# Resource use in a low-input organic vegetable food supply system in UK - a case study

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# Resource use in a low-input organic vegetable food supply system in UK - a case study

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## INTRODUCTION

Until now the demand for food has been met by the use of abundant and cheap fossil fuels; however, we need to reconsider our modes of production to avoid a global environmental crisis. Food production systems should increasingly rely on renewable inputs and increase their stability by reducing dependency on external inputs. We apply the emergy approach to evaluate resource use efficiency of a food supply system in the UK. The main questions for this study were how much the system contributes to society by taking advantage of local renewable flows, and how much it depends on input from society.

## METHODS

### Case food supply system

The small stockless organic farm studied covered 6.4 ha of which 5.6 ha were cropped. The food supply system produced more than 48 different vegetable crops.

The farm managed its own box scheme where bags of vegetables were packed every week with a well-defined content depending on the season. These bags provided vegetables to 200-300 customers. The products were distributed through neighbourhood representatives within a 50 km radius (Figure 1).

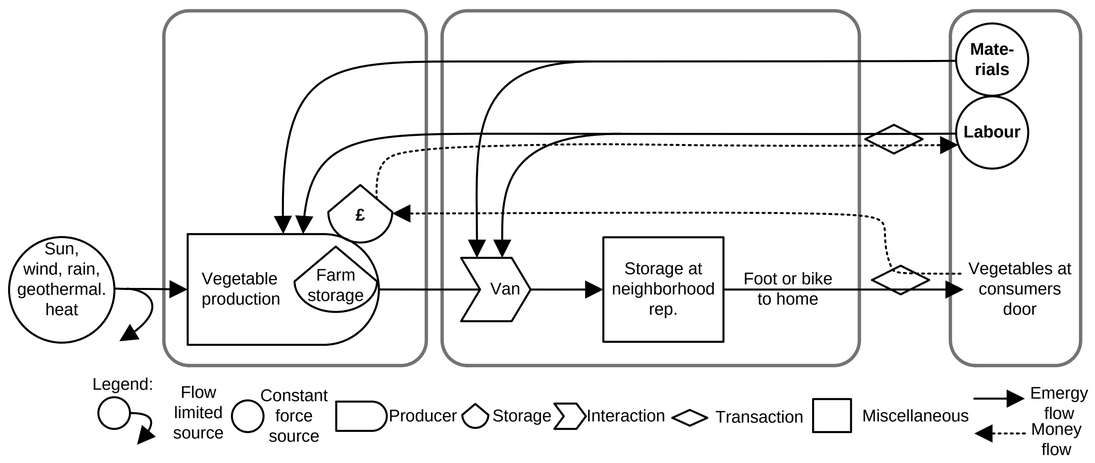



**Figure 1**. System diagram of the vegetable food supply system. See photos below.

### Emergy assessment

The resource use was assessed by emergy (spelled with an "m") accounting. Emergy is defined as:

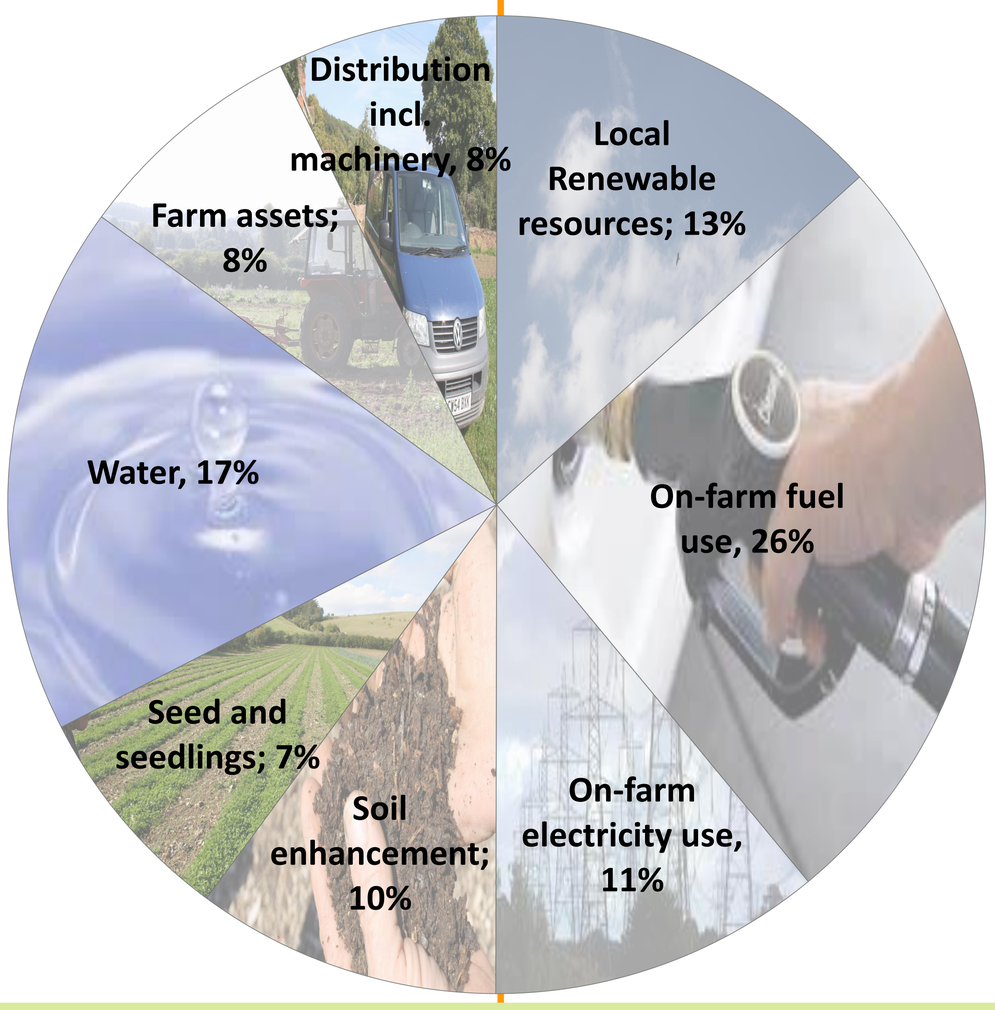
***'the available energy (exergy) used up directly and indirectly to make a product or service'***

The emergy required to provide a product or service is calculated by adding up all forms of available energy used after converting them to the same unit of solar equivalent Joules (seJ).

Emergy assessment is useful for studying agricultural systems as it accounts for non-commercialized renewable resource inputs (e.g. solar radiation, rain, soil etc.) as well as inputs from human-dominated systems (refined fossil fuels, goods, labour). Results are presented without labour and services.

## RESULTS

- 74.3 GJ of food energy was produced annually (an average for the years 2008-2010).
- 5.54E+05 seJ were required to produce joule of food energy, an efficiency was somewhat better than for a typical organic production system delivering a comparable amount in food energy.
- The emergy used for supporting direct labour within the system and indirect labour for manufacturing and supplying inputs made up 89% of total emergy used.
- This emphasise that environmental support for labour in an industrial economy is inherently resource intensive.
- Fuel used for cultivation were the largest single flow with 26% (Figure 2)
- Irrigation used in total 24% of all resources. Of these, 72% was water consumption (18% of total emergy flow).




- Woodchips used as soil-fertility enhancement and to produce potting compost contributed with 94% of the soil-fertility enhancement (10% of the total emergy flow).
- The share of local renewable resources was only 13% of total emergy input. These results are notable as the farm was managed with focus on energy savings and a strong preference to minimise external inputs and utilize local renewable resources.
- The largest potential for improving the percentage of local renewable resources is to reduce the amount of imported fuels.

- *For a comprehensive analysis see Markussen et al., 2014.*

**Figure 2.** Emergy profile visualizing the different inputs required from society and the renewable inputs received by the farm area.

## CONCLUSIONS

- The emergy assessment provides a way to determine to which degree vegetables are produced and distributed based on local renewable resources as opposed to imported fossil fuel subsidized resources.
- Even this dedicated low-input system got 87% of the total environmental support from the society and even more if when labour and service are taken into account.
- Due to the focus on renewable resources and the local supply chain, the studied food supply system is likely to be in a better position to adapt to future environmental constraints than the dominating mass distribution systems which depend on economy of scale and large throughput of goods and fuel.

## REFERENCES

- Markussen, M.V., Østergård, H., Kulak, M., Smith, L., Nemecek, T. (2014): *Evaluating the Sustainability of a Small-Scale Low-Input Organic Vegetable Supply System in the United Kingdom*. Sustainability 6, 1913-1945.

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