Chapter 7
The Web Community of Soil-Less Farmers: A Case Study

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Abstract This chapter investigates the scale of interest that soil-less technologies attract on the internet. While a search for existing urban soil-less community-led projects and small enterprises suggests that these are still rather limited in number, on the web soil-less technologies attract the general public in large numbers, for varied reasons. The web is used here as the space where numbers, motivations and profile of the users searching for information can be gathered. We assume that generally these users are predominantly not professional practitioners looking for specialist advice, but rather individuals scanning the web for new knowledge and opinions. In short, the vast majority of visitors are laypeople wishing to implement small-scale soil-less systems for self-supply, or to start a small activity or simply searching the web for mere curiosity. Search terms used by web users are identified and subsequently used to search on YouTube videos and details of YouTubers. This leads to the identification of the profiles of these YouTubers and the drivers of their interest in soil-less technologies. Findings suggest that practical motivations such as the possibility for an all year-round crop supply and concerns about the quality of food from industrial agriculture attract the largest share of public, while commercial motivations are minor.

7.1 Introduction

This chapter presents an additional case study, in which we identify the scale of interest in soil-less technologies from the general public, using the web as the platform through which people gather information and search for solutions on topics of interest. In this book, case studies and the presentation of the broader soil-less context in Europe suggest that the phenomenon is still small. But interest from the general public is greater than this. The web is used here as the space where numbers, motivations and profile of the users searching for information can be gathered. We assume that generally these users are predominantly not professional practitioners (e.g., SMEs in the food sector) who would typically seek professional advice, but rather individuals scanning the web for new knowledge and opinions. In other words, laypeople wishing to implement small-scale soil-less systems for

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self-supply, or to start a small activity or simply searching the web for mere curiosity. Therefore we ask: why do laypeople with little knowledge of soil-less technologies decide to experiment with them rather than resorting to conventional horticulture, which can be practiced with simpler techniques and tools? How do people appropriate and interpret technology with regards to soil-less technologies? Do people perceive soil-less technologies as high-tech food production? Do they perceive soil-less as more environmentally efficient than conventional horticulture?

The internet is a highly sophisticated and complex product of technology, designed to be used also by people with limited technical knowledge in this field. It is one of the most evident, contemporary manifestations of the interaction between social and technological systems, which has deeply changed patterns and modalities of social relations by offering the opportunity to form communities of interest that are not limited by geographical boundaries. Searching within the soil-less agriculture community of interest and understanding how individuals portray themselves when they promote their soil-less projects on, for example, YouTube, can provide clues on the motivations behind their interest. These videos enable the identification of the socio-cultural profiles of their producers as well as their personal histories, similar to the case studies presented in Chap. 6.

Google and YouTube are two of the most used repositories of material available on the web. Many of the websites visited and videos viewed in this study are commercial or produced by individuals documenting their achievements in building and running soil-less units. Information provided through these videos is far from being scientifically tested and reliable. Yet it is indicative of a growing interest, an overall willingness to share new knowledge either open access or for promoting expertise and equipment that can be purchased online. Either way, knowledge is produced and made available outside scientific institutions, often by non-experts; a form of democratisation and bottom-up production of ‘unorthodox’ knowledge, similar to the concepts of alternative technology and frugal innovation outlined in Chap. 3.

7.2 Methodology and Results

This study is mainly qualitative, with quantification of viewers and frequencies provided, and focusing on hydroponics and aquaponics only. Terms that are most frequently searched on the internet were identified and, using these terms as keywords, videos posted on YouTube were selected. The most frequent terms found on the internet were analysed in term of numbers (i.e., how many viewers searched on the particular term) and plausible reasons for the search. For example, a high number of people searching ‘home hydroponics’ suggests that there is a predominance of individuals who are willing to experiment with this technique at home, either driven by the objective of achieving some form of self-sufficiency or amateur interest in alternative food technology generally. Likewise, the analysis of the videos posted on YouTube enables the identification of some categories under which these videos can

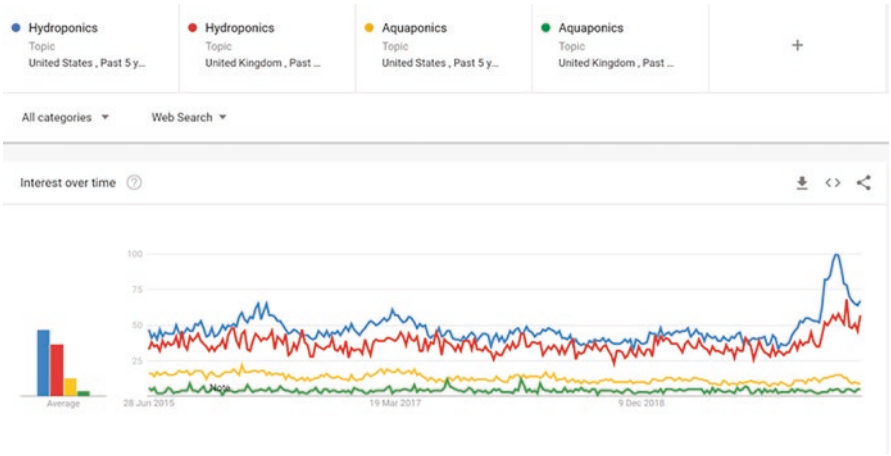

Fig. 7.1 Chart comparing search trends for hydroponics and aquaponics in the UK and the US between June 2015 and June 2020

be clustered, according to the particular interest and motivation or by socio-cultural profiles. The study is limited to the UK and the USA in its Google search, but with no geographical boundaries on YouTube. Samples are relatively small and results cannot be generalised. Hence it must be considered as a pilot aimed at identifying possible trends. What follows is a step-by-step description of the development of the study.

Step 1: Trend search – The keywords *Aquaponics* and *Hydroponics* were used to identify the number of internet users searching for information on these two technologies between 2015 and 2020. Google Trends was used (2020), a search trends feature showing how frequently a given search term is entered into Google's search engine, relative to the site's total search volume over a given period of time.

As Fig. 7.1 shows, over the last 5 years (June 2015 to June 2020), the keyword *Hydroponics* was the most popular both in the UK and the US, with a significant growth in the search rate during the first half of 2020, probably linked to the COVID-19 pandemic. The keyword *Aquaponics* has maintained a constant search rate, probably because more complex as a technology to the majority of web users.

Numbers in the chart (Fig. 7.1) represent search interest relative to the highest point, for a given region and time (Google Trends, 2020b). Each data point was divided by the total searches of the geography and time range it referred to, in order to compare relative popularity (otherwise, places with the most search volume would always be ranked highest); the resulting numbers are in a range between 0 and 100. Different regions that show the same search interest for a term do not always have the same total search volumes.

Figure 7.2 shows the spatial distribution of interest in the USA. Generally, the *Hydroponics* search was higher than the aquaponics one, except in Hawaii, where

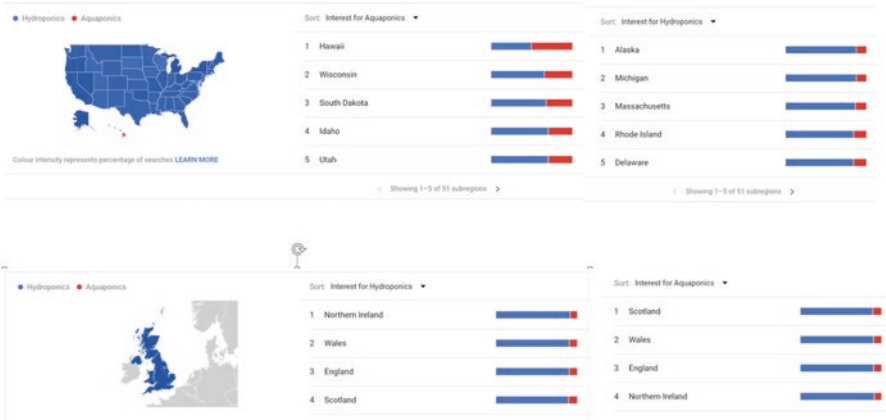

Fig. 7.2 Spatial distribution of internet users in the UK and the US

many food security programmes with aquaponics were organised between 2010 and 2016 (Beebe et al., 2020). Search rate with *Hydroponics* was particularly high in the East coast countries and also in Alaska. Search rate with *Aquaponics* was relatively high in countries such as Idaho, South Dakota and Wisconsin, hence not concentrated in any particular broad region. In the UK, *Hydroponics* showed a very high search rate – and *Aquaponics* a very low one – evenly across the country. It is possible that UK internet users perceive aquaponics, in particular fish farming, as far more complex than hydroponics and is consequently less pursued.

Step 2: Word search – The second step of the study was to identify the most researched topics connected to the keywords *Hydroponics* and *Aquaponics*, which can help identify the motivations driving people to search for information. A search engine optimisation software was employed (Ubersuggest) to generate a list of the 100 most searched words on the web over the month of June 2020, which were associated with the keywords. A list of 400 words, 100 for each keyword and location, was produced and subsequently classified as shown in Table 7.1. In the UK, the search volume of a single month was 53,720 (45,780 searches for hydroponics and 7,940 for aquaponics); in the US this figure was 351,810 searches (269,120 searches for hydroponics and 82,690 for aquaponics). These numbers do not necessarily correspond to the actual number of internet users: a user may have searched more than once with different words or the same one. Yet, they provide a broad scale of the interest raised by these technologies. The two countries show a different ratio hydroponics/aquaponics. In both cases, aquaponics is searched for less as a soil-less technology than hydroponics. However, the ratio for the UK is 5.7:1 and in the US is 3.2:1, thus suggesting a higher popularity of aquaponics in the US.

Table 6.11 shows that specific information on components and system design made up for the largest share of searches (50% – Components, Construction and Modifications), followed by learning the general principles of soil-less systems

Table 7.1 Categories and subcategories of words searched on the internet, under the two key words Hydroponics and Aquaponics

Categories	Subcategories	UK Aquaponics	US Aquaponics	UK Hydroponics	US Hydroponics
Components	Spare parts	10	12	8	9
	Automatization	1	0	0	0
	Grow media	2	3	4	3
	Plants and fish	17	16	7	7
	Nutrients	1	2	4	4
Construction	Construction of the system	10	8	9	8
	Type of system (e.g., ebb and flow)	4	6	5	8
Modifications	Hacks (i.e., customisation of existing systems/ types)	9	10	4	9
	Troubleshooting	1	0	1	0
Commercial	Purchase	9	10	18	20
	Job search	1	4	2	0
Knowledge	Literature	11	11	23	25
	Courses	11	8	2	2
	Other questions (e.g., *hydroponics in London* or *aquaponics 2019*)	13	10	13	5

(34% – Knowledge) and locations where components can be bought or job availability (16% – Commercial). This suggests that about one third of the users, who searched for information about soil-less systems has little prior knowledge on this subject area (probably approaching the subject for the first time), whereas 66% of internet users were already at a more advanced stage of knowledge.

The search engine optimisation software can generate a list of the 10 most visited websites connected with the search words. In the UK and the USA, such websites were mainly commercial companies and, when featuring a tutorial section, these were connected to videos that were available on YouTube (see Sect. 6.5 – Mangrovia Scicli and Sect. 6.10 – RotterZwam). YouTube videos represent an effective low-cost tool as they are relatively easy to create and organise.

Step 3: YouTube search - The list of 200 words per country obtained in Step 2 was used to search on YouTube. Videos selected were the most viewed under each word, even if – for some words – they had a low number of views. Some searches led to the same video. Also, videos of organisations were discarded whenever exclusively selling materials, components or courses. Only videos presenting existing operating soil-less units were included. Videos thus shortlisted were 165.

Step 4: Identifying profiles of YouTubers – Profile of YouTubers were determined through the features that some YouTubers shared – e.g., social background, moti-

vations and interest in soil-less technology. Geographic location and qualitative information were obtained through the location feature and the "About" section in the YouTubers' channels, while other data was inferred from the videos' setups, the YouTubers' statements, and other details on their social media pages (Facebook and Instagram).

The identification of six types of soil-less YouTubers helped understand their socio-cultural background. The sample included 142 videos only, as 23 did not provide sufficient information to identify as a type. These types and profiles are as follows:

Self-sufficiency advocate (**SA** – n = 32), generally living in suburban areas or in isolated places, using soil-less techniques for self-supply complementing low income or in line with a lifestyle choice;

Hobbyist (**H** – n = 39), motivated by curiosity and interested in soil-less technology among other activities. This is especially true for hydroponics, which is simpler to assemble and manage;

Farmer (**F**– n = 5), documenting their practices and advertising their business. Soil-less techniques are seen as complementing traditional growing methods. Motivations mentioned vary from the desire of going back to a more traditional lifestyle to voicing environmental concerns;

Suppliers (**S** – n = 21), marketing products or services;

Off-gridders (**O** – n = 7), living off-grid either for economic reasons or lifestyle choice; and

Educators (**E** – n = 38), promoting training courses, seminars and manuals.

Within this sample, the majority of YouTubers were Hobbyists and Educators (27% each), followed by Self-Sufficiency advocates (23%). Suppliers had a moderate presence (15%) while Farmers and Off-gridders represented only a small share. The sample of aquaponic YouTubers showed a higher share of Educators (36%) and a significantly smaller share of Hobbyists (22%). Conversely the sample of hydroponic YouTubers attested a prevalence of Hobbyists (33%) followed by Self Sufficiency advocates (26%) and Supply resellers (18%), while the number of Educators considerably shrunk in this sample (17%). In our sample, aquaponic YouTubers seemed to be expert in this area and utilised their units as demonstrators rather than food production and supply (Fig. 7.3).

Step 5: Interrogation of the profiles. A smaller sample of videos was selected in order to further analyse motivations and approaches to soil-less technologies. YouTubers selected were providing sufficient details about the aim of the project, their background, the motivations and the context driving the project, and views on soil-less technologies generally. The final sample totalled 30 YouTubers: 17 hydroponic farmers and 13 aquaponic farmers. 25 additional videos were reviewed, which were linked to the YouTubers' videos sampled and provided further relevant information.

In this final sample, most of the profiled YouTubers were white, with a small percentage of Asian and Black speakers. This could be ascribed to the fact that this research was conducted employing English keywords that may attract mainly

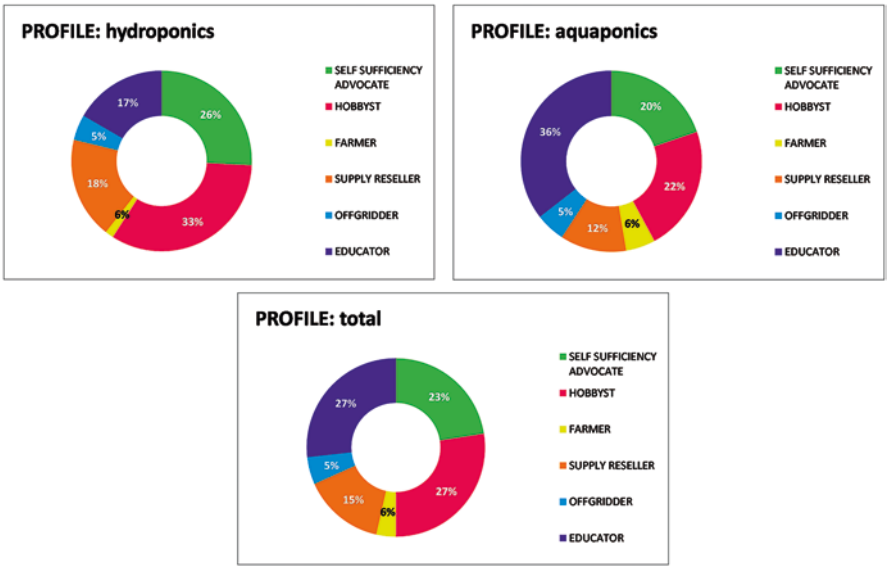

Fig. 7.3 Profiling of the 142 videos

people from English speaking countries with a predominantly white population (Dos-Santos, 2018). Most of the speakers were based in the US, both for hydroponic and aquaponic projects, while Australian speakers were more frequent in videos showcasing aquaponic projects, with only one showing a hydroponic project. Canadian YouTubers were only presenting aquaponic videos, and Asians represented a small number for both technologies. Finally, the vast majority of YouTubers were men, with only 2 women out of 30. This seems to contradict a survey among urban farmers in Maryland, USA, in which 52% participants were males and 48% women (Little et al., 2019). In rural farms, studies suggest a strong gender imbalance: over the last two decades, in US family-led rural farms, the role of women has been secondary and invisible, even when they actively contributed to farming (Fremstad & Paul, 2020; Leckie, 1996).

Aquaponic YouTubers were mostly in their 30s and 40s, but those advocating hydroponic systems were rather more evenly distributed across all age groups. Studies on the demographics of conventional urban farmers in the Global North suggest that the majority are of an older generation. For example, in Japan, where urban farmers account for 25% of farming households nationally, the age of farmers is rapidly rising (Moreno-Peñaranda, 2011). In Bonn, the average age of respondents to a survey of conventional urban farmers was over 50 (Hirsch et al., 2016); the average age of a sample interviewed in Milan was 66, and the majority within the sample (87%) were retired (Ruggeri et al., 2016). Similar conclusions, with an average age of 56 years, were also reported by a study on urban agriculture conducted between Ljubljana, Milan and London (Glavan et al., 2018). The average age of our sample of YouTubers seem to suggest that soil-less technologies can attract younger generations.

7.3 Discussion

In the final section of this case study, the motivations of the final sample of YouTube videos are unpacked and discussed, working towards an overall conclusion. The discussion is structured according to the categories summarised in Table 7.2. Generally, farmers expressed more than one motivation behind their projects. As a result, the total of the motivations reported in the table is higher (n = 77) than the number of the videos included in the sample. Quotes from videos are reported below to support the analysis. The list of the 30 YouTubers with links is available in Appendix B.

7.3.1 Practical Motivations

Practical motivations are predominant, with 63% of YouTubers mentioning them as the most important factor for embracing soil-less cultivation (Fig. 7.4a). The most frequent motivation is the possibility of multiple harvests over the year with a share of 26%. "Aquaponics grows a lot faster than soil beds, just like hydroponics. There's a reason people grow commercially in aquaponics and hydroponics and that's because you can turn over the plant a lot faster", maintains YouTuber 19 (video with 76,470 views). This motivation can apply to cultivation in greenhouses generally, whether or not plants are grown in soil. Yet, the decision to use soil-less technologies must be driven by the perception that these are more productive than indoors greenhouse cultivation. The main productive advantage that aquaponics offers, the harvesting of animal and plant-based food within the same productive cycle, is not mentioned, perhaps because many of these YouTubers do not grow food for subsistence and are therefore not interested in the potential of aquaponics to generate within one system food for a complete diet. YouTuber 8 is an exception, observing that: "we started building our second off-grid property around May 2016 and we are loving every challenge of setting up everything from scratch. We are very self-reliant and everything is done with little to no outside help." This video was viewed 220,353 times.

Table 7.2 Motivations of the YouTubers grouped by profile

Motivations		SA	H	F	S	O	E	TOT
Practical	Multiple harvests	2	4	0	1	1	2	10
	Low cost	1	2	0	0	2	0	5
	Ease of maintenance/ease of cultivation	3	4	0	1	2	0	10
	Space constraints	4	0	0	1	0	0	5
	Climate unsuitable to traditional methods	0	1	0	1	3	1	6
	Integration with conventional agriculture	0	0	2	0	0	0	2
	All year round availability	2	4	0	1	3	0	10
Quality	Safety of produce	4	2	0	1	0	0	7
	Quality of produce	2	2	1	1	0	2	8
	Environmental concerns/Social concerns	1	1	0	0	0	1	3
Technology	Desire to experiment	0	3	0	2	0	0	5
Commercial	Production for trading purposes	0	0	0	3	0	3	6

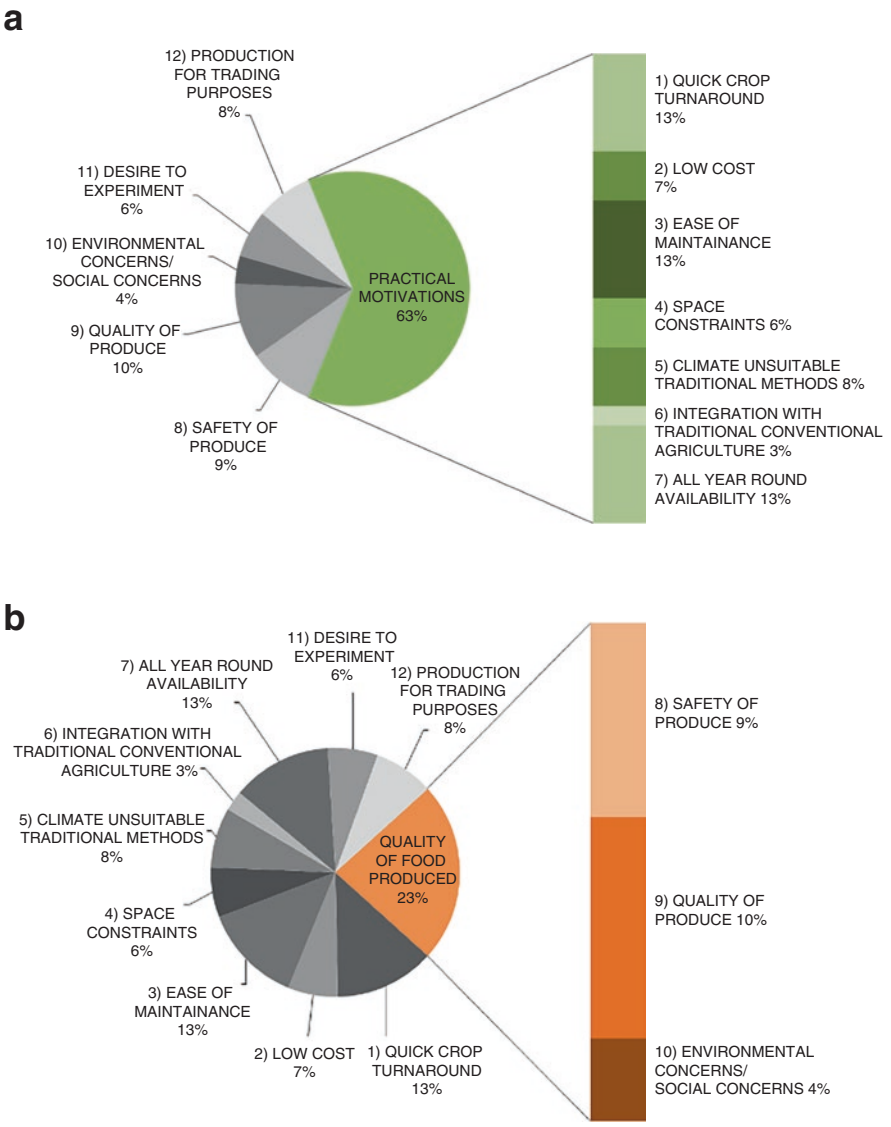

Fig. 7.4 Pie-chart with shares of practical motivations (**a**) and quality of food produced (**b**)

The prevalence of productivity in this sample of YouTubers goes against the spirit of many of the community-led soil-less projects presented in Chap. 6, which generally embrace a strong social agenda. This can be related to the fact that videos sampled present projects organised by individuals rather than groups. Yet, urban agriculture practiced at an individual level has a strong social component too; allotment sites are places for socialising and community building (Cattivelli, 2020). This is not only a consequence of the gardening practice but also of particular spatial

arrangements. Sharing the same green place with other gardeners, inevitably leads to connecting with them. And although at a community level a greenhouse with a soil-less unit can be shared by many, it is difficult to imagine how a soil-less arrangement similar to allotment sites (that is, the aggregation of many plots where food can be grown individually) can happen. Perhaps a conclusion from these reflections is that, in order to generate social benefits, soil-less food growing at an individual level requires new approaches for sharing space and equipment.

Ease of maintenance is mentioned by 13% of the sample. YouTuber 29 says: "I don't need to worry about watering plants, I don't need to worry about fertilizing them and everything" (channel with 37,900 subscribers). This view shows how soil-less techniques lead to a very different approach to horticulture, in which plants are not managed with conventional irrigation methods, perceived as 'worries' by this YouTuber. Yet, soil-less farmers will inevitably need to dedicate time to maintaining the equipment, rather than the plants. Affordability and Space Efficiency are motivations mentioned by shares of 7% and 6% respectively. YouTuber 27 (379,249 views) says: "aquaponics (…) uses the same water again and again, (…), so even with the water restrictions that we have here in the valley where I live (…) it's not even a blip on our water bill and that's pretty amazing". YouTuber 13 (22,284 views) turned to soil-less techniques after relocating to the suburbs, where farmers are faced with several space constraints "I had to sell my 17-acre, rural homestead and return to the suburbs". YouTuber 19 (91,473 views) says that soil-less techniques are the only way to attain food self-sufficiency for some farmers: "I've got a friend in Florida that lives in a community (…), he can't raise animals on his suburban block (…) but he can do aquaponics (…). Sometimes your hands are tied and you just got to go with what works and for some people that's aquaponics ". Space-efficiency is one of the greatest advantages of soil-less techniques and these two YouTubers recognise that this is an advantage particularly relevant for urban environments.

Another motivation, which is relevant to 8% of YouTubers, is the local climate and the possibility to save water in water-scarce contexts such as Australia. A case in point is YouTuber 20 stating on his website "If you live in drought affected areas (as much of Australia has experienced over the last decade), then I believe there could be some significant benefits using aquaponics to reduce water usage". YouTuber 21 explains his aquaponics systems are installed on a farm as one of the food cultivation techniques available, which can complement more conventional techniques, one not excluding the other. This is true for the 3% of the surveyed YouTubers sample. It is a view of an integrated approach to agriculture in which technology and conventional methods go hand in hand ("We've built an aquaponic system on the farm inside a 600 square foot greenhouse, recently converted to a hydroponic system."- video with 44,789 views). Other practical reasons are connected to the reduced physical effort. An Australian Off-gridder (YouTuber 8 – 220,353 views) presenting his hydroponic system says: "we're too old (referring to the act of digging and planting). No muscles involved". Although expressed by a small share, this motivation suggests that community-led soil-less techniques are fit for older urban farmers, indicating a direction of development for these techniques that is novel and relevant to a large group of urban dwellers.

Overall, the videos show a hands-on approach to technology. Most of the YouTubers combine hardware store materials with specialised tools and often document their trial-and-error approach on a personal channel while experimenting with new techniques. Users that cultivate with hydroponic technologies are creative and eager to experiment with components and layouts. For example, YouTuber 11 (8489 views) shows how containers such as coffee jars were used for planting. YouTuber 4 explains how their approach to the construction on the replication and modification of other systems: "…this is the system I built, I saw some other systems online and I adapted what I saw into this…" (2166 views).

Aquaponics farmers tend to opt for a more conservative approach, possibly for the complexity of this system which requires a considerable initial monetary investment. Moreover, fish safety which could be threatened may also deter from experimenting further. YouTuber 19 (76,470 views) remarks "I made a very simple and silly mistake that cost the lives of 10 fish that have been in the system from the start".

7.3.2 Quality of Food Produced

The quality of food produced is a motivation for a smaller share of YouTubers. 19% are concerned with the overall quality of the food they consume generally and utilise soil-less technologies since these enable full control of the whole production process, as remarked by YouTuber 19 (75,817 views): "we're growing fish to feed ourselves and we're growing fish we know where it has come from, we know there's been no (…) antibiotics or other chemicals added in there. That happens in commercial farmed fish; so that's one of the big bonuses." In spite of the traditional mistrust towards input intensive industrial agriculture or even non-conventional food production methods (eg. GMOs) (Poortinga & Pidgeon, 2007; McWilliams, 2014), the use of synthetic nutrients for crops is generally accepted. Yet some YouTubers stressed how the soil-less technologies produce organic food, as remarked by YouTuber 20: "… aquaponics provide food at its maximum, food from plants as well as the fish. (…) No need for artificial fertilizers (…) it's a complete natural and organic system". In this case, the use of the word organic does not refer to the organic standard which is still not applicable to soil-less produce. YouTuber 20 is a commercial enterprise promoting their services through the video. Their claim of organic produce is perhaps knowingly inaccurate and used for marketing purposes. However, YouTuber 24 (1,414,754 views) states that since synthetic nutrients for hydroponics are not "organic", other chemical compounds that are deemed as "natural" can be used to grow 'natural' crops "you'll hear some people say – oh you're supposed to use potassium hydroxide in there – well that's not an organic compound…I use nothing more than over-the-counter vitamins".

YouTuber 2 referred to food security as one of his main drivers to start a YouTube channel on hydroponics (46,400 subscribers). "Food is a basic necessity of life and every single person should not have to worry about their next meal", while YouTuber 5 included resource consumption among the reasons for preferring hydroponics to traditional growing techniques: "I know some people are not fans of this stuff: we

got plastic, chemical nutrients, artificial lighting. But you know? It's amazing growing plants in here. They smell great, they clean the air, they look amazing. To me this is the most responsible use of resources." (94,393 views). Only 4% of YouTubers expressed motivations connected with the environment and pollution. It is surprising that sustainability motivations are apparently not popular within this sample of YouTubers. They are certainly at the core of many urban agriculture projects and, once again, soil-less technologies are promoted as resource efficient, which is one of the conditions for sustainability. It is difficult to establish whether the connection between resource efficiency and sustainability is not clear or whether this is so obvious that it is not worth mentioning. But the predominance of practical motivations, together with misrepresentation of terms such as natural and organic, and how these apply to soil-less produce, suggest that the sustainability related implications of soil-less technologies are not completely comprehended.

7.3.3 Relationship with Technology

The category of technology was identified as desire to experiment. This was manifested by quite a small share of the sample (6%), mainly Hobbysts and Suppliers. It is evident that YouTubers within this sample accept soil-less technologies unconditionally. Therefore, evidence of technology as a motivation was identified with the intention of engaging with it to a further extent. In this share of YouTubers, the relationship with technology is mainly displayed through the propensity to experiment with techniques and assembling methods. YouTuber 11, for example, tests different aspects of soil-less technologies by employing household props, and documents her progress in her channel. "I think this experiment shows that the hydroponic method will produce the same or even better results than the soil method" (video with 24,930 views). Another attitude that can be associated with fascination with technology is functionality. YouTuber 24 (61,251 views) reflects: "I'm actually more concerned with functionality: I get so much food out of these things that I honestly don't care what they look like; functionality is the important part". It is quite surprising that profiles such as Farmers and Self-sufficiency Advocates do not express technology as a major motivation. Being profiles concerned with productivity, they are likely to engage with techniques and technologies to enhance functionality. It is possible that this process was not perceived as a driving motivation but rather as a basic component of the farming profession: one which is inevitable rather than aspirational. Yet, the analysis suggest that technology is attractive only for what it can offer and that unpacking such technologies to understand their inner workings is not perceived as a strong driver by the majority of our farmers (Fig. 7.5a).

7.3.4 Commercial Reasons and Other Observations

The share of YouTubers moved by economic motivations is only 8%, although an underlying advantage not directly stated but implied in many videos from other Youtubers is the potential of soil-less technologies to produce fast growing,

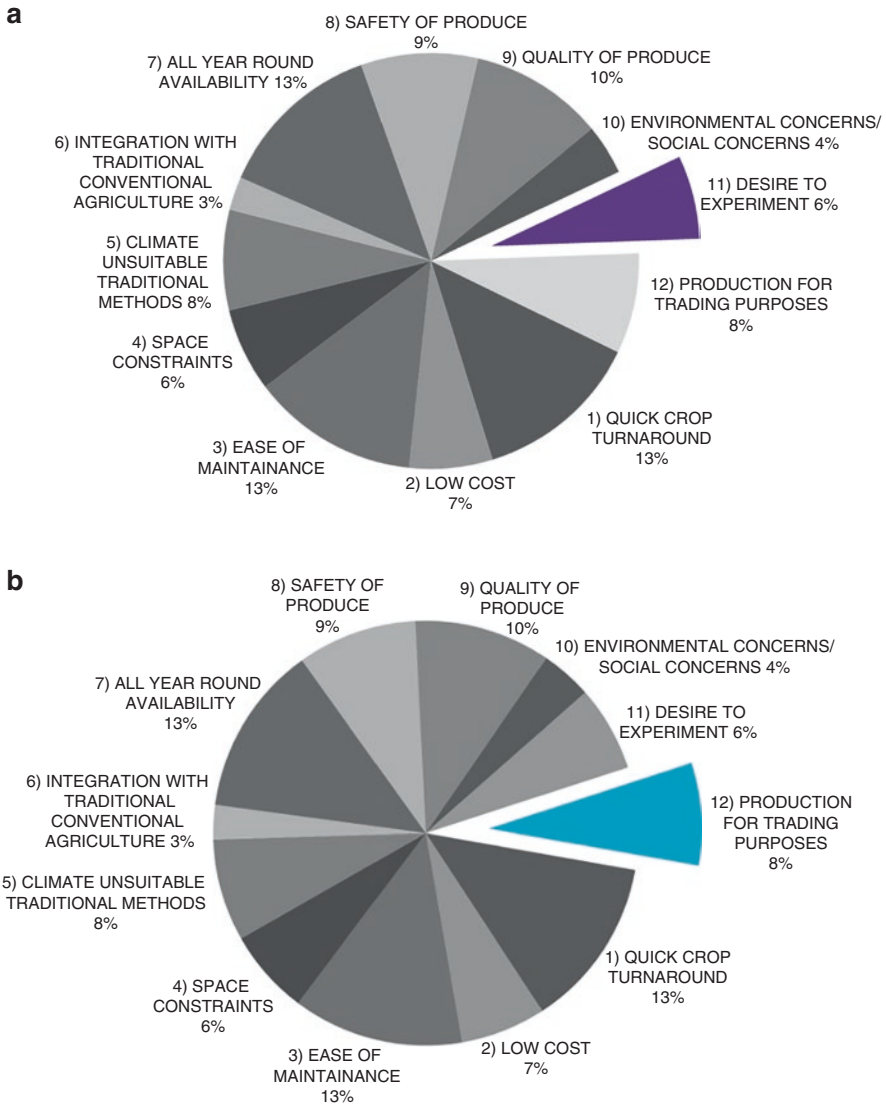

Fig. 7.5 Pie-charts with shares of motivations in relation to attitude towards technology (**a**) and commercial reasons for soil-less techniques (**b**)

high-value crops. Advice given by some YouTubers in this group stresses the importance of a correct economic strategy for the survival of the farm. YouTuber 23 says; "When you're planning a new farm business, you want to consider your production methods and practices from the very start. Production practices shape your business plan, farm construction, and everyday operations for years to come". YouTuber 30 emphasises the importance of marketing strategies: "Making it pay is all about having the product that people want and getting it to them. This is the part of the plan that should occupy 80% of our overall planning, implementation and ongoing enquiry".

The response in the YouTuber 22's blog to the posted question "Can you make money from doing aquaponics?" is quite explanatory: *"Yes. If you put in the effort and conduct yourself as a businessperson more than a farmer"*. Beyond the enthusiastic statements on the business opportunities that soil-less technologies open, caution transpires: an awareness of the fragility of small-scale enterprises operating in this sector, which must adopt innovative approaches to attract clients in order to survive.

YouTuber 30 suggests leveraging on health and food safety issues: "The health and better living movement is growing rapidly, and it takes many turns as it does. Like never before, people are realising that food purity and quality is the pinnacle, the thing to strive for, that will improve and restore personal well-being. We aquaponics practitioners are in the health food business". Soil-less technologies can also be presented as a way of generating income through the home-growing of highly profitable plants that don't take up much space such as peppers, microgreens and tobacco. For instance, YouTuber 16 promotes his channel (410 subscribers) as one advising on how to profit from the growing of diverse types of vegetables.

There are other findings from the analysis of the videos that are not connected to the four categories presented. YouTubers often refer to other people's videos as a way of completing or expanding the information provided. This shows that there is an established community of interest, and that social media are used as a forum. In many videos, soil-less production becomes a means to independence from a social system or the market. For example, YouTuber 9 (63,539 views) launches a call for self-sufficiency in response to recent food shortages due to the COVID-19 crisis: "do whatever it takes to be self-sufficient, look after yourself, look after the ones you love, don't expect the government to step in and help you in times of need". Likewise, YouTuber 17 (channel with 9007 subscribers) believes that the current centralized supply chain model is unreliable: "It's my feeling that we all need to move away from the model of centralized distribution of our food supply which makes us far too vulnerable. It's my opinion we need to be increasingly more reliant on ourselves for our own well-being". There are political implications in these remarks, which can be found in many urban agriculture initiatives. However, while these initiatives are rooted in social movements asking for a more democratic use of resources (e.g., the right to the city and food security (Tornaghi, 2014; Sonnino, 2009), our YouTubers do not seem to focus on specific issues other than to express feelings of distrust generally ("don't expect government to step in"). In between this extreme view and groups using food production for social amelioration, other motivations can be found that rely on soil-less to be off-grid, aspiring to a lifestyle that is detached from an undesirable society. This is clearly represented by YouTuber 8's comment where he declares his independence from external subsistence networks (220,353 views).

One of the findings from this case study is that the interest in soil-less technologies is growing not only for commercial and community-based projects but also among the general public (considering internet users as such). The number of views of the YouTube videos gives an indication of this scale of interest, with some videos reaching over 1 million views, at the time when this study was developed. Within

the general public, practical information is the main driver for turning to Google as a repository of knowledge. Issues such as the elements composing soil-less systems, the way these systems are engineered, or simply literature on soil-less technologies, constitute the most frequent searches. Moreover, practical motivations such as ease of cultivation and advantages such as high yield were the priorities behind most of the projects showcased in the YouTube video sample. Such motivations are perhaps not in line with those behind many of the farmers interviewed for the case studies, who generally prioritise motivations related to sustainability and education. However, this discrepancy is also a consequence of the limits of the research design for this web-based case study. The 30 videos selected were those offering a complete picture of existing projects as well as a complete profile of farmers. This criterion is likely to result in a sample that is not representative of the wider YouTube, soil-less farming community. In fact, within the broader sample used to identify soil-less farmers profiles, Educators numbered 38 out of 142 (27%). Self-sufficiency Advocates and Off-gridders, implicitly motivated by concerns about the current rate of exploitation of resources, totalled 39 (28%). Together, they represent most of the videos sampled.

Hobbyists and Suppliers were 43% of the sample. These two profiles are likely to be particularly interested in the technological and engineering aspects of soil-less cultivation. While educators, environmentalists and technologists seem to be well represented, the smaller group fell under the profile of Farmers (5 out of 142). In many of our case studies, the internet, social media and YouTube were important tools for self-promotion and outreach strategies. While no general conclusions can be drawn because of the limits of the sampling and the sample size, the imbalance between the number of professional farmers and the other profiles is striking. Many reasons may inhibit farmers from producing a video and uploading it on to YouTube (e.g., time, business models not requiring social media for marketing strategies and scepticism towards social media). Yet, soil-less farmers were generally younger and likely to be familiar with the internet and information technologies; the small number of YouTubers under this profile may as well be representative of the real share of professional farmers that are producing food with soil-less technologies. Also, the number of Suppliers is quite large (21). This suggests that demand for soil-less units and components comes from varied groups, including practitioners and amateurs, not only professional farmers. It also suggests that commercial practitioners may not be the largest market share in this sector.

Within its limits, this ‘virtual’ case study completes the picture that the case studies in Chap. 6 give about the characteristics and size of the small-scale soil-less communities in the Global North. It is still an unclear picture in which soil-less technologies are not consolidated and are used for a wide range of purposes. The many profiles identified suggest a multitude of interests, not always coupled with a clarity of views on the real advantages and drawbacks. Yet it is a dynamic scene, likely to evolve soon and as such, requiring analysis and close monitoring.