Technical and economic references for market garden microfarms in Organic Agriculture

M. Conseil[a], S. Rivière, A. De Lapparent[1], D. Berry[2], J. Pellat[3], J. Leroy[4], A. Arnaud-Dupont[5], C. Icard[6], C. Hervouet[7], N. Herbeth[8] and N. Sautereau[1].

[1] ITAB, Paris, France ; [2] Chambre d'Agriculture du Rhône, La Tour-de-Salvagny, France ; [3] CTIFL, Bellegarde, France ; [4]Bergerie Nationale, Rambouillet, France ; [5]VetAgro Sup, Lempdes, France ; [6]L'atelier paysan, Renage, France ; [7]FRAB Nouvelle Aquitaine, Oeyreluy, France ; [8]Bio Grand Est, Laxou, France.

Abstract

The number of diversified market garden microfarms is constantly increasing in France, despite the lack of references that would help to support installation trajectories and facilitate training and support of these innovative farmers. The project "*Acquisition of technical and economic references for diversified, multi-performing organic farming microfarm systems (MMBio[b] - 2019-2023)*" aims to acquire, consolidate, and disseminate technical and economic references for these systems. MMBio is based on in-depth surveys of a forty of farms to assess their performance, viability and vivability. Survey methodology was co-constructed and shared between about 20 actors from different networks to acquire technical and economic references for complex agrosystems such as microfarms. The surveys carried out on these farms was the base on which we built a typology to organize the characterization of their functioning considering the farmers aspirations. We identified some success or risks factors in these farms installation, which will have to be verified and deepened by 2023. In the end, MMBio will propose tools to train and support project holders, monitor their trajectories and facilitate viable and sustainable installations in organic micro-gardening.

Keywords: performance, microfarms, diversification, viability, organic market gardening

INTRODUCTION

For the past ten years, microfarms have spread all over France. Driven by efficient communication, particularly on social networks, of market gardeners from across the Atlantic or closer in France, the dynamic of small-scale farms setting up is also fueled by atypical approaches of vegetable production: biointensive (Jeavons, 2012) or permaculture approach (Holmgren, 2002; Hervé-Gruyer, 2017), intensive organic market gardening on small plots (Fortier, 2012) for some, conservation agriculture via the *Maraîchage sur Sol Vivant* network for others). However, this dynamic suffers from a lack of reliable technical and economic references for training and support of an increasing number of project holders.

Several previous studies have identified some aspects of the viability of these farms (Morel et al., 2016), or their technical and/or economic specificities (FD CIVAM du Gard, 2019; MicroAgri, 2020; Bio de PACA, 2022; Serail 2021). Moreover, they described these new market gardeners aspirations, objectivated the micro-market gardening farms practices and

[a] E-mail : mathieu.conseil@itab.asso.fr

[b] MMBio: acronym for *Microfermes Maraîchères Biologiques*, i.e. Organic Market Garden Microfarms

technical and economic results, and showed some of their specificities and viability conditions (Morel, 2017). In addition to these studies, MMBio project (2019-2023) aims to develop technical and economic references on a larger microfarms network in France, based on two main work packages. On one hand, we carried out in-depth surveys about farm history, practices, and technical and economic results. On the other hand, field trials aimed to identify advantages and limitations of some of their agronomic practices (not addressed in this paper). This research work should develop references needed to support numerous project holders with varied aspirations and secure installation on viable and livable projects.

Technical and economic references are just as necessary for project holders as for the trainers who provide them with the technical and economic bases before and during the project emergence, or the advisors who help them to implement and develop it. Such data exist for simple and less diversified market gardening systems, but few exist for micro-market gardening farms, which are more diversified and complex. Faced with the classic sources of available information (technical data sheets, farm description, economic studies, etc.), micro-market gardening project holders, who are often neo-rural, fairly-well educated, and comfortable with computers, naturally turn to literature intended for gardeners or social networks, to find various information that is not necessarily checked, nor relevant to their project or their installation context. Moreover, they generally lack the necessary hindsight to analyze the information from these media in their own project light, even when it comes from more related work. For example, data from the Ferme du Bec Hellouin (Morel et al., 2017) or MSV network (Maraîchage Sol Vivant, 2017) have often been used as a reflection basis for project holders for many projects since the 2010s. However, taken out of its context, such information could have been misinterpreted and led to difficulties.

Thus, ITAB (French research Institute for Organic food and farming) and around twenty partners from training, development and research sectors co-constructed the MMBio project - *Acquisition of technical and economic references for diversified, multi-performing organic market gardening microfarm systems (2019-2023)*. This article provides a mid-term review of the survey work carried out on 42 microfarms for the years 2019-2020.

MATERIAL AND METHODS

MMBio is based on in-depth surveys within a national panel of market garden micro-farms carried out in 2019 and 2020. The methodology was co-constructed by the partners. The first step consisted in defining the term of "microfarm" and the minimum conditions to be respected to respond to the project's issues. Thus, MMBio microfarms are professional farms that have been established for at least three years, with accessible accounting, whose market gardening activity is carried out on approximately 1 ha and represents 2/3 of the farm turnover, with a diversified production of vegetables (20 species or more). It should be noticed that our panel is neither exhaustive nor representative and is made up of efficient farms to highlight factors of success, but also farms with more difficulties in order to identify factors of failure in this system type.

The survey methodology is based on previous works led by several MMBio partners and the associated data acquisition tools, namely i) *"Trajectoires"* tool developed within the FNAB[c] network and ii) the technical-economic study carried out in 2017 by the Rhône Chamber of Agriculture on 16 diversified market garden farms. Survey and data sheets have been co-constructed to meet MMBio goals. MMBio survey intended to i) define the farmer's

[c] FNAB : Fédération Nationale des Agriculteurs Biologiques

profile and objectives, ii) describe the farm (land aspects, crops, available infrastructure, and agro-equipment), the production (quantities, technical itineraries, outlets), the organization (working hours), iii) the costs and economical results. Every farm has been surveyed over a period of 2 or 3 years during the project.

RESULTS AND DISCUSSION

Despite the previous precise criteria for selecting them, MMBio farms are characterized by a high degree of variability in their structure, practices, and results.

Description of the panel of microfarms studied in MMBio

The forty-two farms surveyed are located in contrasting pedoclimatic contexts throughout France. Most of them are operated by farmers with no agricultural background (66%) and originate from a different region (72%) than the one they are located in. At the time of their installation, MMBio farmers (or women farmers, 5 of whom were installed alone, and 3 in partnership with a man) were 33 years old on average, had little or no farming experience (less than 1 year for 28 of them) and were mainly driven by values linked to environment and life quality. At the time of the survey, most of them had been farming for more than 6 years (32 of them), so their farm had reached a certain cruising speed when surveyed, and their testimonies and the data collected are a reliable reflection of their practices, despite certain approximations (like working time and type of labour).

The studied microfarms have various outlets almost exclusively in short circuits (farm shop, open-air market, baskets selling, organic shops, restaurants) which shows a desire not to depend on a single market outlet. In terms of diversification our panel grows between 20 and 70 species of vegetables. This is the same dispersion as in larger diversified organic vegetable farms for outlet or crop diversification, for which the average is around 30-35 (ITAB, 2020).

Technical and economic data: operation and results of the micro-farms

Crop production intensification

In market gardening, the level of crop intensification of the farms is measured by calculating the "developed area" (DA) devoted to vegetable production. DA[d] is defined by MMBio partners as the cumulative area occupied by several crops following each other in the rotation: the 1000 m^2 succession of a spring crop and of an autumn one in the same plot corresponds to 1000 + 1000 = 2000 m^2 of DA. Crop intensification, i.e. i) crops densification and/or mixture, ii) productive space optimization to produce more per unit area and iii) tunnel areas increase, is generally sought when land is limited. In MMBio microfarms, gross vegetable area represents between 2200 and 14000 m^2, of which 2 to 59% is under tunnel (15% on average), while the DA reaches 5000 to nearly 25000 m^2, of which 4 to 82% is under tunnel (25% on average). The crop intensification level (ratio between DA and cultivated area (on the previous example basis, intensification level is 2000 / 1000 = 2) varies from 1 to more than 2.5 in the open field and from 1.5 to 4 in tunnel, whereas the average crop intensification on all the farms studied is 1,63 (Figure 1). That is the same heterogeneity as in higher size diversified organic vegetable farms.

The farms crop intensification level is slightly positively correlated to turnover per square meter, especially for farms with a low level of crop intensification and the least

[d] Developed area = cultivated area * number of crop cycles per year

intensive micro-farms in terms of crop cycles generally with the lowest turnover/m². On the contrary, high level of area intensification does not automatically lead to better productivity (Figure 2), therefore other parameters are certainly involved.

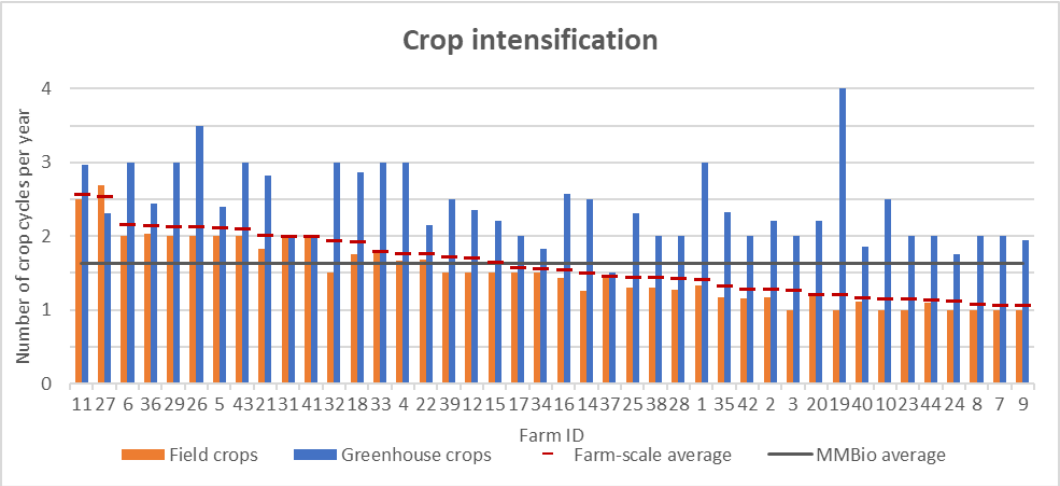

Figure 1: Crop intensification for MMBio micro-farms (2019 data), for open field and tunnels, and on area-weighted average on the farm.

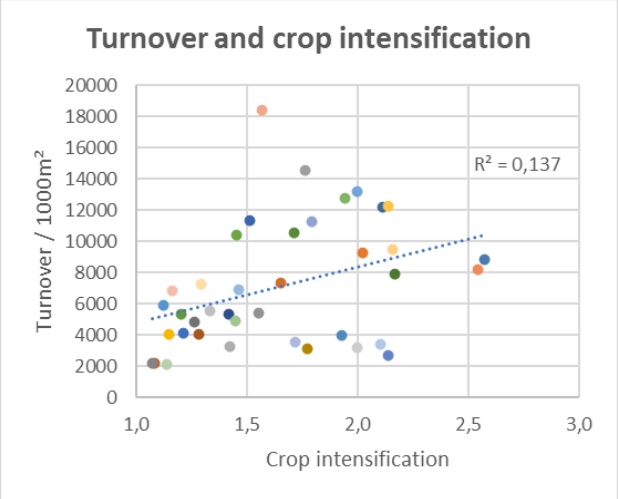

Figure 2: Turnover/m² and crop intensification in MMBio microfarms

Turnover and value of work

The turnover generated by the market gardening microfarms activity in our panel is extremely variable, ranging from less than 2€/m² to more than 20€/m² (Figure 3). In comparison, other references for other panels of diversified vegetable farms indicate an average from 3€/m² to 4.1 €/m² (Chambres d'agriculture Auvergne-Rhône-Alpes, 2013 and 2017). The farms with the lowest turnover/m² raise question in terms of viability and labour remuneration, as their hourly disposable income is often less than 5€/h. Disposable income is defined here as the gross operating surplus[e] (GOS) *less* annual loans payments.

[e] GOS = Gross output – Intermediate goods and services - salaries

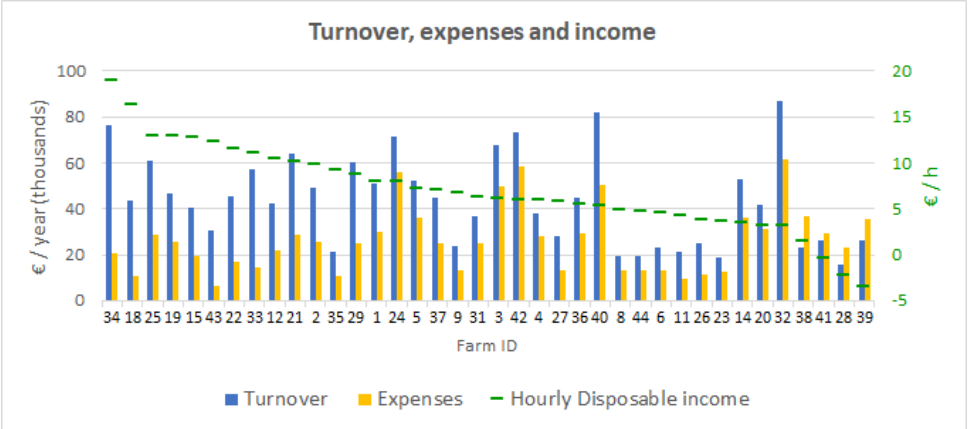

Figure 3: Economic results in MMBio microfarms

Economic efficiency of MMBio microfarms

In the next phase of the project, a more in-depth study of the farms generating the best income should help to identify key factors of their economic efficiency. We can already imagine that the lower economic performance of MMBio farms is linked to the selling prices, generally lower (or even much lower) than the average of the panel, for all or part of their production. Nevertheless, higher selling prices do not explain alone the success and the good hourly value of the farmer's work for the best performing farms. The crop intensification (Figure 2) and technical efficiency are certainly also involved.

Crop intensification allows labour to be valued on the small MMBio farms. There is indeed a good correlation between labour and the generated turnover: when working time increases, so does the farm turnover. But the correlation is less significant between labour and disposable income (Figure 4), certainly because of other factors involved in income building. Labour is one of the key factors in system intensification and its productivity, but it is a significant expense when it is salaried that may affect the farmer's disposable income.

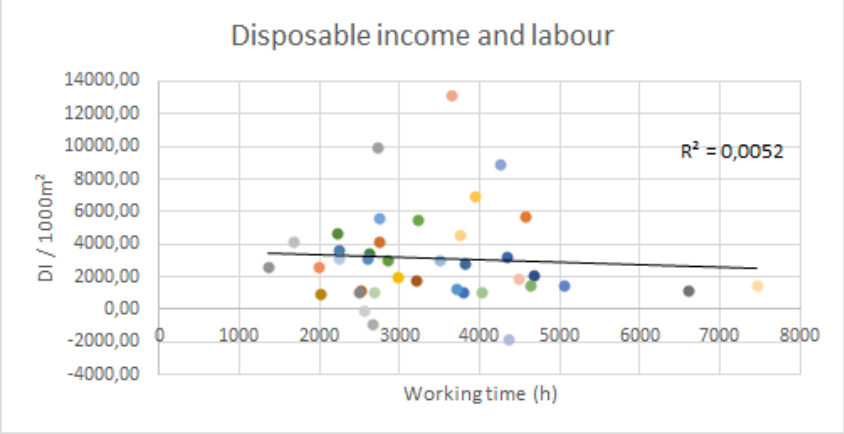

Figure 4: Labour and economic efficiency (in terms of disposable income).

The economic efficiency can also be measured by calculating the turnover generated in euros for each euro spent (without including the investment amount). This indicator helps to identify farms that are pretty efficient, with a strong intensification of production or farms that make efficient use of inputs and labour (Figure. 5).

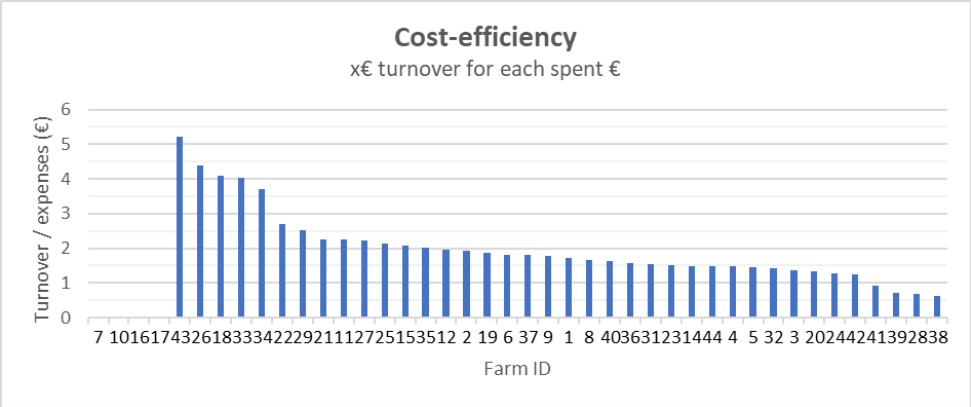

Figure 5: Economic efficiency of MMBio microfarms, in € of turnover generated per € spent

Towards a typology of microfarms?

A Hierarchical Classification on Principal Components did not lead to a satisfying typology, because of the wide heterogeneity within MMBio panel. Thus, in order to answer one of the main questions of how to achieve a certain economic viability, we built a classification according to the hourly disposable income (DI). Among the 42 farms, three are missing because of no reliable accounting information (they appear as ND in the following charts). It has resulted in four groups of different sizes. The following figures represent the parameters averages for each group.

There is a gradient of economic viability from one group to another (Figure 6), considered here as the capacity to generate a given income (Table 1). Groups 3 and 4 generate an income at least equivalent to the net minimum wage (SMIC)[f]. Group 1 and 2, generating a lower income, raise question in terms of long-term viability, even if the needed income to live may be subjective and some farmers do not seek a significant one.

Regarding criteria such as area, crop intensification, expenses, cultivated diversity and others, there is no clear differences between groups. But regarding labour and investment strategy, there is a clear distinction between groups based on DI (Figure 7). Thus, the absolute annual working time is negatively correlated to disposable income. Farmers from groups 3 and 4 are those who work the least in absolute value compared to others. We cannot consider working time amount as a key factor to generate a better income. Moreover, with equal working time, farmers from group 4 can cultivate more land. This leads us to believe that one of the key factors in achieving economic viability is work efficiency.

Table 1 : Farm groups based on hourly disposable income

	Threshold		Number of farms
Group 1	< RSA[1]	< 3,74€	9
Group 2	RSA – net SMIC[2]	3,74€ – 8,03€	15
Group 3	> net SMIC	> 8,03€	8
Group 4	> 1.5x net SMIC	> 12,05€	7
ND (Undetermined)	Non reliable information		3

[1] RSA: Active Solidarity Income (*Revenu de Solidarité Active*), paid to people without resources (567.78 €/month in 2020).
[2] SMIC: legal minimum wage in France. Its net-of-tax value was 8.03 €/hour in 2020.

[f] SMIC : legal minimum wage in France. Its net-of-tax value was 8,03 €/h in 2020

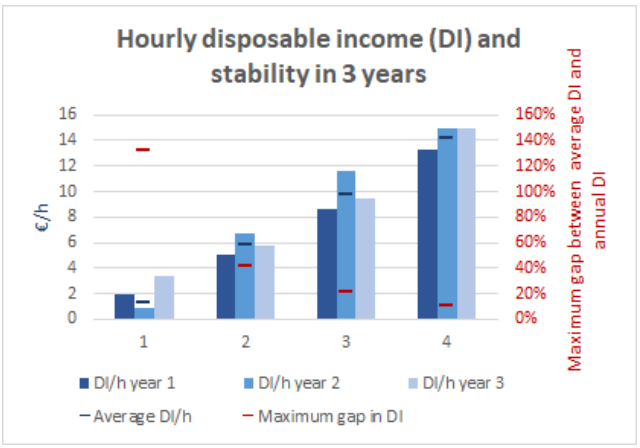

Figure 6: MMBio farms typology based on hourly disposable income (DI)

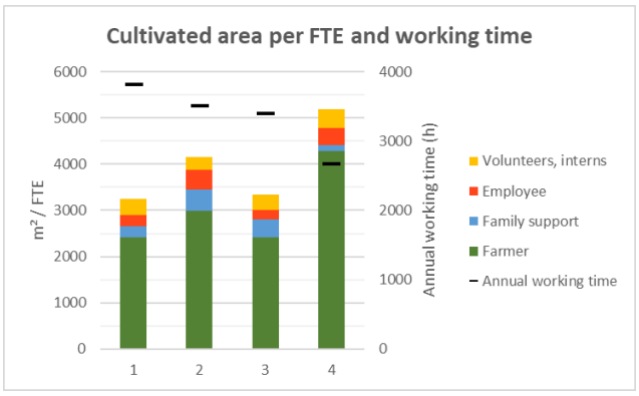

Figure 7: MMBio farms typology – Working time

Concerning investment strategies, differences are observed within MMBio farms (Figure 8). Groups 1 and 2 favour large investments from the beginning of their activity, as group 3 does, but they don't invest much afterward. On the contrary, group 4 invests at the beginning only in essential equipment and continue to invest gradually to develop their productive system. Group 3 seems to be in an intermediate strategy. Another factor that has a negative influence on income is debt payment burden, which is even more important that the farm and the investments are recent. Therefore, there is around a 10-year period to be overcome until the end of debt payment. Indeed, there is a decrease trend in income when debt payment weight increases.

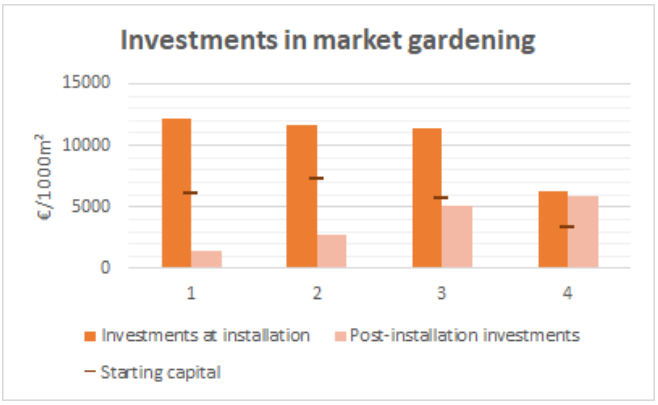

Figure 8: MMBio farms typology – Investments and starting capital

CONCLUSIONS

The data collected in 2019-2020 in MMBio microfarms allowed us to (i) characterize those productive systems (in terms of production, technical practices, economic situation etc), (ii) identify some key traits to be deepened (work efficiency linked with equipment level, distances to selling points, etc.), and (iii) invalidate some stereotypes (relations between cultivated area in tunnel and turnover, or between cultivated diversity and working time). Results obtained in the first years of MMBio project need to be taken with precaution because of the small sample size and the non-representativeness of the farms panel. Even so, much information have to be transmitted to project holders, advisors and trainers. MMBio highlight several factors of success or failure in these diverse types of installation: level of investment (and annual refunds), sale prices of vegetables, available labour, optimization (by crop intensification) of space. At this stage, it is likely that other elements are also involved in microfarms economic viability, such as farmers technical efficiency, which is difficult to measure. The continuation of the project until 2023 should allow to clarify these points.

ACKNOWLEDGEMENTS

The authors would like to thank advisors from the GABs, Chambers of Agriculture, trainers, and students who carried out the survey work, as well as the 42 farmers who welcomed them to answer to the many questions raised in this project about their motivations, practices, and economic results. They also thank members of the steering committee, especially K. Morel, for their external viewpoint, and help for data analysis.

Literature cited

Bio de Provence-Alpes-Côte d'Azur. (2022). https://www.bio-provence.org/Projet-MiMaBio-Maraichage-Bio-sur-petites-surfaces-en-PACA

Chambres d'agriculture Auvergne-Rhône-Alpes. (2013). https://aura.chambres-agriculture.fr/publications/toutes-les-publications/la-publication-en-detail/actualites/approche-technico-economique-des-systemes-de-productions-maraicheres-diversifiees/

Chambres d'agriculture Auvergne-Rhône-Alpes. (2017). https://aura.chambres-agriculture.fr/publications/toutes-les-publications/la-publication-en-detail/actualites/maraichage-sur-petites-surfaces/

Fédération Départementale des CIVAM du Gard. (2019). https://formationcivamgard.fr/?MicromaResultat1

Fortier, J.M. (2012). Le jardinier-maraîcher - Manuel d'Agriculture Biologique sur petite surface, Ecosociété, pp. 198.

Hervé-Gruyer, P. et C. (2017). Permaculture La ferme du Bec Hellouin. Actes Sud. pp. 368.

Holmgren, D. (2002). Permaculture : Principles & Pathways Beyond Sustainability, Holmgren Device services, pp. 648

ITAB. (2020). https://wiki.itab-lab.fr/espacemaraichage/?MicromaraichageResultats

Jeavons, J. (2012). How to grow more vegetables than you ever thought possible on less land than you can imagine. 8th Edition, Ten Speed Press, pp. 256.

Maraîchage sur Sol Vivant. (2017). https://normandie.maraichagesolvivant.fr/ressources/

MicroAgri. (2020). https://www.microagri.org/les-resultats/

Morel, K., Guégan, C. and Léger, F. (2016). Can an organic market garden without motorization be viable through holistic thinking? The case of a permaculture farm. Acta Hortic. *1137*, 343-346.

Morel, K., San Cristobal and M., Léger, F. (2017). Small can be beautiful for organic market gardens: an exploration of the economic viability of French microfarms using MERLIN. Agricultural Systems, *158*, 39-49.

Serail. (2021). https://www.mips-aura.fr/les-r%C3%A9sultats