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# Real versus perceived economic savings of garden vegetable cultivation

Richard Stafford\*, Anne E. Goodenough and Adam G. Hart

Department of Natural and Social Sciences, University of Gloucestershire, Cheltenham, GL50 4AZ.

\*Corresponding author:

Email: [rstafford@glos.ac.uk](mailto:rstafford@glos.ac.uk)

Telephone: +44 (0)1242 714681

## ABSTRACT

*Recent media coverage regarding the home cultivation of vegetables frequently cites the financial benefits of the practice, but often fails to provide empirical evidence of savings. In this study, we present the findings of a simple savings calculator for common vegetables grown in the UK. In general, growing a small quantity of a variety of vegetables produces a modest saving when compared to organic equivalents from supermarkets, but less of a saving, or even a loss, when compared to the cheapest non-organic equivalents. Maximum savings are made on high cost vegetables such as lettuce, cucumber or runner beans; with losses made on crops such as tomatoes or peppers that have higher growing costs – especially in the first year when set-up costs also need to be taken into account.*

## KEY WORDS

*Vegetable Growing, Food Cost, Organic Crops, Gardening, Cultivation*

## Mathematics subject classification

92F05

## Journal of Economic Literature (JEL) Classification Number

Q00

## INTRODUCTION

An economic downturn, rises in the retail price of food and a sharp increase in the price of oil have led many commentators to steer gardeners towards back-garden vegetable production (e.g. Brooks Brown 2008; Cox 2008). Indeed, since 2006, the sale of vegetable seeds in the UK has exceeded that of flowers for the first time since the Second World War (Hoy 2007). For many years, advantages of home grown vegetables have been cited to include increased choice of varieties, freshness, reduced carbon footprint (mainly through reduced transportation) and control over pesticide and fertiliser use, a concept frequently packaged in the term “provenance” (Kemp 1977; Halweil and Prugh 2002). However, today, although these ideas are still important, it is the potential for financial savings that is most commonly cited in the media (e.g. Brookes Brown 2008; Davies 2008).

Quantifying notional advantages associated with increased choice, provenance and carbon savings can be problematic, but determining whether cultivation of vegetables in a home garden can provide financial benefits is more tractable (e.g. Stall 1979; Cleveland et al. 1985). Internet price comparison sites can provide a useful snapshot of current retail prices and, over time, can give season-by-season trends. Using reasonable assumptions for set up costs, seed costs and yields it becomes possible to devise a financial cost/gain calculator for any given vegetable-planting scheme. While such an approach is heavily dependent on assumptions, the parameters involved are relatively straightforward to quantify.

Here we present a web-based calculator to estimate the savings arising from cultivation of up to 10 common, summer harvestable, vegetable species by comparing specific user-defined planting schemes with the organic and non-organic retail prices to quantify the respective economic differences.

## METHODS

The web-based calculator is a java applet, which is available at:

<http://web.mac.com/richardstafford1/vegCalc/vegClass.html>

The program compares the cost of shop purchase with the cost of growing to determine the potential savings of growing the 10 vegetables listed in Table 1. Cost of growing is calculated as:

$$\text{Growing cost} = \text{Costs per plant} * \text{Number of plants grown} + \text{Seed costs} ,$$

where costs per plant included pots and compost for seedlings (where required), grow bags or compost for planting adult plants, support structures such as bamboo canes, and the cost of any feed or fertiliser used. These costs were based on organic brands of compost, plant food and other consumables where information was available. Seed costs were fixed per packet of seeds (or onion sets) where the number of seeds normally far exceeds the number of plants usually grown in a typical garden (Table 1). Where the number of seeds per pack was limited (for peppers, courgette and cucumbers), the seed cost was increased for purchase of additional packets when the number of plants grown exceeded half of the number of seeds (this provided a conservative estimate of germination potential). Seed numbers, costs and varieties were all obtained from the Sutton Seed online catalogue on the 29<sup>th</sup> August 2008 ([www.suttons.co.uk](http://www.suttons.co.uk); Suttons, Paignton, UK). Where possible seeds were taken from the Alan Titchmarsh organic range. It should be noted that basic 'start up' costs of gardening, including the purchase or renting of land, greenhouses, watering costs and purchase of general tools (e.g. spades, forks), as well as an economic consideration of 'working time' spent growing vegetables were not included in this study. These costs can be high, with a typical 'entry level' greenhouse costing around £300 if bought new.

The cost of purchase of vegetables was calculated as the cost of purchasing an equivalent weight of fresh vegetables from a supermarket, during August and September when the crops were in season:

$$\text{Purchasing cost} = \text{Cost per kg} * \text{Number of plants grown} * \text{Yield per plant} ,$$

The cost per kg was calculated from an independent price comparison website ([www.mysupermarket.co.uk](http://www.mysupermarket.co.uk)) for the UK supermarkets Tesco, Asda, Sainsbury and Ocado. In all cases, the cheapest non-organic and the cheapest organic prices (per

kilo) of a given vegetable were taken (Table 1). These were adjusted where necessary when prices were given per individual vegetable (e.g. per cucumber). Yield per plant was defined as the typical crop from a home-grown plant (e.g. weight of tomatoes produced by a single plant or typical weight of an onion when ready to harvest). Information on yield was based on Dobbs (2001) where available and supplemented by data from vegetable growing in the USA (Marr 1992) where no UK data were available. Since data from Dobbs (2001) were for a maximum yield per mature plant, we used 75% of these cropping values for the model to provide a conservative estimate of savings, thereby guarding against overestimation.

## **RESULTS AND DISCUSSION**

Some typical planting plans for a variety of situations and the resultant savings are shown in Table 2. In general, large savings do not occur for comparisons with the cheapest vegetables in supermarkets unless significant quantities of vegetables are grown and substantial amounts of land are set aside. Organic comparisons produce modest savings, again unless large amounts of vegetables are grown. Growing some types of vegetable will not produce savings over purchase in the supermarket. A clear example is that of peas, where the cost of growing peas (excluding seeds) is £4.00 kg<sup>-1</sup> and the cost of purchasing organic peas was only £3.96 kg<sup>-1</sup>. However, savings could be made in subsequent years if canes or other supports are reused, or if other growing methods – such as sowing in old, recycled guttering (e.g. Dobbs 2001) – are employed. Tomatoes and peppers also incur a loss when compared to the cheapest varieties in supermarkets. The biggest savings are made on high price vegetables such as lettuce and runner beans, where the costs per plant are also low.

This study clearly indicates that growing your own vegetables will not necessarily save large amounts of money, contrary to many media claims. While there are no other recent scientific studies in this area, the results are generally supported by similar scientific studies from several decades ago (e.g. Blaylock and Gallo, 1983), which have demonstrated only modest savings from home grown vegetables.

From an economic perspective, growing high purchase price vegetables will maximise savings, and in most cases, growing an assortment of vegetables will incur, at best, modest savings (Table 2). Other factors in growing your own

vegetables, such as taste, increased vitamin content, increased choice, provenance and carbon savings – not to mention enjoyment – are not quantified in this study and are generally poorly quantified in the scientific literature (however, see Mayer 1997; Olson 2006 and review by Worthington 2001 for exceptions to this, especially with regard to vitamin, mineral and antioxidant contents of vegetables). The inclusion of price comparisons with organic vegetables may go some way to compensating for the better taste of home grown vegetables over shop bought vegetables (note however, that items such as seeds and plant food and the standard and previous use of soil in a typical garden mean that the home grown varieties may not be considered organic under Soil Association standards). Savings of home grown vegetables compared to organic shop bought vegetables are always higher than for non-organic choices, however, advocates of home grown vegetables are likely to suggest that these taste better than shop bought organic equivalents.

Previous work has suggested higher savings than the present study (e.g. Cox 2008). Cox (2008), however, was aimed at long standing gardeners and although the author claims that compost and pot costs were included, the cost of growing vegetables and fruit often appear incorrect. For example, the cost of growing 250g of carrots is stated as £0.01 (Cox 2008). This is based on a pack of 500 seeds costing £1.99, indicating that if all carrots are grown successfully and the mean weight of a carrot is 100g the cost will be £0.01 per 250g. However, 500 carrots would produce a yield of 50 kg of carrots, an excessive amount for home growing. Furthermore the germination success of seeds (at around 20-25%) and the method of ‘thinning out’ carrot seedlings commonly used would result in far fewer than 500 carrots growing. Similarly the assumption of apples costing £0.03 per 250g including the cost of purchasing a tree (Cox 2008) appears to be based on long-term savings – certainly not in the first few years when the tree yields will be low and costs much higher.

Growing vegetables over several seasons may result in larger savings (e.g. seeds could be saved and some equipment such as canes and pots can be reused – see five year average costs in Stall (1979) for an example from the USA). Equally, planting many plants such as tomatoes directly into the ground (where suitable soil exists) rather than into grow bags will save a large proportion of the ‘costs per plant’ and will result in higher savings than our conservative estimates.

This study represents the most comprehensive attempt to quantify savings made by home cultivation of vegetables in the UK. However, many of the parameters of this study are conservative estimates and calculated savings should be taken as minimum values. In particular, cropping yields of these plants are rarely scientifically studied in typical garden conditions (although agricultural yields are sometimes available e.g. Saglan and Yazgan 1995). Detailed information on cropping yields, germination success rates, long term supermarket prices (rather than the current two week snapshot), controlled taste tests of home grown versus shop bought vegetables as well as studies on the effect of vegetable cultivation on insect biodiversity and will be the focus of further study.

## CONCLUSIONS

Most media reports indicating the economic savings of vegetable conservation are inaccurate. Using the calculator presented in this paper, it can be seen that economic savings are at best modest, and in some cases, home grown vegetables will cost more than shop bought vegetables, particularly in the first year, when set up costs are incurred. However, current data on yields of most home grown vegetables are poor, and this is an area warranting further research.

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**Table 1.** Economic and biological parameters used in calculating potential savings from back-garden cultivation of 10 common vegetables.

| Vegetable           | Seed cost          | Costs per plant    | Yield per plant (kg) | Cost of purchase – non-organic (kg <sup>-1</sup> ) <sup>9</sup> | Cost of purchase – organic (kg <sup>-1</sup> ) <sup>9</sup> |
|---------------------|--------------------|--------------------|----------------------|---|---|
| Tomato              | £2.00              | £1.91 <sup>5</sup> | 1.50                 | £0.99   | £2.30   |
| Pepper <sup>1</sup> | £2.35 <sup>2</sup> | £1.91 <sup>5</sup> | 0.48                 | £1.97   | £5.27   |
| Courgette           | £2.35 <sup>3</sup> | £1.91 <sup>5</sup> | 1.81                 | £1.61   | £3.29   |
| Cucumber            | £1.30 <sup>4</sup> | £1.91 <sup>5</sup> | 1.38                 | £3.30   | £5.39   |
| Runner Beans        | £3.15              | £0.44 <sup>6</sup> | 0.75                 | £3.17   | £4.89   |
| Peas                | £2.25              | £0.44 <sup>6</sup> | 0.11                 | £2.96   | £3.96   |
| Radish              | £1.75              | 0 <sup>7</sup>     | 0.01 <sup>8</sup>    | £2.60   | £5.59   |
| Onion               | £2.15              | 0 <sup>7</sup>     | 0.18                 | £0.37   | £1.28   |
| Lettuce             | £1.25              | 0 <sup>7</sup>     | 0.15 <sup>8</sup>    | £2.81   | £8.93   |
| Carrot              | £1.30              | 0 <sup>7</sup>     | 0.07                 | £0.41   | £1.23   |

<sup>1</sup>Requires greenhouse – not included in costs. <sup>2</sup>Assumption of 6 seeds per pack germinating. <sup>3</sup>Assumption of 7 seeds per pack germinating. <sup>4</sup>Assumption of 10 seeds per pack germinating. <sup>5</sup>Includes costs of grow bag (organic) with assumption of three plants per grow bag (£1 per plant), plant feed (organic ~20p per plant) and support canes (20p), also pots (39p) and compost (organic ~12p) for seedlings. <sup>6</sup>Includes costs of compost (organic ~12p) and pots (12p) for seedlings and supporting cane for adult plants (20p). <sup>7</sup>Assumption of suitable soil available and sowing directly into ground. <sup>8</sup>No reliable data available, values based on discussions with vegetable growers and mean weights in supermarkets. <sup>9</sup>Based on data from [mysupermarket.co.uk](http://mysupermarket.co.uk) averaged over visits on the 28<sup>th</sup> August and 2<sup>nd</sup> September 2008.

**Table 2.** Estimates of savings made based on examples of what can be grown in a typical garden (numbers indicate number of plants grown). Savings are comparisons with supermarket bought cheapest items or cheapest organic items (note negative saving for non-organic comparison in example 1).

| Vegetable    | Example 1 – pots on patio                | Example 2 – small plot in mid sized garden | Example 3 – medium plot in large garden   |
|--------------|--|--|---|
| Tomato       | 3  | 5  | 10  |
| Pepper       | 0  | 5  | 10  |
| Courgette    | 2  | 2  | 5   |
| Cucumber     | 0  | 2  | 5   |
| Runner Beans | 4  | 8  | 20  |
| Peas         | 4  | 8  | 20  |
| Radish       | 0  | 30   | 50  |
| Onion        | 0  | 10   | 50  |
| Lettuce      | 0  | 10   | 30  |
| Carrot       | 0  | 20   | 50  |
| Savings      | Non-organic = -£1.72<br>Organic = £15.85 | Non-organic = £3.88<br>Organic = £66.66    | Non-organic = £36.86<br>Organic = £170.08 |