

# Can an organic market garden without motorization be viable through holistic thinking? The case of a permaculture farm

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## Abstract

**In industrialized countries, innovative farmers inspired by permaculture holistic principles claim to design market gardens only based on manual labor. We carried out a case study on one of these farms to assess the extent to which this approach could make it possible for a commercial organic market garden to be viable without motorization. Our work showed that these market gardeners implemented a wide range of strategies embracing ecological, technical and commercial dimensions to increase their production on a small cultivated area, and the added value of such production. On a cultivated acreage of 1,061m<sup>2</sup>, it was possible to create year round a monthly net income between 898€ and 1,571€ depending on sales and investment levels. These incomes were generated with an average workload of 43h per week. Such economic performances demonstrated that these initiatives can be viable. However, the studied approach excluded growing storage crops by hand such as potatoes which are expected by consumers. Further investigation should be carried out about the way manual and motorized market gardeners can collaborate at a local scale to fulfill consumers' requirements.**

## **INTRODUCTION**

The environmental and social costs of using oil resources as well as their increasing scarcity are challenging tomorrow's agriculture to reduce its dependency on fossil energies (Chow et al., 2003). In industrialized countries, innovative market gardens inspired by permaculture principles (Ferguson and Lovell, 2013) claim to address this challenge by promoting manual labor and holistic thinking. Our objective was to assess the extent to which a holistic approach could make it possible for a commercial organic market garden to be viable without motorization. We consider here that viability is the capacity of market gardeners to generate a sufficient income to reward themselves while keeping an acceptable workload. Our work was based on the case study of a permaculture farm in Northern France.

## **MATERIALS AND METHODS**

### **Site and production measurements**

The farm we studied is located in the small village of Bec Hellouin, Normandy, France (49°13'24.9"N 0°43'42.5"E). The local climate is temperate under oceanic influence with a high rainfall level (from 700 to 900 mm a year) and the soil is alluvium-calcareous. This farm is a 6 hectares high diversified commercial organic market garden and sells its production through short commercial channels (direct selling to consumers and restaurants). Bec Hellouin farmers claimed that it was possible for a single market gardener to use holistic principles inspired by permaculture to create an acceptable income from a small acreage cultivated with no motorization. To test this hypothesis, marketable harvest quantities and workload were measured daily from 2013 to 2014 on a cultivated surface area of 1,061m<sup>2</sup> (pathways not included). For practical constraints, different market gardeners and trainees worked part time on the studied area but their workload was cumulated in order to make sure that this work on 1,061 m<sup>2</sup> could be done by a single market gardener. From this surface area, 40% was cultivated on plane beds under a cold greenhouse, 24% on open field with plane beds and 36% on open field with curved raised beds. On both types of beds, a 30 cm deep non-inversion tillage (NIT) was applied.

### **Income and global workload estimations**

Harvest quantities were multiplied by prices of vegetables to calculate gross sales for each year. We considered that 100% of harvested marketable vegetables were sold. If the data were available, we used average prices of organic vegetables in direct selling channels in Normandy. Otherwise, we used the farm prices for uncommon vegetables. Following an accounting approach, costs, expenses and taxes were deducted from the sales to evaluate the theoretical income of a single market gardener working full time on the studied area. These data were estimated based on the farm bookkeeping documents and discussions with an expert on market gardening accountancy. We considered (i) a low costs hypothesis (LC): second-hand equipment, basic storage/selling building and no delivery van (the whole production is sold on farm) and (ii) a high costs hypothesis (HC): all equipment is bought new including a more sophisticated building and a delivery van which consumes fuel. The LC hypothesis leads to higher cost of implement maintenance because the equipment is not new. According to classic references in direct selling market gardening we assigned 50% of the on field measured workload to administrative and commercial tasks. We added production, commercial and administrative workload to assess the global workload.

### **Qualitative approach of farmers' holistic thinking**

We carried out semi-structured interviews with the market gardeners about the different strategies and principles they implemented to fulfill their objective of viability without motorization. Through a qualitative analysis method (Miles and Huberman, 1984), we identified relations among these strategies and represented them using a mind-mapping technique (Buzan, 1995).

## RESULTS AND DISCUSSION

### Holistic thinking of farmers

The holistic thinking implemented by the market gardeners relied on two main principles: increasing production on a small manually cultivated area, and increasing added value of such production. A wide range of strategies stemmed from these two principles embracing ecological, technical and commercial dimensions at the farm level (Fig. 1).

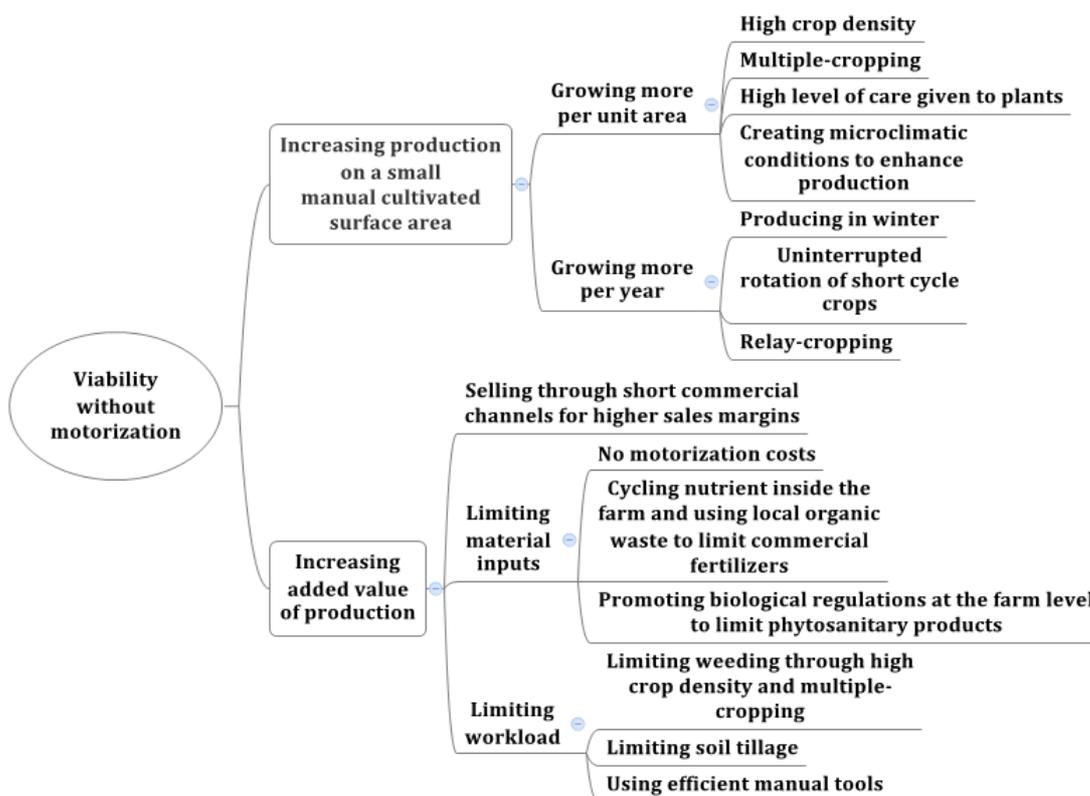


Fig. 1. Mind map of strategies implemented by the studied market gardeners.

### Income and workload

Over the three years, 64% of the gross sales (GS) were vegetables produced under the cold greenhouse which covered only 40% of the studied surface area. On average, 76 production types were grown annually in the gardens: 17 aromatic herbs and edible flowers (7% of GS), 16 fruit vegetables (41% of GS), 11 root and bulb vegetables (20% of GS) and 32 leaf vegetables (32% of GS). The vegetables sold to restaurants represented 25% of GS. In 2013, the GS were 32,788€ with a cumulated annual workload of 2,006 h. This work could be done by a full time single market gardener working in average 43h per week. In 2014, the GS were 57,284€ GS. The corresponding cumulated workload was 3,026h. This workload would represent an average of 58h a week for a single full time market gardener and was judged not acceptable for life quality considerations. Therefore, in the estimated income based on 2014 sales, we considered that the market gardener worked the same time as in 2013 and the excess workload (1,020h) was assigned to an additional employee hired 9.61€ per h (French minimum wage) with 42.3% of additional employer contributions. With the LC hypothesis the monthly net income was 1,132€ in 2013 and 1,571€ in 2014 (both judged acceptable by the farmers). With the HC hypothesis the monthly net income was 898€ in 2013 (not acceptable) and 1,337€ in 2014 (acceptable). The improved performance of 2014 can be explained by an increased expertise in multiple-cropping and relay-cropping, a higher level of care given to plants, and the use of horse manure hotbeds to produce crops earlier and with higher yield in winter. Moreover, the LC hypothesis led to a 26% higher income in 2013 and 17% higher income in 2014 (Table 1). It showed that both financial strategies and technical mastery are key

points of the viability of such initiatives as much as commercial ability because these estimations considered that 100% of marketable vegetables were sold.

Table 1. Net income estimations for a single market gardener depending on sales and cost hypothesis (€).

Year	2013		2014	
	Low	High	Low	High
<b>Cost hypothesis</b>				
<b>Gross sales</b> (including valued-added tax)	<b>32,788</b>		<b>57,284</b>	
-Value-added tax (5,5%)	1,709		2,986	
<b>Net Gross sales</b> (excluding value-added tax)	<b>31,079</b>		<b>54,298</b>	
- Seeds and young plants	4,000		6,500	
- Fertilization, other supplies and small equipment	1,500		3,000	
- Other purchases and expenses (water, electricity, fuel, equipment maintenance etc.)	6,000	5,000	6,000	5,000
- Property tax	100			
- Labor cost and employer contribution (employee)	0	0	13,949	
-Holder's personal social security charges and insurance	4,000			
- Interest expenses (bank)	300	700	300	700
-Depreciation of the greenhouse (constant over 5 years)	800	2,000	800	2,000
-Depreciation of other equipment : irrigation systems, tools, delivery van (constant over 8 years) storage and selling building (constant over 20 years)	800	3,000	800	3,000
<b>Annual net income</b>	<b>13,579</b>	<b>10,779</b>	<b>18,849</b>	<b>16,049</b>
<b>Monthly net income</b> (before personal taxes)	<b>1,132</b>	<b>898</b>	<b>1,571</b>	<b>1,337</b>

### Viability without motorization

In 3 out of 4 presented scenarios, the gross sales created from a 1,061 m<sup>2</sup> acreage without motorization made it possible to create an income which can cover basic costs of living with an acceptable level of annual workload. These sales relied mainly on short cycle crops such as leafy vegetables and fruit crops with a high added value. Storage crops such as potatoes were not grown because they were judged to remain too long in the soil and take up too much space in the gardens relative to their added value. However, these types of crops are generally expected by consumers from a market garden. For this reason, the vegetable baskets sold by the Bec Hellouin farm were complemented with storage crops produced with motorization by another local organic farmer. These sales were not taken into account in our study but highlighted the importance of considering the dependency on external productions in the viability of small farms without motorization. Although annual income and workload are two major criteria of the viability of farms, other aspects will be further investigated such as workload distribution throughout the year as well as personal satisfaction and well-being of market gardeners. Nonetheless, the choice of using no motorization is in accordance with personal values of the Bec Hellouin market gardeners. This tends to bring higher satisfaction to farmers (Mzoughi, 2014).

### CONCLUSIONS

Our case study on a permaculture farm showed that it was possible to create a monthly net income between 898€ and 1,571€ depending on gross sales and investment levels for a direct selling organic market gardener cultivating 76 vegetables types without motorization on a cultivated acreage around 1,000 m<sup>2</sup>. These incomes were generated with an average workload of 43h per week which was judged acceptable for a single market gardener. These results were made possible by a holistic way of thinking combining ecological, technical and commercial strategies which stemmed from two main principles: increasing production on a small manually cultivated area and increasing

added value of such production. The studied farm focused on growing short cycle and high added value vegetables which excluded storage crops such as potatoes. As these crops are often expected by the consumers, further investigation should be carried out about the way manual and motorized market gardeners can collaborate locally to fulfill consumers' requirements.

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