving at the post-test period compared to the pre-test period. These findings led researchers to claim that after-school gardening programmes can positively influence children's activity levels and can also establish sustainable efforts that promote healthful behaviour change. However, it should be noted that the sample size was small - 31 children (17 female and 14 male) in only one school. The results must therefore be treated with some caution.

4.1.3 Psychological and 'wellbeing' benefits

Many research studies indicate a number of psychological or 'wellbeing' outcomes of food growing interventions and gardening programmes. Much of the evidence offered is qualitative in nature and based on interviews and surveys of teachers, pupils and volunteers which examine their perceptions and observations. When referring to the benefits for pupils, adults use a variety of different terms, often interchangeably. The evidence is summarised in the grid below:

Increased confidence, resilience, self-esteem and calm
A review of outdoor learning (Rickinson *et al.*, 2004), not solely focussed on food growing, reported increased confidence and a greater sense of belonging amongst pupils involved in schools grounds projects. This theme is echoed in the 2010 study by the RHS which examined the role of gardening in children's wellbeing, learning and overall development. This study reported that gardening projects boosted self-esteem or 'self-worth', confidence and motivation and improved concentration by providing a calm space to learn – *'classroom pressures such as deadlines and neatness were less obvious outside'* and that *'waiting for crops to grow taught the value of patience.'* (RHS, 2010a, p.10). Cutter-Mackenzie (2009) reports a similar phenomenon in an evaluation of a programme which used food growing as the focus of an environmental education programme in disadvantaged schools in Australia, referring to pupils 'slowing down' in the garden, in contrast to other aspects of their daily life which could be rushed and frantic.

Desmond *et al.* (2009) describes a project in Ethiopia which involved elementary and high-school students in on-site gardening, focusing on food production, vocational training and environmental education and the use of garden produce in two on-site restaurants. Staff involved noted increased self confidence and self worth as benefits for the students.

A web survey of 320 adult volunteers participating in gardening activities with children and young people (Waliczek *et al.*, 2000) reported benefits such as greater self-esteem and social well being. A similar point is made by Pranis (2005) in an analysis of five separate school gardening research studies. One of these studies, the GrowLab programme, which involved third and fifth grade classrooms in garden-based curriculum activities, reported increased responsibility, cooperative behaviour, pride, confidence and self-esteem. Another study into the effects of gardening over a three-year period on self esteem, social skills and behaviour reported an increase in self-esteem in year one which remained high during the next two years. In the same study teachers reported that behaviour often or always improved when growing was the learning context.

Development of social or life skills, interpersonal relationships and sense of belonging

Many studies suggest that social and interpersonal benefits can accrue from food growing activity, but few offer hard evidence of outcomes. In a literature review for a research thesis on experiential learning in school gardens (Huckestein, 2008), the authors conclude that gardening programmes provide pupils with *'countless life skills'* (p. 3) and suggest that school gardens can encourage teamwork and cooperation towards a common goal. Similarly Ozer (2007), in a review of literature examining the effects of school gardens, refers to anecdotal evidence from garden coordinators and teachers describing an improvement in pupil attitudes, a sense of belonging illustrated by references to *'our garden'* and troubled or isolated pupils *'finding refuge'* in the garden.

Two studies from the USA, however, attempted to measure some of these 'softer' outcomes in a robust way. One was a study of 281 students in five schools participating in a one year school garden programme (Robinson and Zajicek, 2005). Researchers used a Youth Life Skills Inventory (adapted from Townsend and Carter, 1983) and the 3-H National Youth Assessment Survey (Peterson *et al.*, 2001) to assess life skills. The study found that students in the control group had significantly higher life skills at pre-test than the experimental group[11], but post-test scores were no longer significantly different, suggesting that the scores of the experimental group had increased. There was no significant difference between the control group's pre-test and post-test scores, but the experimental group did significantly increase overall life skills scores by 1.5 points following participation in the garden program.

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[11] This raises a question about the design of this study. It is not clear that the 'control group' provides an accurate comparison to the experimental group.

Two internal life skill scales were also '*positively influenced'* - 'working with groups' and 'self understanding'.

The other study (Waliczek *et al.*, 2001) sought to evaluate whether children participating in food growing activities benefitted from improvement in interpersonal relationships. No significant differences were found between the control and intervention groups. However, when analysed by grade, the study found that seventh grade students (ages 12-13) had the most positive interpersonal relationship scores. Teacher surveys indicated that the children were able to work independently, and displayed increased socialisation compared to the younger, more supervised children.

Specific outcomes for lower ability or disaffected pupils

Much of the research into the psychological outcomes of food growing programmes indicates a particularly beneficial effect on lower ability pupils or those who have become disaffected with learning. Saunders *et al.* (2011) noted the potential of growing activity to address the needs of particular students including those with Special Educational Needs, disaffected learners and students who struggled with more academic work. One school involved commented on the effect of the project thus: *'Although small, it projects a certain ethos to the school which extends beyond immediate users. At break times it provides a sanctuary for a number of students that have social difficulties within the main school environment. It is also used for students who for various reasons might otherwise be excluded.'* (p. 23). According to Ken Elkes of the Federation of City Farms and Community Gardens which works with around 100 schools across the UK to set up and tend their own gardens, pupils *'learn about self-esteem because they get pleasure and satisfaction out of seeing the results in their garden, which makes they feel better about themselves'* (quoted in Lepkowska, 2009, p. 2).

Qualitative evidence from Australia (Block and Johnson, 2009) indicates that pupils at the lower end of the achievement scale achieved the best outcomes from the Stephanie Alexander Kitchen Garden Programme. Children, parents and teachers all reported increased confidence, self-esteem and enthusiasm. Children also reported enjoying working in teams and felt they had improved in this respect and parents noted improved social skills. Finally, one study, which used the Coopersmith Self-Esteem Inventory (Pranis, 2004), measured underachievers' self-esteem, pre-and post-intervention. This study found that students in the experimental group, who had been involved in growing activity, had greater levels of self-esteem than control classes post intervention.

Understandably perhaps, given the 'soft' nature of the outcomes described in this section, robust evidence from quantitative, peer reviewed studies is lacking in this area. However, all the studies and evaluation reports which report on these types of outcomes indicate multiple health benefits from food growing programmes. Additionally, the adults involved in the studies suggest positive effects on children and young people's wellbeing, particularly in regard to building self-esteem, and confidence.

4.1.4 Information provided from the expert panel on health benefits

In addition to the analyses of published literature, outlined above, the panel of experts appointed to support this review was also asked to provide evidence of the health benefits of food growing in schools activity. Expert panel members provided information on a range of health benefits including evidence resulting from their direct involvement with schools participating in food growing programmes. Additionally, some panel members referred to studies included within this review indicating the importance and relevance of the key sources selected.

In line with the review findings, much of the information provided by the expert panel on the health benefits of growing in schools programmes also related to improvements in children's willingness to try new foods, to develop preferences for fruit and vegetables, and to increase their consumption of fruit and vegetables. This includes two academic studies cited in this review, which provide evidence that engaging in food growing activity promotes interest to try new foods (Barratt Hacking, *et al.,* 2011; Passy *et al.,* 2010) as well as other literature demonstrating the impact of gardening on attitudes towards dietary choice (Hackman and Wagner, 1990; Alaimo *et al.*, 2008). Panel members also provided anecdotal evidence that supported review findings and described outcomes of food growing programmes where both young people and their families were more likely to eat fruit and vegetables following their participation.

Again, reflecting the findings of this review, expert panel members provided information describing the physiological outcomes of food growing activities referring to literature reporting on improved physical fitness of pupils (Barratt Hacking *et al.,* 2011) and benefits to pupils' fine motor skills (Passy *et al.,* 2011 – cited in Section 4.3.2 of this review). Panel members concurred with review findings that food growing can play a role in addressing mental health issues, citing evidence demonstrating the 'calming effects' of food growing activities (Learning Through Landscapes Growing Clubs) and improvements in pupils' self esteem (evaluation of Eco challenge). Improved social interaction between pupils, including enhanced interpersonal skills and the development of competencies in working with others (Growing clubs and Eco challenge) was also referred to by panel members, although this information was not evidence based.

Feedback from the expert panel broadly concurs with the review findings. While some of the panel member's comments are supported by research evidence, other information provided was anecdotal and further research may be necessary to ensure that such findings can be generalised.

4.1.5 Summing up: Health benefits

Evidence confirms that food growing in schools programmes have a number of positive benefits for pupil's nutritional awareness, including a greater willingness to try new foods and an improved ability to identify and describe a range of fruit and vegetables, although the evidence regarding positive changes in consumption patterns is more mixed. Research also indicates that there can be benefits for pupils in terms of enhanced wellbeing, particularly in terms of improved confidence and self esteem and in terms of better developed inter-personal relationships. Many of these outcomes are demonstrated particularly for children with SEN, lower achieving pupils and for those disaffected with learning. Research is only able to suggest that food growing activity can lead to positive benefits for pupils in terms of their physiological development, as the evidence that exists is mostly small scale or impressionistic. Expert panel views echoed all of these themes, although the suggestions of impact that were made are not always supported by robust evidence. This is particularly the case in relation to the physiological benefits of food growing in schools.

4.2 Educational benefits

A large number of studies selected for this review investigated the educational benefits associated with food growing activities in schools. The main areas of educational benefit of interest to researchers related to the effects of food growing programmes on:

- pupils' achievement
- pupils' motivation
- school-community relationships.

These aspects are discussed in turn below.

4.2.1 Pupil achievement

In this section, we explore the links between growing in schools programmes and pupil achievement. Around half of the research studies included in this review refer to the impact, or the potential impact, of such programmes on pupils' academic attainment (different aspects of achievement are considered later in this section). They include studies from the USA, including for example, Blair (2009), Klemmer *et al.* (2005), Smith and Motsenbocker (2005); and from the UK (Woolner and Tiplady,

2009). One the whole, these studies confirm positive, although generally modest, effects on achievement.

A number of the studies in this review specifically set out to identify how growing in school programmes influence attainment. Some are evaluations of combined garden-related activities (in which pupils plant, cultivate, harvest and consume what they have grown) and supplementary in-class education, for example, on nutrition (e.g. Parmer *et al.* (2009). Others evaluate growing in schools activities that are integrated into the existing curriculum, with schools seeking to improve learning in a range of subject areas by providing a hands-on education outside the classroom (Ratcliffe *et al.,* 2011).

Generic attainment outcomes

Research indicates that school-based food growing can have a number of positive benefits for pupil attainment. Desmond *et al.* (2004), in a review of garden-based learning, cite Bell (2001) who found that hands-on involvement in school nature areas can help improve children's overall academic performance. The authors comment that: *'lived experience motivates students and shapes their learning in lasting and personally significant ways'* (p. 42). Other studies indicate that growing in schools can help children make sense of concepts they have learnt elsewhere and thus enhance their wider learning (Roach, 2010).

In a further literature review examining whether school gardens provided sufficient experiential learning to effect changes in student achievement, Blair (2009) concluded that school gardening can generally improve test scores and that teachers believe this to be true. There are also a number of studies depicting enhancements in students' content knowledge, for example increases in the number of vegetables and garden wildlife pupils can name as a result of participating in food growing programmes (Woolner and Tiplady, 2009; Ofsted, 2009). Section 4.3 of this report provides further details.

Some of the research findings also indicate that there are (or are likely to be) performance improvements across the curriculum when pupils engage in growing in school activities (Govender and Kotch, 2004). Whole-school increases in attainment have been identified in the quantitative evaluation of the Food For Life Partnership (FFLP) in England, which found that FFLP schools, on average, improved their attainment scores over the course of the pilot (Orme *et al*., 2011)[12].

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[12] although food growing was only one element of provision in FFLP flagship projects.

Subject-specific attainment outcomes

Much of the literature outlining the educational benefits of food growing in schools is concerned with impacts on pupils' **science knowledge**. Other references relate to improved **mathematics** and **language** outcomes, and to the educational benefits of growing programmes for particular **types of pupils** (including primary aged pupils, pupils with SEN, lower ability pupils and young people disengaged from learning). Examples reflecting the best available evidence within the literature are provided in the grids below.

Several of the research studies that considered impacts on science learning implemented quasi-experimental methods for examining pre- and post-intervention impact on test scores, and/or comparing treatment (growing in schools participants) and comparison (non-growing) group results. Other studies are more qualitative in nature. These include literature reviews (citing studies varying in robustness of methodological approach), case studies and interviews, sometimes with a relatively small number of interviewees.

Impacts on science learning
On balance, the literature confirms that food growing activity increases pupils' scientific knowledge, although the picture is not entirely uniform. A robust quasi-experimental study assessing the effectiveness of school gardens in enhancing science achievement among elementary schools pupils in Texas (USA) was undertaken by Klemmer *et al.*, (2005). A total of 647 students (in third, fourth and fifth grade classes) across seven districts were involved in the study, including, 453 (from 27 classes) in the experimental group and 194 (from 13 classes) in the control group. Students in the experimental group (who participated in school gardening activities) scored significantly higher on a science achievement post-test compared to the control group. In the same year, Smith and Motsenbocker (2005) evaluated a hands-on gardening curriculum in three secondary schools in Louisiana (USA). A total of 62 fifth grade students took part in two-hour sessions once per week for 14 weeks. Corresponding control classes within the same schools and grade were selected (N = 57). Science achievement tests were given before and after the students participated in the activities. Students receiving the hands-on gardening curriculum had achieved better post-test science scores compared to those in the control groups (Smith and Motsenbocker, 2005). In contrast, a study by Pigg *et al.* (2006) found no significant differences in students' science scores following their participation in a school garden programme. Using a quasi-experimental design, scores of 196 third, fourth and fifth grade students in Texas (USA) were compared. The findings show that those students using the school garden programme as an additional method to learn benefited similarly to those using only traditional science based instruction. Additionally, Blair (2009) warns that although pupil involvement in food growing in school activities can appear to have improved their test scores, we cannot be sure that this is the result of exposure to

food growing activity specifically, and not to experiential learning more generally. It was outwith this study's remit to examine at the relative benefits of food growing against those of other practical approaches, and none of the other studies appraised for this review have attempted to look at this issue.

However, there is much qualitative evidence that growing in schools activities can help promote higher-level thinking and understanding of the concepts within science. A mixed-method study (including a literature review, survey and case-study visits) of garden-based learning and its role and effectiveness in education, found **improved understanding of scientific principles** among the pupils involved in the activities (Desmond *et al.*, 2004). Similarly, a systematic literature review of international research on outdoor learning by Rickinson *et al.* (2004), indicates that school grounds projects (including growing in schools programmes) have the capacity to link with most curriculum areas and can enhance **science process skills**. In a qualitative report for the RHS (Passy *et al.*, 2010), interviewees reported that improved cognitive learning had accrued from pupils undertaking investigative work in a school garden and teachers encouraging them to take greater control over their own learning. Pupils in the study displayed **greater scientific knowledge and understanding** as a result.

Finally, in a predominantly qualitative UK study, Woolner and Tiplady (2009) collected information from pupils, teachers, parents and staff to identify the impacts of school gardening on science learning and understanding in 20 schools. Teachers in the study described how pupils who participated in school gardening displayed an **increasing knowledge and understanding of the natural world**. Teachers commented that the gardening programme was *'providing a bridge between the abstract and the practical which appears very useful for learning'* (p. 5). In turn, teachers were able to use examples drawn from the children's experience to illustrate scientific concepts such as food chains. Interestingly, the authors highlight that pupils did not always make links between gardening and science understanding:

> *The children involved seem to experience, and appreciate* (the gardening programme) *as being distinct from other school learning and an opportunity to learn very specific, practical skills, which they rarely related to the knowledge and experiences they recognise as school science* (p. 15).

The same study analysed science test results for a group of learners from a Year 2/3 class, over two academic years. The analysis compared their performance on units of life sciences work to their performance on tests of science units less immediately linked to food growing experiences. The pupils performed considerably better on the plant-related units demonstrating a better understanding of life science than of physical science. Although this is a positive result, the authors recognise that pupils' test scores may well have been influenced by their 'previous experience with living things'. There should be some caution in the generalisation of these findings to other settings (Woolner and Tiplady, 2009).

These broadly positive findings regarding the science attainment benefits of food growing activities are explained by a number of factors:

- The ease in which growing in schools activities can be linked to the science curriculum (several authors make this point).
- That food growing activity can positively enhance the science curriculum (in a survey of California school principals, 69 per cent felt that school gardens were moderately effective in enhancing science lessons (Graham and Zindenberg-Cherr, 2005).
- That food growing activity can positively influence teaching and learning (Woolner and Tiplady (2009, p. 5) report that teachers felt science was 'easier to *teach'* as a result of the background knowledge and understanding that pupils acquired through growing activities).

Highlighting the positive influence of school gardens on science teaching and learning, Adams and Hamm (1998) comment:

> *Gardens can serve as living laboratories in which students can see what they are learning and in turn, apply that knowledge to real world situations.* (p. 5).

Impacts on mathematics learning

Findings relating to the benefits of growing in schools programmes on pupils' mathematics cognition are mixed, and evidence is extremely limited. In a qualitative report for the RHS, Passy *et al*. (2010) cite teacher reports of pupils using fruit and vegetables to help with weights and measures, and managing budgets related to the sale local produce. However, a study by Pigg *et al*. (2006) (described above), found that mathematics scores in a treatment (gardening) group were in fact significantly lower than those in a control (non-gardening) group after exposure to food growing. Commenting on these findings, the authors suggest that this may be because mathematics subject content was insufficiently defined within the gardening curriculum.

Impacts on language learning

The evidence relating to impacts on language learning is more conclusive, although still rather limited. Overall, research indicates that there are positive benefits, especially for children with English as an additional language (EAL).

Qualitative evidence from Australia (Cutter-Mackenzie, 2009), outlines how multicultural gardens are being used to help newly arrived immigrant pupils and their families gain a sense of belonging and to feel integrated into the school and the wider community. The programme uses gardening as a focus for implementing a culturally-focussed environmental education programme. The schools use gardening buddies (including parents, guardians and grandparents) typically new to Australia, to work with children with EAL in creating food gardens. A teacher from one case-study school commented that the gardening programme provided a useful forum for getting

pupils to learn a new language through real life conversation. The pupils themselves also spoke about the benefits of learning English through gardening.

Similarly, Passy *et al.* (2010) reported enhanced literacy and the use of a wider vocabulary across all areas of the curriculum among pupils involved in school gardening programmes. They found that EAL children in particular developed their oracy and language skills. Conversation was said to *'flow in a way that it does not in the classroom, as children become absorbed in what they are doing and lose some of the inhibitions that they may feel indoors'* (p. 21). A teacher from one case-study school reported that the garden provided '*reluctant writers'* with something meaningful to describe, and recounted the story of a pupil with SEN who was motivated to write a letter about working in the garden, harvesting the vegetables and then cooking and eating them.

Finally, a small study undertaken in the USA aimed to evaluate the impact of gardening activities on language development. The study involved a third and fourth grade summer school project that used a whole language approach with gardening as the central theme. Results of formal pre- and post-tests of achievement indicated greater gains for students involved in gardening activities than for those in control classes. Among the most significant student gains were achievements in reading, reading comprehension, spelling and written expression (Pranis, 2004). The author highlights caution in generalising the findings from this study however, given that they are based on the experience of only one school.

The following sections consider wider achievement benefits of growing programmes for particular **groups of pupils** (including primary aged pupils, pupils with SEN, lower ability pupils and young people disengaged from learning).

Specific outcomes for primary aged pupils

The majority of studies appraised for this review consider the impacts of growing in schools programmes on **primary** (or equivalent) aged pupils (those aged approximately 4-11). This is because the majority of evaluated programmes focus on this phase of education. It is generally considered easier to integrate food-growing activities into the primary, than the secondary, curriculum because primary schools reportedly have more freedom in curriculum organisation and content than secondary schools. Additionally, as the secondary school science curriculum is increasingly specific, food growing is likely to contribute to very specific elements of programmes of study only.

Interestingly, Klemmer *et al.* (2005) found that the effect of a gardening programme on nutrition education was more marked in **older** pupils (Grade five – 10-11 year olds) than it was on third and fourth graders. The authors suggest that this is because older pupils have more advanced science cognition than younger pupils. If this is correct, it suggests that benefits could accrue in older pupils, if given the opportunity.

Specific outcomes for SEN, lower ability pupils and those disengaged from learning

A few of the studies appraised for this review suggest beneficial learning effects for pupils with SEN, lower ability pupils and young people disengaged from learning. These are generally perceived impacts and have not been measured.

In the UK, a qualitative study undertaken by the RHS (2010b) in six special schools identified a number of benefits. A key impact related to skills development, with pupils displaying the ability to use new horticultural terms in context, an understanding of cause and effect (for example governing crop successes and failures) and the skills to logically implement the processes required to grow plants effectively. Similarly, Pranis (2004) provides an example of a gardening programme in the USA for pupils with SEN and describes anecdotally that: '*when students have the opportunity to create a garden, become experts and share their expertise with others (often in a role reversal) their skills and confidence soar.'* (p. 3). Passy *et al.* (2010) also note that almost every school in their evaluation (10 schools) reported how gardening had positive impacts on children who were disaffected and/or had severe behavioural problems when based in the classroom.

4.2.2 Pupil motivation

We now move from an appraisal of achievement-related benefits, to consider the potential benefits of involvement in food-growing activity on pupils' motivation for school and learning. While some studies indicate such benefits, they typically draw on a rather limited evidence base. Impacts on pupil motivation were often perceived or observed by individuals involved in growing in school programmes but were not systematically measured. Examples of evidence cited within the literature are provided in the grid below.

Impacts on pupil motivation

Research indicates that there can be an increased enthusiasm and engagement for school and learning exhibited by pupils involved in food growing activities. In a systematic literature review of the impacts of outdoor learning, Rickinson *et al.* (2004) concluded that students involved in school grounds projects (which included growing activities) had an **enhanced motivation towards learning**. Similarly, Pranis (2004) highlighted qualitative indicators of improved student motivation and **attitudes towards school** following pupils' participation in a summer school gardening programme. Teachers observed students arriving at school early, staying late and a reduction in absences. Parents also reported that their children were excited about school and were anxious to return after the summer break to continue to tend to, and 'show off', their garden. A teacher in one case-study school spoke about the benefits of a creative curriculum in motivating students: '*It's exciting for children, it gets them motivated to learn; it also gives them some ownership of their learning. The garden fits in very well with that'* (Passy *et al.*, 2010, p. 32). Pupils reported feeling proud of their garden, and teachers reported that this pride, in turn, meant that children were motivated to maintain the good condition of the school grounds.

Hofman (2004) found that engaging in school gardens resulted in students being more likely to **continue in their academic programmes**. Other studies linked participating in food growing activities to increases in school **attendance** and the **completion of homework** (Hawkins, 2001; Govender and Kotch, 2004).

Saunders *et al.* (2011) indicate that school farms can also positively inform and influence the culture of learning and inclusion within a school. Survey respondents indicated that learners involved in farm-based activities were engaged and motivated. One respondent commented that in their school:

> *Students remain in education and progress as individuals as a result of their experiences on the farm. The farm enhances and enriches most curricular areas and can give students responsibility beyond their years. The farm has a very positive effect* (p. 23).

Conversely, a study by Waliczek *et al.* (2001) presents different findings. Theirs was a pre- and post-test study of 598 pupils (from grades two to eight) across seven schools in the USA. Students volunteered themselves into either treatment (food growing) or control (non-growing) groups. When compared with the control groups, students in the treatment groups had lower scores for attitudes towards school, suggesting their growing experience had a negative effect. However, the fact that students self-selected whether to be involved in growing activities or not has probably had a biasing effect on these results. The study did find that girls had significantly more positive attitudes towards school at the conclusion of the garden program than boys, but overall, it indicates the difficulties of attributing causality to particular interventions or programmes considering pupil motivation towards schools.

4.2.3 School-community relationships

In this section, we consider broader educational benefits, and the extent to which growing in schools programmes have engendered a positive relationship or interplay between different stakeholders in school life: pupils, teachers, parents, external experts, and the wider community.

A number of research studies indicate the potential of food growing in schools to build links between schools and their local communities (RHS, 2001a and b; Teeman *et al.*, 2011). However, a detailed explanation of what is meant by school-community interaction, or concrete examples of enhanced interaction resulting from growing programmes are relatively rare. Dillon *et al.* (2003), discussing the evaluation of Learning through Landscapes (LTL), are one of the few groups of authors to comment:

> *Qualitative findings suggest that the scheme led to improved student behaviour, increased links to the local community, increased parental involvement, and links with outside horticultural organisations.* (p. 27)

Other examples of school-community links are discussed in the grids below. These examples reflect the best available evidence within the literature. The evidence base is generally qualitative (varying in degree of rigour) and sometimes impressionistic. Evidence such as that provided for LTL was rare.[13]

School-parent interaction and home benefits
A quantitative evaluation of the Food For Life Partnership (FFLP)[14] in England shows that pupils' involvement in FFLP had some positive knock-on effects on their families. Of 1,080 parents surveyed: 45 per cent reported eating more vegetables; 43 per cent reported changes in buying patterns; 33 per cent reported eating more seasonal foods; and 26 per cent reported eating more locally-sourced foods. A similar point is made in the evaluation of the Junior Master Gardener (JMG) programme, based in Indiana, USA. This is a scientific and environmental education programme that often involves food growing activities (although the latter is not compulsory). In a post-involvement questionnaire, children reported that they had shared their learning with others including their parents (Dirks and Orvis, 2005). However, there are mixed messages about the extent to which parents have acted upon the learning that their children have taken home. According to Block and Johnson (2009), who evaluated the Stephanie Alexander Kitchen Garden (SAKG) initiative in Australia, there was a variable degree of success in transferring an interest in gardening activities from school to home. In contrast, an evaluation of food growing in England (RHS, 2001a) suggests that parents became more involved in school life as children shared their gardening skills and knowledge at home. The authors note that fathers often seemed keen to participate in physical activities such as 'digging Sundays' in preference to, for example, offering to bake cakes for the school fair. On balance, the evidence indicates some modest impacts on school-parent interaction although research findings do little to differentiate potential gains in this respect. For example, studies tend not to cover all elements of potential interaction and benefit, so we have only piecemeal information on, for example: improved environmental habits in the home; increased parental interest in growing or environmental issues; and increased parental involvement in school life (and in growing activities specifically).

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[13] It is important to note that food growing was only one element of LTL, and so the suggested benefits should not wholly be attributed to growing activity.
[14] While the FFLP flagship projects could incorporate food growing as an element of their activities, they were not solely 'food growing projects'.

Teacher-pupil interaction

There is very little evidence of better teacher-pupil interaction as a result of food growing activity. This does not mean that improved teacher-pupil relations cannot accrue from such activity, but rather that this benefit has rarely been the subject of evaluation.

One example is that during interviews about a 'multicultural school garden' project in Australia, school staff indicated that teachers had become more understanding of immigrant pupils' cultures and needs as a result of their involvement in the project (Cutter-Mackenzie, 2009). In this instance, the author suggests that the garden acted as a catalyst for language and cultural learning through 'real life conversation' in a relaxed environment.

School-community interaction

On balance, research indicates a number of positive benefits for school-community interaction in food growing schools. Although one survey of gardening activities commissioned by the RHS (White and Pyle, 2009) showed that very few of the 1,378 responding teachers (14 per cent of school senior leaders, and eight per cent of classroom teachers) believed gardening activity to have enhanced community involvement[15], qualitative evaluation evidence across a number of different studies, provides indications of enhanced school-community interaction at various levels. A literature review of garden-based learning by Desmond *et al.* (2004) categorises benefits around enhanced school-community interaction as: building bridges between the school and the community; transferring information from one generation to another; and opportunities for 'cultural exchange'. While their review does not provide specific evidence of instances where such benefits have been realised, some other studies do. These are outlined below.

School benefits:
Schools involved in the SAKG programme in Australia reported that the profile of their schools had been raised by involving 'expert' volunteers from the local community in their school gardens (Block and Johnson, 2009). Similarly, the evaluation of FFLP in England describes an incidence in which a local gardening society helped to design a school garden and worked alongside pupils (Teeman *et al.*, 2011). While there is no explicit evaluation of the impact of this interaction between school and community, the implication is that there were benefits for both stakeholder groups, and particularly for the school.

Pupil benefits:
Children involved in Gardens for Life (GFL), an international project aiming to support schools in England, India and Kenya to engage in gardening activities and to strengthen links with their local communities, all expressed the view that gardening had helped them to form links and communications with people outside of school

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[15] The schools and teachers completing these questions, which formed part of NFER's teacher omnibus survey, were not necessarily involved in growing activities.

(Bowker and Tearle, 2007). While this shows that the programme was successful in meeting its aims, it does not tell us much about the benefits that accrued from these enhanced links and communications for the young people.

Mutual benefits:
There is some evidence of a 'generational' exchange of ideas and support. For example, a study by the RHS (2010a) showed that some schools used their gardens to strengthen bonds with local senior citizens' clubs – exchanging cultivated vegetables for gardening expertise. Similarly, in a different area, a school project involved building a 'bottle greenhouse'. The whole community was involved in collecting, donating and preparing the bottles, and in constructing the greenhouse. This was reported to have given pupils experience of team working, and the whole community a common goal (Passy *et al.*, 2010).

Although some of this evidence appears rather impressionistic, a detailed review by Rickinson *et al.* (2004) on research in outdoor learning indicates that there is evidence of impact. It is worth remembering that this review was concerned with all aspects of outdoor learning, and that even those aspects of the review concerned with school grounds projects specifically, did not limit themselves to growing activities:

> *There is significant evidence that social development and greater community involvement can result from engagement in school grounds projects. Students develop more positive relationships between themselves, their teachers and the wider community through participating in school grounds improvements. There is also evidence that such projects result in more positive parental participation in their children's learning* (p. 41).

Research also suggests that an 'ethos' of integration is of fundamental importance to the success of strong school-community relationships. In other words, developing a programme of school food growing activity will not, in itself, help to develop strong links between school and community. Rather, food growing needs to be regarded by schools as:

- **a means of contributing to the community**. As one teacher in the FFLP evaluation commented: *'We want to be valued and valuable to the community'* (Barratt Hacking *et al.*, 2011)

- **a place for the whole community**. Schools involved in the international *Gardens for Life* project had developed their gardens as local places of learning, community, security and peace (Bowker and Tearle, 2007)

- **an activity owned by the whole community**. More than one study suggests that schools can become integrally involved in local community farms and gardens. This can be especially beneficial where school grounds are not sufficiently large for food growing to be undertaken easily on site (Lepkowska, 2009).

In relation to the final point, Quayle (2007) suggests:

Community projects provide a useful facility for schools that may not have the space or financing for their own growing or farm area. It also provides access to livestock and vegetables, reinforcing knowledge about where food comes from. (p. 57)

Closely linked to evidence of school-community links, is evidence related to **enterprise activity**. We found very little robust evidence that involvement in school-based food growing activity had led to greater levels of pupil enterprise activity, or that pupils had developed enterprise skills as a result of their involvement in food growing. This is essentially because very little research was established with a remit to consider such benefits.

However, the literature does make some suggestions about the enterprise benefits that can accrue from food growing programmes. There are also a number of interesting descriptions of activity that provide a flavour of the ways in which links can be made between food growing and enterprising behaviours. These descriptions can be found both within the literature and also within a number of publically available case studies. References to the latter can be found in Appendix A of this report. Examples provided by *School Food Matters* and by *Foodshare* are of particular interest.

Both Bowker and Tearle (2007) and Desmond *et al.* (2004) found that a major feature of school food growing programmes in developing countries was producing food with a view to selling it as a source of revenue. This emphasis is less apparent in developed nations such as the UK. However, Ozer (2007) reporting on school gardening programmes in the USA, and two UK RHS reports (RHS, 2010a; Passy, 2010) show that pupils who had been involved in growing activities in their schools were able to put their mathematics skills into practice by selling produce from the school garden. In the RHS studies, some of the schools involved in the project used 'Enterprise Days' to enable pupils to sell their crops and to learn about handling budgets, sourcing products and negotiating in order to get the best deal possible. Money raised through the sale of produce was often donated to charitable causes, thus demonstrating a focus on 'social enterprise' in UK schools.

The following vignette provides an interesting enterprise activity described in a recent Ofsted evaluation of sustainability in schools (Ofsted, 2009, p. 19). There is some evidence that this activity had led to a range of additional benefits for pupils.

Vignette - Selling food at a local farmers market

This school had recently acquired an allotment where pupils grew vegetables and flowers to sell at the local farmers market. The pupils were actively involved in hands-on selling activity and this gave them the opportunity to establish good relationships with farmers, stall holders and market staff. They also gained the skills and satisfaction of running their own enterprise. A Year 10 pupil commented: '*I really liked working at the farmers market, because we did all the work to get it ready and it was good seeing people buying our stuff.*'

School staff reported that these experiences had improved pupils' behaviour and had raised their self esteem. Some of them had presented talks on their project to groups of adults. Others had developed the skills of managing, and motivating, others and of making decisions on their own.

4.2.4 Information provided from the expert panel on educational benefits

Expert panel members supported the findings of this review in relation to the educational benefits of food growing activities on pupils. In relation to school standards for example, one panel member, reported that twice as many schools received an Ofsted rating of outstanding following their participation in the Food for Life Partnership.

Information provided by the panel relating to subject-specific attainment largely concentrated on impacts on pupils' science knowledge and understanding, particularly in relation to horticultural science, nutritional science and ecology. Echoing the findings from the review, anecdotal comments indicated that food growing provides a practical context for discussion of abstract scientific ideas and can impact on understanding of scientific concepts. Other impacts on pupils' attainment and achievement were also cited including, for example, impacts on pupils' numeracy and literacy skills although this information was not evidence based. Within the context of overall educational improvements, specific references (both anecdotal and research based) were made to impacts on pupils with SEN. Subsidiary benefits were also identified, with one panel member suggesting, anecdotally, that pupil attendance had improved because of pupils' feelings of responsibility to look after their garden.

Illustrative information was also provided by panel members, in line with the review findings, describing broader educational benefits, and the extent to which growing in schools programmes have engendered a positive relationship with the wider community.

4.2.5 Summing up: Educational benefits

In the main, the studies and evaluation reports illustrating educational outcomes resulting from food growing programmes indicate positive impacts for pupils. The majority of this evidence, however, relates to development of pupils' scientific knowledge and understanding and confirms that there are positive impacts in this regard. While the research indicates positive outcomes of food growing activities on pupil motivation and school-community relationships, this evidence base tends to be more qualitative and can sometimes be subjective. Further research to examine the impacts food growing programmes on a wider range of knowledge and skills is required.

4.3 Knowledge, skills and behavioural benefits

In this section, we focus on a range of potential skill, knowledge and behavioural benefits that can arise from food growing in schools activities. These encompass:

- development of horticultural and scientific knowledge (including knowledge about relevant future careers and employment sectors)
- acquisition of practical gardening and growing skills
- enhancement of environmental awareness.

The following sections review the evidence base for each of these areas.

4.3.1 Horticultural and scientific knowledge

The evidence confirms that food growing in schools programmes have an impact on students' horticultural and scientific knowledge. It is important to note that this outcome tends only to be observed where growing programmes have been established with a view to developing horticultural knowledge however. Cutter-McKenzie (2009), for example, in a qualitative evaluation of multicultural school gardens in Australia, found that children's practical knowledge of different plants was lacking. Interviews with teachers confirmed that developing horticultural knowledge was not an overarching aim of the programme. This illustrates the importance of matching outcomes to programme aims, and not assuming that because a programme has not demonstrated benefits against specific criteria, that it has had no impact at all.

Two evaluations adopting quasi-experimental designs confirm the benefits of food growing activities on students' horticultural knowledge. A matched comparison trial of 770 children involved in the Stephanie Alexander Kitchen Garden (SAKG) programme in Australia found that exposure to the programme led to increased knowledge of pest control and to facts about 'what plants need to grow' (Block and Johnson, 2009). There was a statistically significant improvement in knowledge about

pest control, from 19 per cent at baseline to 33 per cent at follow up (compared to figures of five per cent and ten per cent in comparison groups). Although there were improvements in knowledge about 'what plants need to grow', these were not statistically significant. Similarly, a pre-and post-intervention evaluation of the Junior Master Gardener Programme in the USA, involving 277 children, showed a positive improvement in attitude towards agriculture and science as a result of involvement in the programme (Dirks and Orvis, 2005).

Additionally, two literature reviews indicate that a number of studies have found evidence of enhanced pupil horticultural knowledge as a result of gardening activity (Dillon, *et al*, 2003) and school-farm programmes (Joshi *et al.*, 2008). In the case of the Joshi review, it should be noted that some of these programmes were based on visits to farms, rather than on farming within schools. Many of the studies were based upon pre-and post-intervention tests or questionnaires, and all showed positive improvements at follow up compared to baseline. Benefits included increased knowledge and understanding of:

- growing cycles and food seasonality
- sustainable agriculture
- food sourcing
- routes from farm to table
- environmental management.

A number of additional studies, more qualitative in nature, indicate that pupil horticultural knowledge has been enhanced through involvement in various school-based food growing programmes, and many of these point to the same benefits as those identified above. A study by the RHS (2010b) talks of pupils' ability to use horticultural terms in context and to demonstrate an understanding of cause and effect. Similarly, an evaluation of the RHS Campaign indicates that pupils involved in campaign schools displayed a good understanding of scientific concepts (such as taxonomy), scientific methods (including devising experiments), scientific knowledge (including habitats and life cycles) and use of appropriate scientific language (Passy *et al.*, 2010). A qualitative evaluation of FFLP reports an increased knowledge of food production and sourcing among pupils, and also notes teacher reports of pupils asking more questions about these issues than previously (Teeman *et al.*, 2011). This wide range of benefits is encapsulated in the following quotations from a recent Ofsted evaluation of sustainability in schools, and from an evaluation of 'Growit', the RHS strand of Open Futures:

> *By tending and maintaining the land and growing a wide range of crops in the school allotment, pupils from Years 3 and 4 built up an excellent understanding of the natural environment. For example, they were able to identify a wide range of plants, animals and insects. They could explain where their food came from and appreciated the effort required to produce it.*
> (Ofsted, 2009, p. 19).

> [Pupils in case-study schools] *described how plants need daylight, watering and weeding, and it was also clear that through constructing 'wildlife towers', they had developed their knowledge of garden wildlife* (Woolner and Tiplady, 2009, p. 7).

There is almost universal confirmation of positive horticultural knowledge developments among children involved in food growing activities. However, when looked at in relation to students in developing countries, students in England lagged behind in their knowledge acquisition. A qualitative study of the 'Gardens for Life' international programme found that students in India and Kenya had much higher levels of agricultural and horticultural knowledge and awareness than did children in England. The authors suggest that this is possibly because the focus in England was often on gardening for 'fun', whereas in India and Kenya, it was much more closely tied in with food production for sale and sustenance (Bowker and Tearle, 2007). In addition to considering the benefits of enhanced horticultural knowledge, this review is also tasked with examining the extent to which growing activities in schools have contributed to an increased awareness among young people about future **careers and employment sectors related to horticulture**.

There are only a few relevant examples within the literature, and these are only able to suggest that school food growing projects might be able to contribute to an enhanced knowledge of horticultural careers, or to an increase in the number of young people choosing horticulture as a career. Available examples are provided in the grid below.

Horticultural careers and sectors
Most 'evidence' in relation to pupil knowledge about careers in horticulture is anecdotal or based upon isolated examples from individual schools or projects. Some authors make passing statements about students developing vocational skills, for example related to building (Passy *et al*., 2010). Others report in slightly more detail. For example, the FFLP evaluation (Barratt Hacking *et al*., 2011) indicates that in one secondary school, children were reported to have broadened their ideas about careers as a result of involvement in the programme (which was not focused solely on food growing). According to this evaluation, working with farms similarly opened pupils' eyes to a range of career opportunities.   This point is developed in an evaluation of school farms by Saunders *et al.* (2011, p. 23). A questionnaire response by a member of staff in one school stated: *'As a school for students with moderate learning difficulties it* [involvement with the farm] *allows them to develop life and work skills.'* There is no further elaboration of the type of work skills developed, or indications of the types of career that pupils might be being prepared for. Teachers responding to a survey about the impact of the Year of Food and Farming in England (which incorporated food growing as one of its elements) felt that the 'year' had had some impact on students' awareness of careers in food and farming (39 per cent felt that there had been 'some impact', while only four per cent felt there had been a 'significant impact'). Compared to other outcomes described by teachers related to nutrition, attainment and environmental awareness,

however, the 'year' reportedly had a lower level of impact on pupils' awareness of horticultural careers (Year of Food and Farming, 2009).

One case-study example stands out as providing slightly more description of activity. This is an example of a community garden, based within school grounds. The author explains that initially the garden was used by the school as a vent for pupils who were disruptive in the classroom. This emphasis has now changed and the school offers horticultural NVQs and ASDAN courses related to horticulture to pupils. The author states:

> *This garden provides a vital opportunity for young people who are struggling academically who may be at risk of leaving school without any motivation or interest in their future. These young people are given the opportunity to develop skills that could lead them on to further education or employment before they become fully disengaged with formal education systems. Since opening opportunities for horticultural education, the garden has received interest from pupils of mixed age and gender* (Quayle, 2007, p. 57).

It is notable, in most of the examples above, that qualifications and subsequent careers in horticulture seem generally to be regarded as routes for less academically engaged or able students. There is no specific evidence of school growing projects promoting horticulture as a career opportunity for all young people. This may be a reflection, of course, that research projects have rarely been established to investigate this issue, rather than a reflection that schools with gardens are failing to provide opportunities for young people to gain qualifications in horticulture and to consider related careers in the future.

4.3.2 Practical gardening and growing skills

In contrast to evidence on the development of horticultural knowledge, very few of the reviewed items provide insights into the extent to which pupils had developed practical gardening skills, although one might expect this to be an outcome of school-based growing activity. While some authors claim to comment on practical skills acquisition, they actually tend to refer to an enhancement in students' horticultural or environmental knowledge, as described in the previous and following sections.

A handful of examples can be found in the literature suggesting that students were able to develop practical growing skills, but these are generally anecdotal and describe benefits that have been seen in individual schools.

One exception is the matched comparison trial of 770 children involved in the SAKG programme in Australia. This evaluation found that exposure to the programme led to increased knowledge of gardening techniques among treatment group children. Responses to eight multiple-choice questions showed an increase in score from 4.7

at baseline to 5.5 at follow up (Block and Johnson, 2009). An evaluation of the Year of Food and Farming (2009) also found that teachers believed involvement in the 'year' to have had an impact on pupils' practical skills. Forty two per cent of respondents reported 'some impact' in this regard, while 53 per cent reported 'significant impact'. Interestingly, given this finding, the evaluation of 'Growit' showed that children were more likely than their teachers to see the skills they were developing through school-based growing as 'gardening skills'. This perhaps explains why so little has been written on this potential benefit. Teachers were more likely to be looking out for a range of broader skills developments such as 'listening' and 'cooperation' (Woolner and Tiplady, 2009).

Two qualitative studies provide illustrations of the types of practical growing skills that some pupils had developed. One nursery school had set aside space for children to practice digging and putting soil into buckets, to help them learn how to handle their tools carefully (Roach, 2010). Older students involved in RHS Campaign schools reportedly developed a range of new skills. These encompassed gross motor skills such as digging and hoeing; but also the fine motor skills needed for tasks such as transplanting tiny seedlings and tying tomatoes to canes. Teachers reported that pupils learnt to be careful around plants. They also learnt the type of behaviour that was appropriate when in the vicinity of potentially dangerous chemicals, or sharp equipment (Passy *et al.*, 2010).

4.3.3 Environmental awareness

This section is concerned with the extent to which involvement in school-based growing activities helps pupils to develop a broad environmental awareness, an understanding of environmental issues, and knowledge of topics such as ecology, environmental responsibility and environmental management. On balance, the literature indicates that school-based growing activity can lead to such benefits. However, there is a considerable merging of evidence around the related benefits of enhanced horticultural knowledge (already discussed) and enhanced environmental awareness. The sections that follow tease out the limited evidence that exists related to environmental awareness specifically.[16]

A survey of 1,378 practising teachers in England found that over half (55 per cent) perceived one of the main benefits of school-based gardening to be 'enhancement of pupils' environmental awareness' (White and Pyle, 2009). This is reflected in the fact that a large number of studies report on this outcome. The literature tends to be suggestive of impact, based on individual case studies and often reflecting the impressions of practitioners rather than offering any kind of measurement. Three studies offer a more robust appraisal however. These are outlined below.

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[16] Our remit was to consider environmental awareness and participation. However, we found no evidence within the literature of involvement in school-based food growing activity leading to wider environmental participation among young people.

The quantitative evaluation of the Food for Life Partnership (FFLP) in the UK (Orme *et al.,* 2011) found positive effects of involvement in FFLP on pupils' environmental awareness. Year 5 and 6 children who had taken part in FFLP were more than twice as likely to hold very positive attitudes towards organic, local, free range and fair trade food production as children with no such involvement (22 per cent compared to 11 per cent). Parent surveys of primary age children also indicated that parents believed their children to have become more 'food aware' as a result of involvement in FFLP. In particular, pupils were reported to have increased their knowledge of issues such as: fair trade; food sourcing; animal welfare; organic food production; and food packaging. It is important to remember, of course, that food growing was just one potential element within FFLP of a broader programme related to healthy eating and food production.

Pranis (2004), in a review of a number of food growing initiatives in the USA, cites 'Project Green' and 'GrowLab' as programmes that led to improvements in environmental awareness among participating pupils. Pupils involved in 'Project Green' scored significantly better than pupils in a control group on test measures such as 'appreciation for the environment' and 'concern about human impact'. Similarly, the experimental group within 'GrowLab' gained significantly higher scores on a scale measuring 'concern for the environment' than their control group peers. In the latter study, teachers also reported that pupils were showing increased levels of environmental awareness and concern, and increased enthusiasm for, interest in, and love for, plants and science as a result of their involvement in the programme.

An evaluation by Skelly and Bradley (2007) of the Florida School Garden Competition, looked at the impact of different 'types' of gardening involvement on pupil outcomes. Crucially, they found that environmental attitude scores were high across all garden types (from vegetable to flower gardens), but they also found that scores were higher among students engaged in flower gardening than among those involved in vegetable growing. Explanations for this finding are not provided.

Other evidence of the impact of food growing on students' environmental awareness is much more impressionistic, and generally non specific. So, for example, a number of authors simply indicate that pupils involved in food growing activities in school had a 'higher level of awareness of environmental issues' as a result (Block and Johnson, 2009; Cutter-Mackenzie, 2009). Dirks and Orvis (2005), evaluating the Junior Master Gardener Program in the USA found, through a post-involvement qualitative questionnaire, that '*most children made positive statements about the environment'*, and that they '*made positive statements about plants, planting, caring for, and growing plants'.*

Similarly, Roach (2010), suggested that children involved in food growing came to feel a sense of ownership of the outdoor space. One example given, was that they learned that they should not pick flowers or fruit for themselves, because everyone had a right to enjoy these. A related point is made in a study by Ozer (2007).

Referring to the 'Earthworks' programme, the author comments that students developed:

> …*an appreciation of the value of all living creatures and became protectors of the orchard…Youth who once ripped plants out of the garden for fun now weed, water and protect the garden and orchard crops'* (p. 856).

Reasons for this enhanced level of environmental responsibility are not provided. However, Saunders *et al.* (2011), in a study on the impact of school farms in the UK, provide an assessment of how involvement in farming or agriculture can influence children's environmental behaviours. This example is provided below.

Vignette - The impact of school-based farming on environmental awareness

A member of school staff in one secondary school with a farm on site commented: '*It is very difficult to quantify, but it is generally agreed that it [the farm] contributes massively to the social, spiritual and academic wellbeing of many children. It does give the children a more comprehensive understanding and appreciation of the choices that they may make as consumers of the future. It provides the most amazing focus to teach the children the importance of sustainable food production for their future. The Key Stage 3 curriculum we have developed makes this possible.*' (Saunders *et al.*, 2011, p. 24).

Although the evidence base on the impact of food growing on pupils' environmental awareness is variable in its robustness, there are a large number of studies that provide evidence of enhanced environmental awareness, all of which indicate positive benefits, or potentially positive benefits. A slightly different picture is painted through an evaluation of the international project, 'Gardens for Life'. While this study reported an enhanced level of environmental awareness among pupils in England, it also found that this level of awareness was relatively low when compared to that of the children in India and Kenya (Bowker and Tearle, 2007).

The results of this study indicate that Indian and Kenyan children had a better understanding of food chains than those in England, with Indian children relating food growing to wider environmental issues, for example the ways in which weather affects crop production. By contrast, children in England were more aware of gardening 'design' issues including, for example, the merits of water features, garden decking and wind chimes. The authors suggest that the children had probably been influenced by television programmes. The findings also indicate the different emphases placed on garden spaces in the developed and the developing world. For pupils in England, gardens were perhaps more typically regarded as decorative, or leisure spaces, whereas in developing nations, pupils were more likely to regard them as spaces for food production.

4.3.4 Information provided from the expert panel on knowledge skills and behaviours

Corresponding to the findings of the review, expert panel members highlighted a range of improvements in pupils' knowledge, skills and behaviours resulting from their participation in food-growing activities. While much of the information provided by panel members was not verified by research data, there were still reports of positive impacts, particularly in relation to enhancements in pupils' gardening and growing skills.

In addition to the small number of relevant examples within the literature, expert panel members provided anecdotal accounts of the contribution of food-growing activities to future academic and career pathways. One panel member, for example, was aware of pupils involved in food growing programmes that had gone on to study related qualifications in horticulture. Similarly, another described that a young person attending a pupil referral unit (PRU) requested work experience to further develop his skills for a career in horticulture as a result of participating in school gardening activities.

Only one member of the expert panel commented on impacts of food growing activities on environmental awareness, suggesting anecdotally, that such programmes could have impact on children's pro-sustainability behaviour and ability to care for the environment.

4.3.5 Summing up: Knowledge, skills and behavioural benefits

The evidence confirms that involvement in school-based food growing activity enhances pupils' horticultural knowledge. It also indicates that a range of other knowledge, skills and behavioural benefits can accrue from pupils' involvement in food growing, particularly in relation to enhanced environmental awareness. However, research only suggests that involvement in school-based food growing can lead to an improved awareness of horticultural career options, or to an increase in the numbers of young people adopting horticulture as a career. Although one might expect school-based gardening activity to develop pupils' practical gardening and growing skills, there is little evidence of this. This is not to say that pupils are not developing a range of relevant skills; rather that this has rarely been the subject of evaluation, or of practitioner comment or appraisal.

4.4   Cost benefits

Within the studies included in this review, evidence of the cost benefits that can accrue for schools and communities from involvement in school-based food growing activities is extremely limited. Despite the conclusions drawn by Dillon, *et al* (2003) of the need for research into cost benefits and *'the measures necessary to explore*

economic effectiveness in this context' (p.52), few studies have since undertaken value for money assessments, or explored the costs benefits of food-growing activity, in any depth.

Of the studies that did report on the costs associated with food growing programmes, Asuma, *et al* (2001), suggested that: '*while there are costs and maintenance issues associated with the development and sustainability of such a program, start-up costs tend to be quite low'* (p.4). This research also suggested that the costs of food growing activities can be kept low through the involvement of volunteers from the community and parents. Other studies reported on the profits made by selling produce grown in school gardens. This included a report by the RHS (2010) which found that some schools used 'enterprise days' to sell crops. However, there was no detail provided on the amounts of money raised by such activity or any comparison to the costs associated with such programmes.

A study by Ofsted (2009) described food-growing activities in case-study schools and commented on how changes made to a catering service in one school included the use of vegetables grown by the pupils in the school garden. It was suggested that these activities had resulted in higher take-up of school meals over a three-year period. The number of pupils using the catering service had grown from 135 to 200 pupils and despite the rising costs of food and energy, the catering service made approximately £150 profit per week. However, links with the school garden were only one element of the changes made to the catering service and it is unlikely that this accounted for the total saving.

One of the case studies appended to this report (see Appendix A – Foodshare Case Studies) attempted to 'measure' enterprise statistics. Pupils entered the weight of everything they had harvested into a 'totaliser', which, in turn, calculated what the same food would have cost that day in the supermarket, and therefore the overall saving made. The tool showed that £1 worth of seeds sown resulted in £100 worth of produce, based on supermarket prices. As the founder of Foodshare comments, the main benefit of this tool was that: *'through the weighing of their harvest, children rapidly gain an appreciation of the different 'values' of food'.* As a tool for assessing the relative cost benefits of food growing in schools activities, the totaliser approach only provides a partial picture however. A much wider and more structured assessment would need to be undertaken of a range of input and outcome costs (including teacher time, teacher training undertaken, meeting time, the cost of tools and materials used and so on) in order for cost benefits to be assessed.

The following vignette provides an interesting example of a recent project led by School Food Matters and Waitrose (see Appendix A – School Food Matters case studies) and describes the funds raised from a school produce sale.

> **Vignette - School Produce Sale**
>
> School Food Matters, in partnership with Waitrose ran a school produce sale involving 19 London schools taking part in food growing activities. A total of 1247 children were directly involved. Across the schools the largest food growing area was equivalent to two football pitches and the smallest food growing area was a wheelbarrow of strawberries. Over forty types of fruit and herbs were grown for sale. A total of £2,137.59 was taken on the day of the sale and the highest amount of money raised by an individual school was £312.33.
>
> One of the schools involved ran a gardening club, with a Garden Organic gardener and a parent volunteer. The school received £8,000 funding and some support from local businesses. A small charge (per pupil attending the gardening club) covered the cost of the gardener. Money raised from the produce sale in this school was £54.00.

Of the studies describing the cost benefits of food growing in schools, probably the most robust is a study by Block and Johnson (2009) evaluating the Stephanie Alexander Kitchen Garden programme in Australia from 2006 to 2009. The programme was funded by government grants and many schools received donations of labour, goods and services. Some schools in the programme also sold their produce. The study found that six schools on average generated $1.93 for every $1 of government grant. These figures, however, relate only to the programme 'economy' (that is, the programme's *inputs* rather than an estimated valuation of its *outcomes*). Although the study valued a comprehensive range of inputs, including paid staff time, unpaid staff time (such as overtime), volunteer time, paid for garden expenses, and garden donations, it did not consider other measures such as efficiency, overall cost effectiveness, or any sort of cost-benefit analysis.

Overall, the evidence relating to the costs and benefits of food growing in schools is largely anecdotal and based on the comments of individuals or findings from a small number of schools. It is also inconclusive. This is currently a major gap in the literature.

5. How can the potential of food growing in schools be realised and sustained?

<div>

Key findings

Leadership

- Senior leadership support is essential to the successful development and sustaining of food growing activities. Champions are needed who can guide programmes through complex political and institutional barriers.

- Leadership must also be dispersed, so that there is at least one coordinator, and ideally, a dedicated staff team overseeing the food growing activity.

Whole-school planning and development

- Food growing activities are most successful where they are planned for and developed on a whole-school basis.

- Links need to be made between the growing activity and whole-school agendas, the academic curriculum, and a range of desired pupil outcomes. This gives the growing activity purpose and ensures that it is more than a 'cosy add on'.

Professional development

- There is evidence that school staff still lack confidence in developing food growing activities within their schools.

- Specifically, teachers require guidance on how best to integrate growing activities with existing curricular approaches and materials, and require specific skills development related to the practical skills of gardening and garden management.

Sustaining growing activities

- A perceived lack of staff time currently stands as a major obstacle to the effective development and sustaining of school growing activity. It is important to note that this perception often reflects a failure of managers to prioritise growing activity when resources are scarce, rather than a genuine lack of staff time.

- External support is likely to be essential for schools if food growing is to become a reality in a larger number of schools than currently. Key sources of such support can be found within the local community, through specialist horticultural organisations, and through improved links with pupils' homes and families.

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As might be expected, the research into food growing in schools identifies many challenges and barriers to the successful implementation and development of such programmes. However, studies offering solutions or enablers to address these challenges (for example, Barratt Hacking *et al.*, 2011) are rarer. An evaluation of the Growing Schools project (Scott *et al.*, 2003) comments on this paucity of identified enablers and questions the extent to which the *'barriers cited were actually barriers'* (p. 31). The authors suggest that the challenges identified were often, in reality, self-imposed limits that could have been overcome with better strategic planning.

The following sections outline what the review tells us about the essential factors that need to be considered if the potential of food growing in schools is to be realised and sustained in the longer term.

5.1 Leadership

School leadership is a crucial factor in the success and long-term sustainability of any food growing activity or initiative.

5.1.1 Senior leadership support

According to research, the involvement of the headteacher or senior management team is essential (Barratt Hacking *et al.*, 2011). Joshi *et al.* (2008) also acknowledge leadership development to be of crucial importance and report that most successful farm-to school-programmes have developed or secured active leaders and champions to guide the programmes forward through complex political and institutional barriers to achieve their goals. Commenting on successful use of school grounds for outdoor learning Titman (1999) concurs that:

> *Schools which had made the most use of sites correlated in the main with those where the head was actively involved in and committed to the concept. In these schools the grounds had status and profile. On a practical level interested headteachers are also more likely to facilitate use through management structures, for example by creating a special responsibility post/allowance.* (p. 44)

Research indicates, however, that such leadership can be lacking in schools. White and Pyle (2009) found that, in a majority of schools surveyed, junior staff or other stakeholders tended to have been the main influence in developing school gardens. Often schools' involvement had been initiated by classroom or subject teachers or other members of the school community such as support staff or even the pupils themselves, rather than by senior staff. Although it is positive that enthusiastic members of staff have often provided the impetus for their schools to become involved in food growing activities, evidence indicates that without support and

leadership from senior managers, this enthusiasm does not always grow or become integrated into the operation of the school as a whole (Barratt Hacking *et al.*, 2011).

It is interesting that, in spite of a reported lack of senior leadership in schools, NFER's baseline survey of school-based food growing activity, which is reported on in the following section of this report (see Section 6.4), and provides up to the minute findings, found that food growing activities currently have the support of senior leaders in over four fifths (83 per cent) of institutions. This is an extremely positive finding.

5.1.2 Coordination and wider staff involvement

Research certainly indicates that identifying key personnel is an essential ingredient in a successful programme. Desmond *et al.* (2004) and Somerset and Markwell (2009) note the need for a coordinator or key teacher with responsibility for the growing programme. Schools involved in growing often mentioned lack of staff time or loss of key personnel as a considerable barrier to the success and sustainability of gardening programmes. With this in mind, Barratt Hacking *et al.* (2011) note that the continued success of food growing programmes requires a shift from individual champion to a team with dedicated responsibility for food growing, in addition to their other responsibilities. Azuma *et al.* (2001) also found that schools with sustained gardening programmes attributed their success to widespread long term support of the principal, teachers, parents, volunteers and students. The authors emphasise the importance of developing a **broad base** of support for food growing in schools (see also section 5.4 below for more detail).

NFER's baseline survey of schools found that, currently food growing activities are coordinated by teaching staff in 44 per cent of institutions, by non-teaching staff in 17 per cent, and by senior leaders in 16 per cent of institutions. Only in seven per cent of institutions does no one reportedly have responsibility for food growing (see Section 6.2). This suggests that the recommended broad base of support is taking shape across a number of schools.

5.2   Whole-school planning and development

Another key success factor relates to ensuring that food growing activities are planned for and developed on a whole-school basis.

5.2.1 Links to whole-school agendas

Research indicates that where food growing forms part of a wider whole-school agenda (such as promoting healthy living, sustainability, outdoor learning, or eco-schools), it is more likely to be successful and sustainable. Orme *et al.* (2011)

emphasise the importance of *'mainstreaming'*, ensuring that children are participating in and enthusiastic about food education through whole-school activities.

Eat Smart Move More (2010) note that the sustainability of a school garden requires *'broad support from the school community'* (p. 44). However, the evidence also indicates that only a minority of schools are so far making gardening or food growing activities a priority area for development. A survey of 844 children aged 7-10 in England (FACE, 2008) revealed only 15 per cent of pupils reporting growing food at school (an increase of three per cent on 2007), with involvement in growing food at schools in urban areas at a very low level (one per cent). Furthermore, findings from a teacher omnibus survey in England (White and Pyle, 2009) indicate that awareness of gardening as an activity for pupils, and the priority placed on this, may be greater in primary than secondary schools, with nearly two thirds of secondary teachers noting a lack of priority given to such work, compared with just under half of primary teachers surveyed.

5.2.2 Links to the academic curriculum

Another important aspect of planning successful food growing in schools is ensuring that activities are well linked to the curriculum. Robinson-O'Brien *et al.* (2009) found that linking garden-based education to school subjects and learning objectives, together with regular assessment and monitoring of outcomes was important to successful implementation. An RHS study (2010a) reported that successful programmes depended on the school garden being more than *'a cosy add-on'* and that activities needed to be deeply and easily embedded across all areas of the curriculum. Several other studies also indicate the importance of linking food growing activities closely to specific curriculum areas (Azuma *et al.*, 2001; Desmond *et al.*, 2004; Barratt Hacking *et al.*, 2011), while Oxenham and King (2010), in a review of using school-based gardening to promote nutrition education, argue that such programmes should be age-specific and aim to target groups with realistic, stimulating programmes. Orme *et al* (2011) conclude that:

> *Integration into curricular schemes of work is likely to be an important factor in the longer term sustainability of garden enhanced project work.* (p. 82).

In secondary schools, where a greater emphasis is necessarily placed on examination work, Scott *et al.* (2003) note the importance of ensuring that materials and support are subject-specific in order to maximise relevancy. However, one note of caution can be found in Rickinson *et al.* (2004) which warns of the danger of 'overstructuring', noting that the appeal of outdoor learning for many pupils lies in the absence of worksheets, note taking and written activities, but rather having the chance to interact with the natural environment.

5.2.3 Links to pupil outcomes

The evidence collated for this review suggests that successful food growing programmes make explicit links to pupil outcomes. Roach (2010) describes ways in which primary schools have used food growing as a means of developing the skills and attitudes needed for scientific learning, including: pupils using first hand observation of seasonal change and life cycles to draw their own scientific conclusions; learning the classification of plants by identifying which plants are weeds and which are sown; handling tools carefully; taking turns; communicating with one another in the garden; and also cooking the foods they grow. An American study of primary aged pupils in the US (Skelly and Bradley, 2007) makes links to very similar outcomes. Other studies (RHS, 2010a and b; Pranis, 2004) emphasise the importance of food growing activities in providing pupils with unique hands-on experiences, which can be both valuable and stimulating.

5.3   Professional development

Many of the studies reviewed for this report make reference to the need for teachers to receive adequate training and development to enable them to incorporate food growing activities into the curriculum.

5.3.1 Training and development on curriculum integration

Surveys of school principals and teachers in California (Graham *et al.*, 2005; Graham and Zidenberg-Cherr, 2005) identified a need for more teacher training in the use of the garden to enhance nutrition education. Sixty one per cent of the teachers surveyed also noted a lack of teacher experience and knowledge as a barrier to the development of garden-based learning. Rickinson *et al.* (2004) and Scott *et al.* (2003) cite teachers' lack of confidence as a barrier to successful use of the outdoors for learning, a concern that Teeman *et al.* (2011) found could be overcome through teacher workshops in FFLP schools. Scott *et al.* (2003) also note that staff must receive development in project management if they are successfully to implement and sustain growing activities in schools. Research by the RHS (2010b) found teacher training to be fundamental in delivering a step change in the way that school grounds are used to inspire pupils and engage them in a dynamic learning experience.

5.3.2 Training and development in food growing and preparation

Teachers and other school staff also need training in practical gardening and food preparation skills (Eat Smart Move More, 2010) in order to effectively pass these on to pupils. In this respect the use of volunteers with gardening expertise, or horticulturalists, may be advantageous as a means to enhance garden-based

provision and offer professional development in the form of a hands-on learning experience for teachers alongside their pupils. Scott *et al.* (2003) suggest that peer training or mentoring can be a valuable mechanism for staff development using a 'trickle-down' approach. They conclude that*:*

> *a much more overt focus on teacher professional development is needed if schools are ever to become less dependent on external professionals for direct work with children.* (p. 41*).*

Furthermore, the importance of quality teacher input is stressed by Blair (2009), in a review of the benefits of school gardening. He concludes that *'teacher and administrator attitudes toward the efficacy of school gardening in terms of learning outcomes was the most critical variable'* (p. 33).

5.4 Sustaining growing activities

There are a number of factors that can potentially contribute to the sustainability of food growing activities in schools.

5.4.1 Staff time

Given the weight of literature suggesting that a perceived lack of staff time is an obstacle to developing food growing activities in schools, even if this perception often reflects a failure of managers to prioritise growing activity when resources are scarce, rather than a genuine lack of staff time, any strategies that help schools to prioritise growing activity and to allocate resources appropriately will be welcomed. The NFER baseline survey of current food-growing activity found, in fact, that the three main current barriers reported by institutions in relation to food growing are: a lack of curriculum time (reported by 46 per cent of institutions); a lack of personnel to coordinate activity (36 per cent of institutions); and a lack of personnel to supervise activities (36 per cent of institutions) (see Section 6.6 below for more detail). All of these relate to the overarching issue of time.

Currently, a perceived lack of staff time for planning, development and maintenance is the main source of concern for schools wishing to become involved with food growing. Many of the issues raised centred on teacher release and sustainability. Sixty five per cent of teachers in England who took part in a teacher omnibus survey (White and Pyle, 2009) reported a lack of staff time as a barrier to progress in establishing a gardening programme. A similar percentage of schools involved with the FFLP (Orme *et al.*, 2011) found freeing up staff time to be a considerable challenge. Rickinson *et al.* (2004) also note schools' concerns in this area. A survey of Californian schools involved in gardening programmes (Azuma *et al.*, 2001) reported that 14 per cent of participating schools had been unable to sustain their

gardening programmes. One of the main reasons cited for this failure was a lack of staff time or teacher overload.

In their review of school farms, Saunders *et al.* (2011) found that many staff and volunteers gave of their personal time to ensure the success of the programme. In this instance, harnessing and valuing staff enthusiasm and commitment was crucial to the sustainability of programmes. In schools where such enthusiasm is lacking however, a 'volunteer' approach to staffing may not lead to the most positive results. Scott *et al* (2003) conclude that, due to the many pressures on their time, teachers need external support if food growing programmes are to become a feasible reality.

5.4.2 Community support

There is certainly indicative evidence that the most successful food growing programmes seek to secure community support in order to ensure the long-term viability of their initiatives (Eat Smart Move More, 2010; White and Pyle, 2009; Azuma *et al.*, 2001). In order to be sustainable, school gardens must make use of community volunteers and external help. A survey of school principals in the USA (Graham *et al.*, 2005) reported that over half of those surveyed considered that it was vital to secure the services of community volunteers to assist school staff in the day to day maintenance of the garden. In some schools, community volunteers were enlisted to help with large scale building projects (RHS 2010b). Similarly, Block and Johnson (2009) found that volunteer help was key to the success of the SAKG programme in Australia.

Walicek *et al.* (2000) report that community volunteers acted as role models for pupils as well as providing much needed practical support for school staff. While Teeman *et al.* (2011) acknowledge that schools involved with the FFLP found it challenging to engage parental and community support, there is evidence that many projects and initiatives have successfully made use of this valuable resource. Joshi *et al.* (2008) refer to 'complementary partnerships' where successful school farm programmes involved diverse stakeholders, including community-based NGOs, which could support the programme in a variety of ways both from within and outside the school district. An Australian study by Somerset and Markwell (2009) reported that the engagement of a part-time coordinator with education training had provided a useful conduit between garden and curricular activities, enabling teachers to use the garden for teaching without garden maintenance. Furthermore, building relationships with a local adult permaculture education facility had provided assistance with landscaping, while a community garden had offered horticultural expertise and the police citizens youth club had provided help with security.

5.4.3 Home support

Research also indicates the importance of strong home-school links and engaging parental support. Such support is considered particularly valuable in promoting

nutrition education and healthy eating. Ransley *et al.* (2010) suggest that parental involvement seems to have an effect on the vegetable intake of pupils, possibly because parents are providing effective role models for their children. Programmes which combined cooking and gardening (Block and Johnson, 2009) provided good opportunities to involve parents and carers in activities, with pupils taking food and garden produce home to taste. A study on gardening with SEN pupils (RHS 2010b) found good communication with the home to be vital. In one school, pupils' gardening achievements were celebrated in the school's weekly newsletter, sent out to parents and carers, encouraging a number of pupils to share their skills at home. Parents were also invited to be involved in hands-on gardening activity through open days and 'digging Sundays.' It is encouraging that NFER's baseline survey of food-growing activity levels in schools shows that around half of all institutions currently have parents offering formal or informal support to their food-growing programmes (see Section 6.5 below).

5.5 Summing up: how can potential be realised and sustained?

There are currently more identified challenges to developing and sustaining food growing activities in schools than there are solutions. However, the literature appraised for this review provides some interesting indications of the types of consideration that need to be made if more schools are to be encouraged to take up, and to sustain, food growing activity in the future. Of key importance will be addressing issues around school leadership – specifically how to disperse leadership and coordination responsibility and engage a wider range of school-level stakeholders in growing activity. Planning the activity so that it is closely connected to the whole-school agenda, the academic curriculum and desired pupil outcomes is also of key importance. School staff still require substantial development, both in relation to integrating growing activities with the existing school curriculum, and in terms of developing the confidence and practical skills to manage and tend a school garden effectively. Finally, in order to overcome substantial staffing pressures and the impact of conflicting school priorities, schools will need to draw on the support of communities, families and external experts to ensure that gardens can both be developed initially, and sustained in the longer term.

6. Survey findings

A baseline survey of schools and early years settings was undertaken by NFER between August and September 2011. The purpose of the survey was to examine the extent and nature of food growing activities in institutions. Section 3.2 outlines the survey methodology.

Key findings

Base line survey results

- The majority of schools and early years settings are involved in food growing activities to some extent. Primary schools are statistically more likely to be involved in food growing activities than early years settings and secondary schools.
- Food growing activities appear to be well embedded in almost a fifth of institutions.
- It is most frequently teaching staff who coordinate food growing activities in their setting, according to respondents. Where senior leaders coordinate food growing, this is most likely to be in primary schools.
- Within primary schools similar proportions of children in key stages 1 and 2 participate in food growing; as children get older (in key stages 3, 4 and 5) levels of participation reduce.
- Almost all institutions involved in food growing grow food in an outdoor plot/raised bed/garden onsite.
- Almost all institutions have the support of senior leaders for food growing activities.
- Parents offer support for food growing in about half of institutions.
- The motivations for institutions involvement in food growing relate to: teaching pupils about the environment and where food comes from (this was also the most popular response when asked about the one main motivation for growing food).
- The perceived barriers to food growing activities relate to: lack of time in the curriculum and a lack of staff to coordinate or supervise activities. Proportionally, more respondents selected 'lack of time' than other barriers when asked about the main barrier.
- Many institutions hope to expand food growing over the next couple of years. Of these, the majority are in urban areas.

This section presents the findings of the baseline survey. The findings are presented under the following headings:

- Involvement in food growing
- Length of involvement in food growing
- Coordination of food growing
- Pupil, staff and community involvement in food growing

- Nature of food growing
- Support for food growing
- Motivations and barriers associated with food growing
- Future of food growing.

6.1 Involvement in food growing

All survey respondents were asked to indicate whether their school/early years setting is involved in food growing activities. Of the 1306 respondents overall, 80 per cent (1040) are currently involved in food growing to varying degrees; 11 per cent (143) are not currently involved but have been in the past and nine per cent (119) are neither currently, nor have previously, participated in food growing.

Table 1 below shows the proportions of schools and early years settings involved in food growing activities.

Table 1: Institutions' involvement in food growing

Is your institution involved in food growing activities?	Early years		Primary schools		Secondary schools		All	
	N	%	N	%	N	%	N	%
Yes	405	80	365	86	270	72	1040	80
No, but has been in the past	62	12	40	9	41	11	143	11
No and has not been in the past	39	8	17	4	63	17	119	9
No response	1	<1	1	<1	2	1	4	<1
Total	507	100	423	100	376	100	1306	100

Due to rounding, percentages may not sum to 100.
Source: Food growing in schools and early years settings: baseline survey 2011.

A slightly greater proportion of primary schools (86 per cent) participate in food growing compared to early years settings (80 per cent) and secondary schools (72 per cent). The data shows that primary schools are statistically more likely to be involved in food growing activities than early years settings and secondary schools.

Institutions currently involved in food growing were asked about the length of time they have been participating. Just under two-thirds (34 per cent) have been involved in food growing for more than four years and over a quarter have been involved for 'one to two years' or 'three to four years' (28 per cent and 26 per cent respectively). Ten per cent of institutions have been growing food for less than one year.

Table 2: Length of time institutions have been growing food

For what length of time has your institution taken part in food growing activities?	N	%
Less than 1 year	106	10
1-2 years	292	28
3-4 years	269	26
More than 4 years	350	34
Not sure	15	1
More than one box ticked	1	<1
No response	7	1
Total	1040	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered 'yes' to question1.Source: Food growing in schools and early years settings: baseline survey 2011

Twenty per cent (N = 262) of respondents who indicated that their institution is not participating in food growing currently were asked whether their setting will grow food in the future. It is encouraging that only fifteen per cent of respondents indicated that their institution will 'probably not' or 'definitely not' participate in food growing in the future. Six per cent are unsure. Over a quarter (26 per cent) of respondents indicated that their institution 'definitely' would grow food in the future.

Table 3 presents the data below.

Table 3: Institutions currently not growing food and their likelihood of doing so in the future

If your institution is not currently involved in food growing activities, will your institution take part in food growing activities in the future?	N	%
Definitely	67	26
Probably	61	23
Possibly	77	29
Probably not	35	13
Definitely not	6	2
Not sure	15	6
No response	1	<1
Total	262	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered 'No but has been in the past' or 'No and has not been in the past' to question 1.
Source: Food growing in schools and early years settings: baseline survey 2011.

Table 4 below presents data from the 143 institutions that currently do not grow food but have done so in the past. Of these 143 schools and early years settings, 70 per cent (N = 99) of respondents indicated that their institution 'definitely' or 'probably' will participate in the future; only one respondent selected 'definitely not'. Further analysis shows that of these 143 institutions, primary schools are most likely to grow food again in the future, whereas early years settings are most likely to not grow food in the future. Urban institutions that have grown food previously but currently do not are also more likely than their rural counterparts to indicate they will grow food in the future.

Table 4: Institutions currently not growing food, but have in the past, and their likelihood of doing so in the future

If your institution is not currently involved in food growing activities, will your institution take part in food growing activities in the future?	N	%
Definitely	48	34
Probably	51	36
Possibly	31	22
Probably not	5	3
Definitely not	1	1
Not sure	6	4
No response	1	1
Total	143	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered 'No but has been in the past' to question 1.
Source: Food growing in schools and early years settings: baseline survey 2011.

Of the 119 institutions that have not previously participated in food growing, 29 per cent (N = 35) of respondents indicated that they 'probably' or 'definitely' would not in the future (see Table 5 below). Of the early years settings and primary schools that have grown food previously, no one indicated that they 'definitely would not' grow food again. Only one secondary school involved in food growing previously, indicated that they 'definitely would not' do so again in the future.

Table 5 Institutions that have never grown food and their likelihood of doing so in the future

If your institution is not currently involved in food growing activities, will your institution take part in food growing activities in the future?	N	%
Definitely	19	16
Probably	10	8
Possibly	46	39
Probably not	30	25
Definitely not	5	4
Not sure	9	8
Total	119	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered 'No and has not been in the past' to question 1.
Source: Food growing in schools and early years settings: baseline survey 2011.

6.2 Coordination of food growing

Respondents who indicated that their institution is currently growing food were asked who is responsible for coordinating food growing activities. Teaching staff were reported to coordinate food growing activities in over two-fifths (44 per cent) of institutions, as shown in Table 6. Similar proportions of non-teaching staff and senior leaders are reported to be responsible for coordinating food growing (17 per cent and 16 per cent respectively). In seven per cent of institutions no one is reported to have responsibility for coordinating food growing. Further analysis shows that senior leaders in primary schools (42 per cent, N = 70) are more likely to coordinate food growing activities compared to senior leaders in secondary schools (37 per cent, N = 62) and early years settings (21 per cent, N = 35). Of the respondents (four per cent, N = 38) who indicated food growing is the responsibility of a volunteer from the community, half of these were secondary school respondents (N = 19) compared to 14 respondents from primary schools and 5 respondents from early years settings.

Table 6: Responsibility for coordinating food growing

Who, if anyone, is responsible for coordinating food growing activities across your institution?	N	%
Teaching staff	461	44
Non-teaching staff	177	17
Senior leader	167	16
Nobody has responsibility	74	7
Volunteer from community	38	4
Someone else	10	1
Not sure	4	<1
No response	109	10
Total	1040	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered 'yes' to question 1.
Source: Food growing in schools and early years settings: baseline survey 2011.

6.3 Children, staff and community involvement in food growing

Respondents were asked who within their institution is involved in food growing. Specifically, we wanted to explore any patterns regarding the age ranges of children and young people involved in food growing across the three phases of education. No unexpected patterns emerged, but it is interesting to note that similar proportions of key stage 1 and 2[17] pupils participate in food growing (76 per cent and 81 per cent respectively). A slightly greater proportion of key stage 3 pupils and key stage 4 pupils (56 per cent and 49 per cent respectively) participate in food growing compared to sixth form students (key stage 5) (19 per cent).

We also sought to explore the proportions of children and staff involved in food growing across the institutions. Table 7 below presents this data.

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[17] Of the 376 responding secondary schools, 45 per cent (N=171) had children from key stages 1 or 2. The secondary school sample included 'all through' independent/special schools and middle deemed secondary schools.

Table 7: Proportions of children and staff involved in food growing

What proportions of the following groups were involved in food growing activities last year at your institution?	None	Less than 25%	25% to 50%	51% to 75%	More than 75%	All	No response	Total
	%	%	%	%	%	%	%	%
Children	1	26	21	12	11	26	2	100
Teaching staff (as a participant or supervisor)	4	45	17	7	6	15	6	100
Non-teaching staff (as a participant or supervisor)	8	45	13	7	6	9	12	100

N = 1040

A series of single response questions.
Due to rounding percentages may not sum to 100.
A filter question: all those who answered 'yes' to question 1.
A total of 1028 respondents gave at least one response to these questions.
Source: Food growing in schools and early years settings: baseline survey 2011.

The data shows that all children are involved in food growing in around a quarter of institutions (26 per cent); all teaching staff are involved in 15 per cent of institutions; and all non-teaching staff participate in food growing in nine per cent of institution. Further analysis shows that of institutions involving all children[18], teaching staff[19] or non-teaching staff[20], primary schools are significantly more likely to do so compared to secondary schools and early years settings.

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[18] Of the 273 institutions involving all children in food growing, 62 per cent (N=170) were from primary schools compared to 26 per cent (N=72) from secondary schools and 11 per cent (N=31) from early years settings.
[19] Of the 155 institutions involving all teaching staff in food growing, 65 per cent (N=100) were from primary schools compared to 27 per cent (N=41) from secondary schools and nine per cent (N=14) from early years settings.
[20] Of the 98 institutions involving all non-teaching staff in food growing, 53 per cent (N=52) were from primary schools compared to 33 per cent (N=32) from secondary schools and 14 per cent (N=14) from early years settings.

6.4   Nature of food growing

Respondents currently involved in food growing were asked about the nature of their activities. Their responses are shown in Table 8 and the key findings are given here:

- Almost all respondents (92 per cent, N=961) grow food in an outdoor plot/raised bed/garden onsite. Of these 961 institutions, early years settings are significantly less likely to grow food in an outdoor plot/raised bed/garden onsite (26 per cent) compared to with primary (37 per cent) and secondary schools (37 per cent).

- In 83 per cent of institutions (N = 862), food growing activities have the support of senior leaders. Of these 862, early years settings are significantly less likely to have support from senior leaders (26 per cent) compared to with primary and secondary schools (37 per cent and 38 per cent respectively).

- Food is grown in pots outside in over two-thirds of institutions (68 per cent, N = 710). Of these 710 institutions, primary schools are significantly more likely to grow food in pots outside (44 per cent) compared to secondary schools and early years settings (33 per cent and 23 per cent respectively).

- Just over half of institutions ensure food growing is accessible to children through extra-curricular clubs and activities (54 per cent, N = 565). Of these 565, secondary schools are significantly more likely to ensure food growing is accessible to children through extra-curricular clubs and activities (45 per cent) compared with early years settings and primary schools (28 per cent and 27 per cent respectively). In addition, institutions in urban areas (65 per cent) are more likely to ensure food growing is accessible to children through extra-curricular clubs and activities compared to institutions in rural areas (35 per cent).

- Around half of early years settings and schools grow food organically (52 per cent).

- Around a half of institutions make their own compost (51 per cent, N = 528). Of the 528 institutions, secondary schools are significantly more likely to make their own compost (42 per cent) compared with primary schools and early years settings (30 per cent and 28 per cent respectively). Institutions in urban areas (63 per cent) are also more likely to make compost compared to institutions in rural areas (37 per cent).

- Food growing is targeted at specific groups of children and young people in a quarter of institutions (26 per cent, N = 275). These groups include children and young people with special educational needs (SEN) or specific year groups. Further analysis shows that of the 275 institutions targeting food growing at specific group of children and young people, early years settings are significantly more likely to do so (47 per cent) compared to secondary schools and primary schools (30 per cent and 23 per cent respectively). In addition, institutions in urban areas (74 per cent) are more likely to target specific groups of children and young people compared to institutions in rural areas (26 per cent).

- Overall, only seven per cent (N = 72) of respondents indicated that their institution grows food using a space in the local community. Of these 72, early years settings are significantly more likely to do so (43 per cent, N = 31) compared to secondary schools and primary schools (33 per cent, N = 24 and 24 per cent, N =17 respectively).

- Further analysis shows that statistically, of the 513 institutions that frequently plan food growing activities into lessons, primary schools are more likely to do so (44

per cent) compared with secondary schools and early years settings (34 per cent and 21 per cent respectively).

- Thirty-nine per cent (N = 410) of food growing in schools and early years settings takes place in pots inside. Further analysis shows that of these 410 institutions, primary schools are significantly more likely to do this (47 per cent) compared to secondary schools (31 per cent) and early years settings (22 per cent, N = 91).

- Of the 212 institutions teaching food growing through one-off events, significantly more secondary schools (44 per cent, N = 93) do this than early years settings (30 per cent, N = 63) and primary schools (26 per cent, N = 56).

It is interesting to note that almost a fifth of all respondents (19 per cent) in schools and early years settings currently growing food, indicated that food growing activities are part of the institutions overall policy; that it has the support of senior leaders and that food growing is frequently planned into lessons. This suggests that food growing in these institutions is well embedded. Although it is encouraging to find that 80 per cent of institutions grow food to a varying degree, the level of embeddedness overall is low.

Table 8: Food growing activities

Which of the following statements are true about food growing in your institution?	N	%
We grow food in an outdoor plot/raised bed/garden onsite	961	92
Food growing activities have the support of senior leaders	862	83
We grow food in pots outside	710	68
Food growing is accessible to children through extracurricular clubs/activities	565	54
We grow all our food organically	540	52
We create and use our own compost	528	51
Food growing is frequently planned into lessons	513	49
We grow food in pots inside	410	39
Food growing activities are part of our institution's overall policy	352	34
Food growing is targeted at specific groups of children (e.g. year groups, SEN, etc)	275	26
Food growing is taught 'off timetable' through one off events or 'enrichment days/weeks'	212	20
We grow food using a space in the local community (e.g. an allotment site)	72	7
No response	6	1
Total =	1040	100

More than one answer could be given so percentages may sum to more than 100.
A filter question: all those who answered 'yes' to question 1.
A total of 1034 respondents answered at least one item in this question.
Source: Food growing in schools and early years settings: baseline survey 2011.

6.5 Support for food growing

We were interested to find out what help, if any, schools and early years settings received to support food growing activities. Respondents were asked to indicate from a given list where they had received support from, Table 9 presents the data.

Table 9: Support received to help with food growing

From which of the following has your institution received support (either formally or informally) to help with food growing?	N	%
Parents	513	49
A business (local or national)	305	29
A charity (local or national)	211	20
Another type of organisation/partner	194	19
Local authority	106	10
Another school/ early years setting	35	3
National government	15	1
None of these	260	25
No response	12	1
Total =	1040	100

More than one answer could be given so percentages may sum to more than 100.
A filter question: all those who answered 'yes' to question 1
A total of 1028 respondents answered at least one item in this question.
Source: Food growing in schools and early years settings: baseline survey 2011

Around half of respondents (49 per cent) indicated that parents offer either formal or informal support to their institution. Of these, parents in institutions in urban areas are significantly more likely to offer support compared to those in rural areas (61 per cent and 39 per cent respectively). Interestingly, parents of children in early years settings (16 per cent) are less likely to offer support compared to those in secondary schools or primary schools (44 per cent and 39 per cent respectively).

Almost a third of respondents (29 per cent) indicated that a business had supported them and almost a fifth (19 per cent) had been supported by another type of organisation or partner. Secondary schools are significantly more likely to receive support from a business[21], a charity[22] or another type of organisation or partner[23] compared to early years settings and primary schools.

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[21] 44 per cent of secondary schools, compared to 29 per cent of early years settings and 27 per cent of primary schools. Please note the overall N=305.
[22] 41 per cent (N=86) of secondary schools, compared to 34 per cent (N=71) of early years settings and 26 per cent (N=54) of primary schools. Please note the overall N=211.

Twenty-five per cent of respondents reported that none of the listed organisations had supported them in food growing activities. Respondents from primary schools (54 per cent[24]) were significantly more likely to indicate 'none of these' compared to early years settings (26 per cent) and secondary schools (20 per cent). Respondents least frequently reported that they had received support from national government. A smaller proportion of respondents (less than five per cent) indicated that they had received support from another school or early years setting.

Respondents were asked to select from a given list of options what types of support they had received during the previous year to help food growing activities. The most frequently mentioned form of support was material resources (e.g. plants, tools, buildings) by 44 per cent of respondents. Around a third of respondents (38 per cent) reported that their institution had not received any of the listed types of support in the last year. Table 10 below presents the data.

Table 10: Support received during previous year

Did your institution receive any of the following types of support in relation to food growing activities last year?	N	%
Material resources (e.g. plants, tools, buildings)	458	44
Human resources (e.g. volunteers, parents)	394	38
Funding	201	19
Help with developing staff and/or pupils' skills or knowledge	171	16
Lesson plans	105	10
Help with relevant school trips	70	7
Other type of support	68	7
Making local land available for growing	43	4
None of the above	313	30
No response	30	3
Total =	1040	100

More than one answer could be given so percentages may sum to more than 100.
A filter question: all those who answered [Q1=1].
A total of 1010 respondents answered at least one item in this question.
Source: Food growing in schools and early years settings: baseline survey 2011

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[23] 44 per cent (N=86) of secondary schools, compared to 30 per cent (N=58) of early years settings and 26 per cent (N=50) of primary schools. Please note the overall N=194.
[24] Of the 260 respondents selecting 'None of these'.

Of the 30 per cent (N = 313) of institutions indicating that they had not received support in the last year, statistically, respondents from primary schools (53 per cent) are more likely to have not received support compared to early years settings (26 per cent) and secondary schools (21 per cent).

Furthermore, statistically, the following differences between early years settings, primary and secondary schools are evident:

- Of the 44 per cent (N = 458) of schools and early years settings that had received help with material resources in the previous year, respondents from early years settings were less likely to have received support (23 per cent) compared to secondary schools (45 per cent) and primary schools (32 per cent).

- Of the 38 per cent (N = 394) of institutions receiving human resource support, 48 per cent were secondary schools, 34 per cent were primary schools and 18 per cent were early years settings.

- Of the 201 respondents (19 per cent), primary schools are less likely to have received funding in the past year (23 per cent, N = 47) compared to secondary schools (39 per cent, N = 79) and early years settings (37 per cent, N = 75).

- Of the 171 (16 per cent) schools and early years settings receiving help to develop staff and/or pupils' skills or knowledge, 42 per cent (N = 71) were secondary schools, 37 per cent (N = 64) were early years settings and 21 per cent (N = 36) were primary schools.

- Of the 105 (ten per cent) institutions receiving support with lesson plans, 44 per cent (N = 46) were secondary school respondents, compared to 32 per cent (N = 34) of early years settings and 24 per cent (N = 25) of primary schools.

- Of the 70 institutions (seven per cent) receiving help with relevant school trips, 50 per cent (N = 35) were secondary schools compared with 29 per cent (N = 20) from early years settings and 21 per cent (N = 15) from primary schools.

- Of the 68 institutions (seven per cent), receiving other types of help in the past year, over two fifths were secondary schools (42 per cent, N = 29) compared with 32 per cent (N = 22) of early years settings and 25 per cent of primary schools (N = 17).

The data suggest that secondary schools are better at accessing support than primary schools or early years settings. This may however, be due to the number of secondary schools that have special school status (N = 103).

6.6 Motivations and barriers associated with food growing

Respondents were asked to indicate what their institutions' motivations for getting involved in food growing are and what barriers are associated with food growing activities.

Motivations for food growing

All respondents who indicated that their institution is currently or will participate in food growing activities were asked for their motivations for getting involved. They were asked to select from a list of options (see Table 11) and were also asked to select their one main motivation (see Table 12).

The most popular motivation for getting involved in food growing is to teach pupils about the environment and where food comes from (80 per cent respectively). The least frequently selected option was that the local authority or a governor had requested the institution grows food (two per cent).

Table 11: Motivations for food growing

What is motivating your school to get or remain involved in food growing activities and which one factor motivates your school's involvement the most? This factor was a motivation	N	%
To teach pupils about the environment	1002	80
To teach pupils where food comes from	994	80
To teach pupils about nutrition	903	73
To support delivery of an outdoor curriculum	852	68
To help students develop skills for a healthy adult life	848	68
To support the science curriculum	704	57
Food growing was a personal interest of a member of staff or other adult	682	55
To support the food technology curriculum	489	39
To encourage pupils to exercise	415	33
Children's request	281	23
To subsidise school dinners with self-grown items	126	10
Given the opportunity to join a formal food growing initiative (provided by a charity or the LA, for example	96	8
Parents' request	54	4
LA/Governors' request	30	2
Other	43	3
Not sure	2	<1
No response	49	4
Total =	1245	100

More than one answer could be given so percentages may sum to more than 100.
A filter question: all those who answered that the school/setting was currently involved in food growing activities or that their school/setting definitely, probably or possibly would in the future)].
A total of 1196 respondents answered at least one item in this question.
Source: Food growing in schools and early years settings: baseline survey 2011.

Respondents in the 232 institutions who indicated that their setting may participate in food growing in the future, most frequently gave the following factors as their motivations:

- to teach pupils about the environment (73 per cent)
- to teach pupils where food comes from (70 per cent)
- to teach pupils about nutrition (63 per cent).

When asked to select what their main motivation for food growing was, the most frequently selected response was 'to teach pupils where food comes from' (20 per cent), followed by 'to help students develop skills for a healthy adult life' (14 per cent) and 'to teach pupils about the environment' (14 per cent). Thirteen per cent of respondents selected 'to support delivery of an outdoor curriculum'. It is interesting to note that 'teaching pupils about nutrition' was one of the most commonly selected motivators for food growing but was less frequently reported as a main motivation (two per cent of respondents gave this as the main motivation).

Table 12: Main motivation for food growing

What is motivating your school to get or remain involved in food growing activities and which one factor motivates your school's involvement the most? - Main motivation	N	%
To teach pupils where food comes from	255	20
To help students develop skills for a healthy adult life	178	14
To teach pupils about the environment	177	14
To support delivery of an outdoor curriculum	165	13
Food growing was a personal interest of a member of staff or other adult	83	7
To support the science curriculum	48	4
To teach pupils about nutrition	29	2
To support the food technology curriculum	8	1
Children's request	16	1
To encourage pupils to exercise	1	<1
Given the opportunity to join a formal food growing initiative (provided by a charity or the LA, for example)	6	<1
To subsidise school dinners with self-grown items	4	<1
Parents' request	1	<1
LA/Governors' request	2	<1
Not sure	6	<1
Other	21	2
More than one box ticked	136	11
No response	109	9
Total	1245	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered that the school/setting was currently involved in food growing activities or that their school/setting definitely, probably or possibly would in the future)].
Source: Food growing in schools and early years settings: baseline survey 2011

There was little difference between the main motivations indicated by those currently involved in food growing and those whose institution plans to get involved in the future.

Barriers associated with food growing

When asked about the main barriers to food growing activities, respondents selected all relevant barriers from a given list and were also asked to select one main barrier (see Table 13 below). The most frequently cited barriers include:

- lack of time in the curriculum (46 per cent)

- lack of personnel to coordinate activity (36 per cent)

- lack of personnel to supervise activities (36 per cent).

Lack of material resources and difficulties in synchronising the curriculum with food growing seasons were selected by 33 per cent and 30 per cent respectively.

It is perhaps interesting to note that a 'lack of interest from children' and 'a lack of support from senior leaders' were not widely reported to be a barrier to food growing.

Table 13: Barriers to food growing

Based on your experience, what are the main barriers to food growing in schools/ early years settings?	N	%
Lack of time in the curriculum	475	46
Lack of personnel to coordinate activity	376	36
Lack of personnel to supervise activities	379	36
Lack of material resources (e.g. equipment and seeds)	343	33
Difficulty in synchronizing the curriculum with food growing seasons	311	30
Lack of staff knowledge or skills	244	23
Lack of interest from staff	205	20
Lack of outdoor space	193	19
Different priorities/interests	188	18
Lack of support from community/parents	137	13
Lack of indoor space	95	9
Health and safety concerns	97	9
Lack of interest from children	51	5
Other	39	4
Lack of support from senior leaders	33	3
Not sure	22	2
No response	87	8
Total =	1040	100

More than one answer could be given so percentages may sum to more than 100.
A filter question: all those who were currently involved in food growing activities].
A total of 953 respondents answered at least one item in this question.
Source: Food growing in schools and early years settings: baseline survey 2011

For institutions currently involved in food growing activities, the mostly frequently reported main barriers are a 'lack of time in the curriculum' (20 per cent) and a 'lack of material resources' (12 per cent).

Responses from schools and early years settings not currently involved in food growing and that are not likely to become involved in the future, most frequently identified the following barriers (around 20 respondents in each instance):

- lack of personnel to coordinate activity
- lack of time in the curriculum
- different priorities/interests.

6.8 Future of food growing

Schools and early years settings that indicated they are involved in food growing activities were asked about their plans for the future. The table below shows the proportions of schools and early years settings that indicated they planned to either expand, reduce, stop or maintain a similar level of food growing in the future.

Table 14: Plans for the future

Which of the following statements best describes the future of food growing in your institution over the next couple of years?	N	%
We hope to expand our food growing activities	646	62
We will continue to provide the same amount of food growing activities	368	35
We plan to reduce the amount of food growing activities	4	<1
We plan to stop offering any food growing activities	1	<1
More than one box ticked	13	1
No response	8	1
Total	1040	100

Due to rounding, percentages may not sum to 100.
A filter question: all those who answered 'yes' to question 1.
Source: Food growing in schools and early years settings: baseline survey 2011.

It is encouraging to find that 62 per cent of institutions hope to expand food growing over the next couple of years. Of these, 72 per cent are in urban areas compared to 28 per cent in rural areas. Furthermore, 37 per cent of institutions planning on expanding food growing are primary schools compared to 34 per cent of secondary schools and 29 per cent of early years settings. Very few individual respondents indicated that their institution planned to reduce or stop food growing. No one from early years settings indicated that their institution planned to reduce or stop food growing.

6.9 Summing up: current school involvement in food growing

The baseline survey results show the extent and nature of food growing activities in schools and early years settings for the first time. It is encouraging to see that 80 per cent of institutions are involved in food growing to some degree and that the majority of primary schools, secondary schools and early years settings surveyed are committed to doing so in the future, with many planning on expanding food growing activity. In nearly one fifth of institutions there was clear evidence that food growing activities are well embedded, with high-level policies in place and effective and wide-ranging curriculum integration.

Institutions motivations for getting involved in food growing centred around teaching children and young people about the environment and where food comes from. Reported barriers, however, focussed on a perceived lack of time and not enough adults to coordinate or supervise food growing.

The data provide a useful baseline from which to monitor the progress of food growing in schools and early years settings in the future.

7. Conclusions

This review reveals several interesting messages about the benefits that can accrue for pupils, schools and communities from involvement in school-based food growing activities. On balance, across those topics on which evidence is available, research paints a positive picture, with almost all studies identifying positive impacts for pupils, schools and communities (albeit not always backed by fully robust evidence). There are virtually no indications of negative impacts associated with food growing in schools programmes.

7.1 Strong evidence

Research **confirms** that being involved in food growing in schools projects leads to:

- **Improved pupil nutrition** (specifically willingness to try new foods, and an enhanced ability to recognise and describe a variety of fruit and vegetables).
- **Improved pupil attainment in science** (in particular, improved knowledge and understanding and enhanced understanding of scientific principles and processes).
- **Improved horticultural knowledge** (in particular, improved attitudes towards agriculture and increased knowledge of topics such as pest control, growing cycles, food seasonality, food sourcing and routes from farm to table).

It is encouraging that links have been drawn, through several robust research studies, between food growing in schools activity and enhanced nutritional and educational outcomes. Many programmes were established with a view to making a difference in these respects and a large number of the studies appraised for this review were established to evaluate these objectives.

Evidence is very clearly strongest in relation to benefits that are closely related to the content of school-based food growing activity – for example food awareness and horticultural knowledge. Additionally, the school science curriculum is the most natural 'home' for practical growing activity and so it is not altogether surprising that this curriculum subject, more than others, has been the subject of evaluation and has also shown the most positive effects. Limited evidence in relation to mathematics learning shows a less clearly positive picture, for example. One of the few studies of mathematics learning, in fact, reported a negative impact on mathematics scores for pupils involved in food growing activity (Pigg, *et al.*, 2006). This isolated study is by no means a strong enough evidence base upon which to base a conclusion that food growing in schools activity does not benefit pupils' mathematics learning, however. There is some evidence of language learning benefits for pupils with EAL, but this is generally impressionistic in nature.

While there is strong evidence that involvement in food-growing activity has positive benefits for students' scientific knowledge and understanding, there is currently a research gap in relation to its potential to have benefits for a wider range of attainment outcomes. The extent to which there is a need for more detailed research into the impacts of food-growing activity on other areas of the school curriculum (such as mathematics and design and technology) depends, to a large degree, on the desired academic benefits of food growing in schools programmes. If food growing activity is intended to enhance student attainment across the whole curriculum, then there is an outstanding need for specifically focused research to investigate these effects. Such research should ideally be measurement-based.

Interestingly, however, the baseline survey reported upon in Section 6 of this report, found that the main motivations identified by schools and early years settings for getting involved in food growing were not only related to subject-specific curriculum benefits (57 per cent believed support of the science curriculum to be a motivation, and 39 per cent believed support of the food technology curriculum to be a motivation). Rather, the main reasons that institutions gave for becoming involved were: to teach pupils about the environment (80 per cent), to teach pupils about where food comes from (80 per cent) and to teach pupils about nutrition (73 per cent) (see Section 6.6 above).

We should also remember that although the research base provides strong evidence of impact in relation to increased scientific and horticultural knowledge, and in relation to improved pupil nutrition, most of these studies were undertaken overseas (most commonly in the USA). It is important to recognise that food growing activities may not necessarily result in the same benefits in the UK.

7.2 Modest evidence

Research **indicates** that being involved in food growing in schools projects can contribute to:

- **Improved pupil nutrition** (specifically improved consumption of fruit and vegetables, although there is little evidence of long-term health benefits beyond the immediate scope of a programme or intervention).

- **Enhanced environmental awareness** (specifically more positive attitudes towards free range, organic, local and fair trade production, and more generally, broad comments about pupils having 'better environmental awareness').

- **Improved psychological and 'wellbeing' outcomes** (particularly related to enhanced confidence and self esteem, improved interpersonal skills and specific personal development benefits for low achieving, disaffected or SEN pupils).

- **Enhanced pupil attitudes towards school** (this is closely related to the point above, particularly as a number of authors point to particularly positive benefits for low achieving, disaffected or SEN pupils. However, it relates specifically to in-school motivation such as better attendance, improved behaviour and an overall improved attitude towards school).

- **Improved school-community links** (particularly between school and home and between schools and and their local communities. There is less evidence of improved interactions between pupils and teachers).

A range of additional benefits to school-based growing activity are outlined here, some of which reportedly resulted from food growing programmes indirectly (in other words, the food growing programmes were not specifically established to have an impact in this regard). Most of the evidence of these benefits is qualitative in nature and, whilst largely robust in design, is only able to provide perceptions of impacts on pupils, schools and communities.

It is no coincidence that the evidence base for these benefits is less conclusive than for some of the nutritional and educational benefits mentioned in Section 7.1 above, although none of the research studies mentioned here reported any negative impacts arising from food-growing activity. Firstly, many of these outcomes are 'soft' in nature and not easily measured. Hence there is a more subjective feel to the evidence surrounding discussion of these outcomes. Secondly, many of the research studies were not established to measure these outcomes specifically. Nevertheless, there is a large body of evidence around all of these themes indicating that food growing in schools activities can have a number of psychological and motivational benefits for pupils, and can also bring benefits in terms of drawing schools and the communities that they serve closer together.

If there is interest in examining in more detail the impacts of food-growing activity on, for example, changes in pupils' long-term food consumption patterns, or improvements in their environmental knowledge and awareness, then research established specifically to measure these effects will need to be undertaken. The evidence base, as it stands, does not provide confirmatory evidence of impact, although it gives some interesting indications.

Before committing resources to such an endeavour, however, several questions need to be asked. These include: *'What outcomes do we expect to see from pupil involvement in food-growing activities in schools?'* *'Which of these outcomes are the most important?'*, and *'Which warrant further, in-depth, investigation?'* The findings of the baseline survey outlined in Section 6 above indicate that schools and early years settings are particularly interested in teaching pupils about the environment and about nutrition. These are their main motivations for getting involved in food growing activity (See Section 6.6 above). This suggests that further research to investigate these effects might be beneficial.

7.3 Impressionistic evidence

Research (largely anecdotal in nature) **suggests** that being involved in food growing in schools projects has the potential to contribute to:

- **Better knowledge of routes to horticultural careers** (although there is anecdotal evidence of some schools offering horticultural courses and qualifications, there is no evidence of the take up of these options, nor of pupils' progression to horticulture-based occupations).

- **Improved physical fitness** (such as greater levels of physical activity and greater willingness to move around outdoors. There is a small amount of evidence of such benefits but no evidence of pupils adopting less sedentary lifestyles in the longer term).

- **Improved practical growing skills** (although one might expect this to be a natural benefit of pupils' involvement in school-based growing activity, there is only anecdotal evidence of pupils developing new practical growing skills).

- **Opportunities for enterprise activity** (the evidence that we have is largely descriptive in this respect, providing individual examples of activity at the school level).

- **Cost benefits** (there is virtually no evidence of the cost benefits that can accrue for schools and communities from involvement in school-based food growing activities. The little evidence that we have is limited in its design. No robust cost benefit analyses or value for money assessments have been undertaken).

Many horticultural experts believe that school involvement in food growing can lead to the positive benefits outlined above. Indeed members of our expert panel provided a number of examples, from their own experiences, of food growing activity leading to improved physical fitness, or greater enterprise activity for example. Currently, however, there is little firm research evidence confirming that these benefits are accruing from food growing in schools activities. This is definitely a case of there being key 'gaps' in the evidence base, rather than a case of the available evidence presenting a picture of a failure of food growing activities to achieve such impacts. None of the research studies commenting on the potential benefits above reported negative impacts.

Essentially, most food growing projects and evaluations (especially those emanating from the USA) have been established to assess the impact of food growing in schools on pupil nutrition, or on pupil attainment. Hence, there is a paucity of evidence related to a range of other potential impacts such as those identified in Section 7.3 above. The extent to which further research is needed to 'plug' this gap depends largely upon expectations of what a school-based food growing programme should achieve, and the relative importance attached to different outcome measures. NFER's baseline survey found that only one third (33 per cent) of institutions believed 'encouraging pupils to exercise' to be a motivation for getting involved in food growing activity. They were not invited to comment on any of the other potential outcomes discussed above (see Section 6.6).

7.4 The evidence base – a case for further development of food growing in schools activity?

As explained in the sections above, most of the research studies appraised for this review were established to examine the impacts of food growing in schools activity on pupil nutrition and on pupils' scientific and horticultural knowledge and understanding. It is very encouraging that this body of research has confirmed a positive impact on these important benefits for pupils. This makes a strong case for food growing activity having a place within schools. Two caveats need to be noted here, however:

- Most of the evidence of such outcomes emanates from overseas, in particular from the USA and Australia. It should not be assumed that the benefits identified will necessarily be transferable to the UK context. Many of the programmes evaluated overseas had received government funding or large grants to get established, which demonstrates that they were operating in a different context to many schools in the UK.

- Most of the evidence relates to outcomes for primary-aged pupils. Less research has been conducted looking at benefits for secondary-aged pupils, although where evidence does exist, it suggests that older children often have the capacity to draw clearer links between growing activities and their science learning than younger pupils.

The review has also indicated that food growing in schools activity has the capacity to have a wide range of additional benefits for pupils, schools and communities; although we are unable to confirm that such activity leads to these benefits. There is indicative evidence that food growing activity can lead to enhanced environmental awareness, improved psychological state and sense of wellbeing, improved attitudes towards school, and better links between schools and their communities. The reason that we are unable to confirm these benefits is that research studies have rarely been established with these outcome measures as the main focus of investigation. If such benefits are believed to be crucial to the future success of the campaign to develop food growing in UK schools, then robust measurement-based or in-depth qualitative studies may need to be commissioned to explore these issues specifically.

This same point applies to potential benefits about which we currently have very little evidence of impact – cost benefits; better knowledge of routes to horticultural careers; improved physical fitness; the development of practical growing skills; and the development of enterprise skills. There are clear current evidence gaps with regard to all of the above potential outcomes. If evidence of positive impact in relation to these factors is deemed important to the future success of food growing in UK schools, then it is advisable that specifically-focused research be commissioned.

Before any further resource is dedicated to evaluation, decisions need to be taken about the positive outcomes that we most wish to see emanating from school-based food-growing activity. From an assessment of the current 'gaps' identified above, the authors suggest that the case for developing food-growing activities in UK schools could best be enhanced by boosting research in areas that are most likely to be

persuasive to schools and/or potential funders. Such areas might include: the cost benefits and value for money of food growing activity; the long-term health benefits (particularly in terms of improved consumption of fruit and vegetables) of food growing in schools activity;[25] improvements in students' environmental awareness; and the success of food growing activity in enhancing pupils' knowledge of horticulture as a potential career path and, in the longer term, in increasing the number of young people entering horticultural careers.

In spite of limitations in the evidence base, there are many positive messages that can be taken from this review. Almost all appraised sources reported specific positive benefits for pupils, schools and communities, with virtually none reporting negative impacts, and only a few reporting no significant effects. Most importantly, on three major measures that many programmes and evaluations were established to investigate (pupil nutrition, scientific attainment, and horticultural knowledge), there is strong evidence of positive impact.

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[25] A large-scale randomised control trial, funded by the National Institute for Health Research, and conducted by researchers at the University of Leeds is currently underway and is assessing the impact of gardening as a tool to improve children's fruit and vegetable intake. Results will be published in 2012.

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Appendix A   Case studies

Publically Available Case Studies of Food Growing in Schools Activity

Think Food and Farming case studies

Food from the Garden and the Farm
Written By: Osset School
http://www.growingschools.org.uk/Support/CaseStudies/Osset.pdf

Creating A School Farm
Written By: Eastfield Primary School
http://www.growingschools.org.uk/Support/CaseStudies/Eastfield-Primary-School.pdf

Grow Your Own Grub
Written By: Kirk Hallam Community College
http://www.growingschools.org.uk/Support/CaseStudies/Kirk-Hallam.pdf

Grow it, Cook it, Eat it
Written By: Portway Junior School
http://www.growingschools.org.uk/Support/CaseStudies/Portway.pdf

Schools' Challenge Case Study
Written By: Sidmouth College
http://www.growingschools.org.uk/Support/CaseStudies/Sidmouth.pdf

Learning through landscapes case studies

Hamilton Grammar School

This secondary school started the work in its grounds before its building refurbishment and has continued since the development has been underway. The school has three Eco-schools green flags and has participated in a wide variety of projects including monitoring the variety of species in the grounds and creating an online database of this information. The school has developed an organic garden and a forest trail with fitness stations along its length. Students from the school have also worked with younger children from a local nursery to help them with their own growing projects.
http://www.ltl.org.uk/pdf/CStudy-Hamilton-Grammar1287732099.pdf

RHS case studies

Gardening to grow community power

Garden projects run by local communities for a variety of causes seem to be springing up everywhere. Rae Spencer-Jones explores the background to these and seeks to understand what drives this trend today, looking at several inspiring examples from around Britain.
http://www.rhs.org.uk/Plants/RHS-Publications/Journals/The-Garden/2010-issues/October/Community-gardening-projects

Cropwell Bishop Gardening Club

Established in 2008, in response to local demand, Cropwell Bishop's gardening club brings people together and aims to improve the village by installing plants and flowers throughout the public green spaces. After receiving a request for help from a local school, several of the club's 50 members have also found time to set up and run a very successful school gardening club.
http://www.rhs.org.uk/Gardening/Community-gardening/RHS-affiliated-societies/Case-studies/Cropwell-Bishop-Gardening-Club

School Food Trust case studies

Badger Hill Primary School

Badger Hill Primary School enlisted the help of a local company to design and create an allotment-style garden to enable pupils and the wider community to grow fresh fruit and vegetables. Pupils have gained team-working skills and now feel a great sense of pride and ownership for their garden. They are now much more aware of healthy eating and having a healthy lifestyle. Read on to find out more....
http://www.schoolfoodtrust.org.uk/school-cooks-caterers/case-studies/badger-hill-primary-school

School Food Matters case studies

Bedelsford School

Right outside the Green Class, the children can get to their own veg garden where they can smell, taste and help to water the plants. Special 'waterers' have been adapted from old drinks bottles to allow the children to give the plants a good soak.
http://www.schoolfoodmatters.com/documents/SFM_bedelsford_school.pdf

Collis Primary School

http://www.schoolfoodmatters.com/documents/Collis-Primary.pdf

Coombe Boys' School
http://www.schoolfoodmatters.com/documents/SFM_coombe_boys_school.pdf

Richard Challoner School
http://www.schoolfoodmatters.com/documents/SFM_richard_challoner_school.pdf

Fern Hill Primary School
http://www.schoolfoodmatters.com/documents/SFM_fern_hill_primary.pdf

Orleans Infant School
http://www.schoolfoodmatters.com/documents/SFM_Orleans_School.pdf

The Mount Primary School
http://www.schoolfoodmatters.com/documents/SFM_The_Mount_Primary_School.pdf

Nelson Primary School
http://www.schoolfoodmatters.com/documents/SFM_NELSON_PRIMARY_SCHOOL.pdf

St Matthew's
http://www.schoolfoodmatters.com/documents/SFM_st%20matthews.pdf

Trafalgar Infant School
http://www.schoolfoodmatters.com/documents/SFM_Trafalgar_Infant_School.pdf

Oathall School Farm
The farm was first established at Oathall in 1941, as part of 'Dig for Victory'. Students undertook the cultivation of potatoes and vegetables in two areas of land, previously playing fields. Curricular links were forged with most subject areas. After a period of decline, the farm is now once again seen as a major teaching resource for most areas of the curriculum.
http://www.schoolfoodmatters.com/documents/OATHALL.pdf

Learning Outside the Classroom case studies

Thomas Tallis School
Local regeneration through school grounds projects
http://lotc.org.uk/wp-content/uploads/2011/04/Thomas-Tallis-School-Grounds-London.pdf

Western Springs Community Primary School
Rugeley, Staffordshire
http://lotc.org.uk/wp-content/uploads/2011/03/Western_Springs_School_Case_study.pdf

Foodshare case studies

Pupils grow 'soup kitchen' for Cambridge homeless
http://www.foodshare.co.uk/cms/2011/05/school-children-grow-their-own-soup-kitchen-to-feed-homeless/

http://www.bbc.co.uk/news/uk-england-cambridgeshire-13888889

Food for Life case studies

Growing for Bronze – Children are giving parents the growing bug
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/441/Growing-for-Bronze-Children-are-giving-parents-the-growing-bug.aspx

Engaging the community with gardening clubs and village fêtes
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/490/Engaging-the-community-with-gardening-clubs-and-village-fetes.aspx

Creating an organic garden with the help of the community
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/488/Creating-an-organic-garden-with-the-help-of-the-community.aspx

Harvesting community links
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/484/Harvesting-community-links.aspx

Food growing at Bronze, Silver and Gold
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/319/Food-growing-at-Bronze-Silver-and-Gold.aspx

Grandparents help children to grow veggies
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/307/Grandparents-help-children-to-grow-veggies.aspx

Engaging students in learning about the origins of food
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/292/Engaging-students-in-learning-about-the-origins-of-food.aspx

Building an organic kitchen garden
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/116/Building-an-organic-kitchen-garden.aspx

How to get parents planting in the city - Carshalton Boys Sports College, Surrey
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/113/How-to-get-parents-planting-in-the-city-Carshalton-Boys-Sports-College-Surrey.aspx

My, how they've grown! – Creating a natural space for young children
http://www.foodforlife.org.uk/Resources/Casestudies/Resourceview/tabid/110/ArticleId/112/My-how-theyve-grown-Creating-a-natural-space-for-young-children.aspx

Individual school case studies

The Hermites
Encouraging students to take an active interest in the origins of the food they eat and how it is produced; as well as sustainable living and the environment that surrounds them.
Written By: The Hermitage School gardening group
http://www.growingschools.org.uk/Support/CaseStudies/thehermites.pdf

One Step One World Challenge Case Studies
http://www.ncb.org.uk/default.aspx?page=3948

Grow your own potatoes case studies
http://www.potatoesforschools.org.uk/CaseStudies.aspx?PageId=68

How to grow food at school
http://www.kingston.gov.uk/rbk_growing_ideas_booklet_lowres.pdf

Open futures

The impact of open futures in a primary school: on its curriculum, teachers and children

http://www.openfutures.com/case-studies/the-impact-of-open-futures-in-a-primary-school-on-its-curriculum-teachers-and-children

During the past four years, a number of primary schools in the south and north of the country have been developing *Open Futures*. Their reasons for becoming involved in the programme were many and varied; however, for most of the schools involved, the four curriculum strands which make up the *Open Futures* programme, were instantly attractive and engaged their interest. Whatever additional benefits the programme might bring, it seemed, from the outset, that these four contexts for learning – *askit*, *growit*, *cookit* and *filmit* – could be exciting, motivating and engaging for everyone involved. Four years down the line, it is clear that these early, often intuitive reactions were not wrong.

GreenFingered Entrepreneurs

Here at Laverstoke Park Education Centre we are committed to teaching all generations the importance of natural farming in today's world. We offer educational insights covering every aspect of bio-diverse farming through this web site and through visits to the Education Centre and farm.

Over 6,000 school and college students have visited us since 2002. We are delighted to offer our farm as a resource for learning outside the classroom, incorporating all aspects of the national curriculum. We have never charged for a school visit and never wish to do so, since we want it to be as accessible as possible to all students.

http://www.lpec.co.uk/folders/greenfingered_entrepreneurs/about_greenfingered/index.cfm

Edible Playgrounds

http://www.edibleplaygrounds.co.uk At Dorset Cereals we heard about this amazing scheme that had been created by Screen Bites, Dorset's Food Film Festival, which focuses on local food and healthy eating, and we had to find out more...

In 2007, the Edible Playground scheme worked with four Dorset schools. The schools were supported in growing food and then shown how to make their produce into fabulous meals. Alongside activity in the garden and kitchen, the children had fun finding out about lots of different foods, focusing particularly on what is grown locally. Visits to local growers and farms were part of the experience.

Charlton Manor Primary School

Charlton Manor is a primary school in Greenwich and was one of the first to sign up to Capital Growth. They transformed a disused area of the school grounds into a fantastic garden, with a wildlife and food growing area. Many pupils do not have gardens of their own, so this gives them a unique opportunity to learn about soil preparation, seed sowing, maintenance and harvesting and to understand where

food comes from. Their intention is to get parents and the local community involved too.
http://www.capitalgrowth.org/images/CaseStudy_6_Charlton_low_res.pdf

Edible Schoolyard Berkeley, California
http://www.edibleschoolyard.org/.

Morrison's 'Lets Grow' Programme

Wm Morrison Supermarkets plc's 'Let's Grow' programme supports schools with growing activities. Over half the schools in the UK are registered with the Morrisons 'Let's Grow' Programme. The following website provides advice for schools and pupils on growing in school – together with materials produced in partnership with organisations such as the National Schools Partnership.www.morrisons.co.uk/letsgrow

Appendix B   Search strategy

This appendix contains details of the search strategy adopted for the review and of the search results. The search was informed by the following review parameters, which were agreed with Defra at the outset of the study:

Publication date:	Work published from the year 2000
Geographical scope:	United Kingdom (including separate jurisdictions) or international
Language:	Published in English
Study type:	Empirical research and/or evaluation; published literature (peer and non-peer reviewed)

The search used five types of source to ensure thorough coverage of the evidence base:

- A range of general bibliographic databases.
- Websites of key organisations.
- Publication lists of subject experts.
- Reference lists of previous reviews.
- Recommendations from the Food Growing in Schools in Schools Taskforce and expert group.

The first stage in the process was for the NFER's information specialists to match database keywords to the review's objectives and agree the search strategy with Defra. The keywords are itemised in the detailed search strategy that follows.

The next stage in the process was to carry out searching across the specified databases and web resources. The list of websites identified in the proposal was supplemented by suggestions from the Food Growing in Schools Taskforce. These websites were searched on main keywords and/or the publications/research/policy sections of each website were browsed as appropriate. References were extensively harvested from previous reviews and subject experts.

The numbers of items found by the initial database search, and subsequently selected are described in the following table. The three columns represent:

- items found in the initial searches
- items selected for further consideration (that is those complying with the search parameters after the removal of duplicates)

Table B1. Overview of searches

Database	No of results	No selected
Applied Social Sciences Index and Abstracts (ASSIA)	1016	2
Australian Education Index (AEI)	565	9
British Education Index (BEI)	388	4
British Education Index Free Collections	2	0
Database of Promoting Health Effectiveness (DoPHER)	1	0
Education Resources Information Center (ERIC)	1591	10
Health Technology Assessment (HTA) Database	1	1
HWSE Database	0	0
PsycInfo	9	7
PubMed	16	16
Social Policy & Practice	555	12
Social Care Online	0	0

Search strategy

This section provides information on the precise search strategies used with each of the bibliographic databases in terms of the keywords used and, in some cases, the combinations of keywords. Smaller sets of keywords were used in the more specialist databases. All searches were limited to publication years 2000-2011, in English language only. Throughout, the abbreviation 'ft' denotes that a free-text search term was used.

Applied Social Sciences Index and Abstracts (ASSIA)

(searched via CSA 24/06/2011)

ASSIA is an index of articles from over 600 international English language social science journals, which provides unique coverage of educational and developmental aspects of children.

#1   Food
#2   Food growing (ft)
#3   Food gardens (ft)
#4   Nutrition education
#5   Child nutrition (ft)
#6   Garden based nutrition education (ft)

#7 Gardening education (ft)
#8 School gardens (ft)
#9 School gardening (ft)
#10 Gardening clubs (ft)
#11 Gardening
#12 Vegetable growing (ft)
#13 Fruit growing (ft)
#14 Eco schools (ft)
#15 Waste reduction (ft)
#16 Recycling
#17 Composting (ft)
#18 Healthy schools (ft)
#19 Health promoting schools (ft)
#20 Horticulture
#21 Outdoor activities
#22 Outdoor education
#23 Extracurricular activities
#24 Environmental education
#25 Experiential learning
#26 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25

Australian Education Index (AEI)

(searched via Dialog 22/06/11)

AEI is Australia's largest source of education information covering reports, books, journal articles, online resources, conference papers and book chapters.

#1 Food
#2 Food growing (ft)
#3 Food gardens (ft)
#4 Nutrition education
#5 Child nutrition (ft)
#6 Garden based nutrition education (ft)
#7 Gardening education (ft)
#8 School gardens (ft)
#9 School gardening (ft)
#10 Gardening clubs (ft)
#11 Gardening (ft)
#12 Vegetable growing (ft)
#13 Fruit growing (ft)
#14 Eco schools (ft)
#15 Waste reduction (ft)
#16 Recycling (ft)

#17   Composting (ft)
#18   Healthy schools (ft)
#19   Health promoting schools (ft)
#20   Horticulture
#21   Outdoor activities
#22   Outdoor education
#23   Extracurricular activities
#24   Environmental education
#25   Experiential learning
#26   #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25

British Education Index (BEI)

(searched via Dialog 23/06/11)

BEI provides information on research, policy and practice in education and training in the UK. Sources include over 300 journals, mostly published in the UK, plus other material including reports, series and conference papers.

#1   Food
#2   Food growing (ft)
#3   Food gardens (ft)
#4   Nutrition education
#5   Child nutrition (ft)
#6   Garden based nutrition education (ft)
#7   Gardening education (ft)
#8   School gardens (ft)
#9   School gardening (ft)
#10   Gardening clubs (ft)
#11   Gardening (ft)
#12   Vegetable growing (ft)
#13   Fruit growing (ft)
#14   Eco schools (ft)
#15   Waste reduction (ft)
#16   Recycling
#17   Composting (ft)
#18   Healthy schools (ft)
#19   Health promoting schools (ft)
#20   Horticulture
#21   Outdoor activities (ft)
#22   Outdoor education
#23   Extracurricular activities
#24   Environmental education
#25   Experiential learning

#26   #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25

British Education Index Free Collections

(searched 27/06/11

The free collections search interface of the British Education Index (BEI) (formerly the British Education Internet Resource Catalogue) includes access to a range of freely available internet resources as well as records for the most recently indexed journal articles not yet included in the full BEI subscription database.

#1   Food
#2   Food growing (ft)
#3   Food gardens (ft)
#4   Nutrition education
#5   Child nutrition (ft)
#6   Garden based nutrition education (ft)
#7   Gardening education (ft)
#8   School gardens (ft)
#9   School gardening (ft)
#10   Gardening clubs (ft)
#11   Gardening (ft)
#12   Vegetable growing (ft)
#13   Fruit growing (ft)
#14   Eco schools (ft)
#15   Waste reduction (ft)
#16   Recycling
#17   Composting (ft)
#18   Healthy schools (ft)
#19   Health promoting schools (ft)
#20   Horticulture
#21   Outdoor activities (ft)
#22   Outdoor education
#23   Extracurricular activities
#24   Environmental education
#25   Experiential learning
#26   #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25

Database of Promoting Health Effectiveness (DoPHER)

(searched 27/06/11)

DoPHER contains focussed coverage of systematic and non-systematic reviews of effectiveness in health promotion and public health worldwide.

#1   Food growing (ft)
#2   Food gardens (ft)
#3   Garden based education (ft)
#4   School gardens (ft)
#5   School gardening (ft)
#6   Gardening (ft)
#7   Vegetable growing (ft)
#8   Fruit growing (ft)
#9   Eco schools (ft)
#10   Horticulture (ft)

Education Resources Information Center (ERIC)

(searched via Dialog 23/06/11)

The ERIC database is sponsored by the US Department of Education to provide extensive access to education-related literature. Coverage includes research documents, journal articles, technical reports, program descriptions and evaluations and curricula material.

#1   Food growing (ft)
#2   Food gardens (ft)
#3   Child nutrition (ft)
#4   Garden based nutrition education (ft)
#5   Gardening education (ft)
#6   School gardens (ft)
#7   School gardening (ft)
#8   Gardening clubs (ft)
#9   Gardening (ft)
#10   Vegetable growing (ft)
#11   Fruit growing (ft)
#12   Eco schools (ft)
#13   Waste reduction (ft)
#14   Recycling
#15   Composting (ft)
#16   Healthy schools (ft)
#17   Health promoting schools (ft)
#18   Horticulture
#19   Outdoor education
#20   Extracurricular activities

#21   #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13
        or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24
        or #25
#22   #21 not (Adults or Adult education or Higher education)

Health Technology Assessment (HTA) Database

(searched 27/06/11)

The *HTA* database brings together details of completed and ongoing health
technology assessments from around the world.

#1   Food growing (ft)
#2   Food gardens (ft)
#3   Garden based education (ft)
#4   School gardens (ft)
#5   School gardening (ft)
#6   Gardening (ft)
#7   Vegetable growing (ft)
#8   Fruit growing (ft)
#9   Eco schools (ft)
#10   Horticulture (ft)

HSWE Database

(searched .27/06/11)

HSWE Database provides comprehensive and up-to-date coverage across the
disciplines of health, community studies and education.

#1   Food growing (ft)
#2   Food gardens (ft)
#3   Garden based education (ft)
#4   School gardens (ft)
#5   School gardening (ft)
#6   Gardening (ft)
#7   Vegetable growing (ft)
#8   Fruit growing (ft)
#9   Eco schools (ft)
#10   Horticulture (ft)

PsycInfo

(searched via Ovid SP 27/06/11)

PsycINFO contains references to the psychological literature including articles from over 1,300 journals in psychology and related fields, chapters and books, dissertations and technical reports.

#1	Food growing (ft)
#2	Food gardens (ft)
#3	Child nutrition (ft)
#4	Garden based nutrition education (ft)
#5	Gardening education (ft)
#6	School gardens (ft)
#7	Gardening (ft)
#8	Vegetable growing (ft)
#9	Fruit growing (ft)
#10	Eco schools (ft)
#11	Healthy schools (ft)
#12	Health promoting schools (ft)
#13	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12

Pubmed

(searched 28/06/11)

PubMed comprises more than 20 million citations for biomedical literature from MEDLINE, life science journals, and online books.

#1	Food growing (ft)
#2	Food gardens (ft)
#3	Child nutrition sciences (ft)
#4	Garden based nutrition education (ft)
#5	Gardening (ft)
#6	School gardens (ft)
#7	Gardening (ft)
#8	Vegetable growing (ft)
# 9	Fruit growing (ft)
#10	Eco schools (ft)
#11	Healthy schools (ft)
#12	Health promoting schools (ft)
#13	Outdoor education
#14	Extracurricular activities
#15	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14

Social Policy and Practice

(searched via OvidSP 27/06/11)

Social Policy and Practice is a bibliographic database with abstracts covering evidence-based social policy, public health, social services, and mental and community health. Content is from the UK with some material from the USA and Europe.

#1   Food growing (ft)
#2   Food gardens (ft)
#3   Child nutrition (ft)
#4   Garden based nutrition education (ft)
#5   Gardening education (ft)
#6   School gardens (ft)
#7   Gardening (ft)
#8   Vegetable growing (ft)
#9   Fruit growing (ft)
#10   Eco schools (ft)
#11   Healthy schools (ft)
#12   Health promoting schools (ft)
#13   #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12

Social Care Online

(searched 24/06/11)

Social Care Online is the Social Care Institute for Excellence's database covering an extensive range of information and research on all aspects of social care. Content is drawn from a range of sources including journal articles, websites, research reviews, legislation and government documents and service user knowledge.

#1   Food growing (ft)
#2   Food gardens (ft)
#3   Garden based education (ft)
#4   School gardens (ft)
#5   School gardening (ft)
#6   Gardening (ft)
#7   Vegetable growing (ft)
#8   Fruit growing (ft)
#9   Eco schools (ft)
#10   Horticulture (ft)

Table B2. Website searches

Website results

Website	Results selected for review	Case studies chosen
Academy of Culinary Arts	0	0
Audit Commission	0	0
Botanic Gardens Conservation International	1	0
Botanical Gardens Education Network	0	0 (need a subscription to access)
Capital Growth	0	1
Children's Food Campaign	3	0
City Harvest	6 (13 reference harvested)	0
CYPN	0	0
Defra	0	0
Department for Education	5	0
Department of Health	0	0
Directgov	1	0
European Union	1	0
Farming And Countryside Education (FACE)	6	0
Federation of City Farms and Community Gardens	1	0
Food for Life	2	10
Food Share	0	1
From Farm to Fork (Co-op)	0	0
Garden Organic	0	0
Growing Schools	0	6
Grow Your Own Grub	0	0
Health Education Trust	0	0
IDEA	0	0
Institute of Social and Economic Research	0	0
Laverstoke Park Education Centre	0	1
Learning Outside the Classroom	3	2
Learning through Landscapes	5	1
LG Group	0	0
National Children's Bureau	1	7
Ofsted	5	0
Open Futures	0	9
Royal Horticultural Society	7	2
RSPB	2	0
School Food Matters	0	11
School Food Trust	5	1
Scottish Government	0	0

Website	Results selected for review	Case studies chosen
Social Science Research Unit	0	0
Sustainability and Environment Education	1	0
Sustainable Schools Alliance	0	0
Sustainweb	2	0
Transition towns	1	0

Appendix C Screening and coding strategy

Screening strategy:

On completion of literature searching (See Appendix B for search strategy and results), all the identified items (204) were uploaded into Eppi Reviewer. The review team, in agreement with Defra, developed screening criteria to help make an initial assessment of the relevance of each item, based on its abstract (or where unavailable, on the basis of the full item). The screening criteria applied were:

- **Include – research and evaluation** (any research or evaluation evidence related to food growing, gardening or horticulture in schools)

  (112 items fell within this category).

- **Include – policy documents** (policy or background sources not suitable for the review, but useful for contextual information)

  (39 items fell within this category).

- **Include – practice documents** (documents produced for schools or others attempting to develop growing activities. Not evaluation items, but potentially of interest to readers of this review. Details of these items are included in the references section of this report

  (31 items fell within this category).

- **Exclude – irrelevant content** (items not related to food growing, gardening or horticulture in schools)

  (22 items fell within this category).

Coding strategy:

Once the screening process was complete, we developed a detailed coding frame, in collaboration with Defra, to help us further asses the 112 literature items selected during the screening process. This coding frame is provided below:

Figure C1 - Coding Frame

A.1 Coder initial	A.1.1 JLN A.1.2 KM A.1.3 JN
A.2 Coded on abstract? *(single code to be allocated)*	A.2.1 Yes and adequate *(adequate enough to make decisions about its relevance)* A.2.2 No, coded on full report A.2.3 No, abstract and full report not available
A.3 Relevance to outcome measures *(multiple codes permitted)*	A.3.1 Public Health Outcomes *(longer-term **physiological** (e.g. better physical fitness; greater interest in outdoor rather than sedentary activity) and **psychological** (e.g. improved mental health) benefits for pupils).* A.3.2 Educational Outcomes ***a) Attainment*** *(including knowledge and skills acquisition, decision-making skills, problem solving, critical thinking).* ***b) Broader learning outcomes**, including social interaction, emotional development, personal well-being and motivation towards school and study.* A.3.3 Skills and behaviours ***a) Practical skills and knowledge about food*** *(e.g. types of food, awareness of source, taste of food, food preparation), horticulture, and science and technology (including progression to relevant careers/sectors).* ***b) Environmental behaviours and participation*** *(e.g. participation in other activities, such as gardening or growing food crops at home; better understanding of food sustainability/ environmental responsibility; impact on buying habits).* A.3.4 Community engagement ***a) Enterprise*** *(including examples of selling grown food in the local community, such as at local markets).*

	b) Building communities and relationships with the broader community.
	A.3.5 Other broader outcomes *such as: family eating habits (healthy eating); pupil eating habits at school; take up of school meals; improvement in school meal quality.*
	A.3.6 Cost-benefits/VfM/SROI
	A.3.7 Success factors barriers; *enablers; what success looks like (to include case study vignettes where evidence is available).*
	A.3.8 Content of general relevance, but evidence of impact unclear
	A.3.9 Inadequate information, but could be relevant
	A.3.10 Irrelevant content - exclude
A.4 Type of literature *(single)*	A.4.1 Evaluation report *(If CBA/VfM report include here)*
	A.4.2 Peer reviewed research article (e.g. academic journal)
	A.4.3 Other research article (e.g. in practice journal)
	A.4.4 Literature review
	A.4.5 Meta analysis
	A.4.6 Opinion/discussion piece *This presents an opinion or makes an argument (from media source or professional journal)*
	A.4.7 Other *(please enter details in A.4)*
	A.4.8 Inadequate information
A.5 Other type of literature *(please enter details)*	A.5.1 Please give details
A.6 Country/area involved *(multiple) Please select country. Enter area in text if applicable*	A.6.1 UK/Great Britain (generic)
	A.6.2 England
	A.6.3 Scotland
	A.6.4 Wales

	A.6.5 Northern Ireland
	A.6.6 Europe (additional to UK – including Eire)
	A.6.7 USA
	A.6.8 Canada
	A.6.9 Australia
	A.6.10 New Zealand
	A.6.11 Other (non-European) *Please give details in A.6*
	A.6.12 Inadequate information
A.7 Other country (non-European) *Please give details*	A.7.1 Please give details
A.8 Country/area details *(single) Further information on country/area involved, if available (e.g. North East of England; Georgia, USA)*	A.8.1 No further information A.8.2 Country/area - further information *Add further information about the country/countries and area/areas involved*
A.9 Research design *(make a judgement on best fit - could be multiple but aim for single)*	A.9.1 Experimental (e.g. RCT) A.9.2 Quantitative (e.g. QED comparison group; baseline and follow-up survey) A.9.3 Qualitative A.9.4 Mixed-methods A.9.5 Literature review A.9.6 Other research design *(please enter design details in A.9)* A.9.7 Not research A.9.8 Inadequate information
A.10 Other research design *Please enter brief description of other design (NB not specific methods)*	A.10.1 Please enter design details
A.11 Research methods *(multiple) Main methods used*	A.11.1 Survey *(incl. web and telephone surveys/CATI)* A.11.2 Interviews *(face-to-face or telephone or via web))* A.11.3 Observation A.11.4 Secondary analysis *(i.e. new analysis using data collected for a previous study)*

	A.11.5 Literature review/scoping study *(as a main method, not just a few references to theory/research)* A.11.6 Other method *(please give details in A.11)* A.11.7 Not research A.11.8 Inadequate information
A.12 Other research methods *Enter brief description of methods if not included in list*	A.12.1 Describe other method
A.13 Study population *(single)*	A.13.1 Please enter details *(only applies to research projects - e.g. number, age and key characteristics of study population. For example: 'Study of 50 children aged 5 and 6 all eligible for free school meals' i.e. who has been studied?)* A.13.2 Not research A.13.3 Inadequate information
A.14 Identify as key item *(single) Is this one of the 50 most relevant items?* *If coded as 'possibly' add explanatory comments to text box*	A.14.1 Yes (use for definite 'yes') *This item addresses **one or more** of the outcomes, is highly relevant and authoritative and has a **robust research design**, and should be considered for including in the review as one of up to 50 key studies. Note: please order the full text* A.14.2 Possibly (use if item fits in some of 'yes' but not all) *This item may be important to include as a key item (e.g. has a weak link to outcomes, but is about food growing; or has good impact evidence, but is about outdoor learning more generally). Note: consider ordering a full copy - you will need this if you are to summarise it in the review* A.14.3 No (use for definite 'no') A.14.4 Inadequate information
A.15 Has QA check been carried out? *(single)*	A.15.1 Yes A.15.2 No
A.16 Extra notes	A.16.1 Please enter any extra notes for this item *For example, if you feel this item addresses an important issue that is not currently covered by the outcome measures, note it here*

Still working within Eppi Reviewer, and using the above coding frame, the review team coded each of the 112 items, on the basis of abstracts (or full text for items where no abstract was available). We extracted data on the relevancy of the studies to the review topic, the research methods used, the sample size (where relevant) and the country of origin. As part of our quality assurance processes, a second member of the review team checked ten per cent of coding decisions. This ensured that the coding was being carried out in a consistent manner.

As a result of the coding, a list of 'key items' and a supplementary list of 'possible key items' were developed and shared with our panel of experts. As a result of this consultation, we agreed upon a final list of 50 items for review.

Appendix D   Appraisal and synthesis strategy

Once the 50 key items for review had been selected and ordered, the review team began the process of appraising and synthesising the literature in preparation for reporting.

Appraising the literature

The review team used the following template to assist the process of appraising (summarising) each item of literature. This ensured that each item was appraised in a systematic fashion.

Figure D1: Literature appraisal template

Full reference	
Research summary/overview	
- Research aims - Key findings	
About the source	
Project/ Programme/ Activity/ Intervention description	
Type of literature	
Country/area involved	
Study population	
Research design/method	
Relevance to research theme 1. The impact of food growing in schools activities and programmes	
Health outcomes (Enter N/A against any outcomes not covered in item)	**Healthy eating** (e.g. pupil eating habits at school; take up of school meals, developing food preferences; family eating habits). **Physiological outcomes** for pupils (e.g. better physical fitness; greater interest in outdoor rather than sedentary activity). **Psychological outcomes** for pupils (e.g. improved mental health, wellbeing).

Educational outcomes (Enter N/A against any outcomes not covered in item)	• **Attainment** (e.g. knowledge and skills acquisition, decision-making skills, problem solving, critical thinking, improvement in test scores). • **Broader learning outcomes** (e.g. social interaction, emotional development, personal well-being and motivation towards school and study).
Skills and behaviours (Enter N/A against any outcomes not covered in item)	• **Practical skills and knowledge about food** (e.g. types of food, awareness of source, taste of food, food preparation), horticulture, and science and technology (including progression to relevant careers/sectors). • **Environmental behaviours and participation** (e.g. participation in other activities, such as gardening or growing food crops at home; better understanding of food sustainability/ environmental responsibility; impact on buying habits). • **Other skills and knowledge**
Community engagement (Enter N/A against any outcomes not covered in item)	• **Enterprise** (including examples of selling grown food in the local community, such as at local markets). • **Building communities** and relationships with the broader community.
Other broader outcomes (E.g. improvement in school meal quality) (Enter N/A against any outcomes not covered in item)	
Relevance to research theme 2. The cost-benefits associated with food in schools programmes	
Details of cost-benefits, VfM or SROI	
Assessment of robustness of the analysis	
Relevance to research theme 3. The challenges and enablers to success associated with delivery at a local and national level	
Success factors (Include case-study vignettes where evidence is available)	
Barriers	

Review of evidence	
Overall, relevance rating: (e.g. highly relevant = robust impact study, evidence relevant to more than one research theme/outcome)	Highly relevant ☐ Mostly relevant ☐ Of some relevance ☐ Limited relevance ☐
Contributory in advancing wider knowledge or understanding about policy, practice, theory or a particular substantive field	Y/N
Defensible in design by providing a research strategy that can address the research questions posed	Y/N
Rigorous in conduct through the systematic and transparent collection, analysis and interpretation of data	Y/N
Credible in claim through offering well-founded and plausible arguments about the significance of the evidence gathered	Y/N
Reviewer's comments:	
Reviewed by:	

Based on Spencer, L et al. (2003) Quality in Qualitative Evaluation: A Framework for Assessing Research Evidence. Chief Social Research's Office. London: Cabinet Office.

When appraising the quality of each literature item, members of the review team were mindful of:

- distinctions between different kinds of evidence, such as: quantitative evidence qualitative evidence; well-established trends; and emerging findings.

- the validity or trustworthiness of individual studies' findings according to a range of criteria, including the research design, sample size, methods of data collection and data analysis, theoretical approach, and relationship between claims made and evidence presented. The appraisal was sensitive to different genres of research, such as quantitative and qualitative work.

Synthesising the literature

Once all key items of literature had been appraised, the research team began the process of analysing the reviewed data in order to draw out emerging themes, patterns, and key messages. The synthesis was guided by the research objectives outlined in Section 1 of this report, with an emphasis on examining the evidence base as a whole in order to identify findings relating to each objective.

We adopted a best available evidence approach to determining the weight given to each piece of literature within the review (the most weight given to the best evidence). The primary focus of this review is to report the findings on the subject topic: growing food in schools. However, we also describe and comment on the nature of the evidence base. This will hopefully help the reader to understand where the evidence base is strongest and weakest, and will assist future commissioning of primary research into the review topic.

Providing independent evidence to improve education and learning.

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