



City Research Online

City, University of London Institutional Repository

Citation: Dobson, M., Reynolds, C., Warren, P. & Edmondson, J. (2020). "My little piece of the planet": the multiplicity of wellbeing benefits from allotment gardening. *British Food Journal*, 123(3), pp. 1012-1023. doi: 10.1108/bfj-07-2020-0593

This is the accepted version of the paper.

This version of the publication may differ from the final published version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/25125/>

Link to published version: <https://doi.org/10.1108/bfj-07-2020-0593>

Copyright: City Research Online aims to make research outputs of City, University of London available to a wider audience. Copyright and Moral Rights remain with the author(s) and/or copyright holders. URLs from City Research Online may be freely distributed and linked to.

Reuse: Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

City Research Online:

<http://openaccess.city.ac.uk/>

publications@city.ac.uk

1 Author accepted manuscript of

2 **“My little piece of the planet”: the multiplicity of wellbeing benefits from**
3 **allotment gardening**

4 For final manuscript, please see British Food Journal

5

6 Miriam C Dobson

7 Christian J Reynolds

8 Philip H Warren

9 Jill Edmondson

10 **Abstract**

11 *Purpose*

12 Participation in urban horticulture (UH) is increasing in popularity, and evidence is emerging
13 about the wide range of social and environmental benefits “grow your own” can also provide.
14 UH can increase mental and physical wellbeing, as well as improve nature connectedness,
15 social capital and community cohesion.

16 *Approach*

17 This study focuses on allotments, which is one of the dominant forms of UH that takes place
18 in the United Kingdom. 163 volunteers in England and Wales participated in keeping a year-
19 long allotment diary as part of a citizen science project investigating activities on allotment
20 gardens. This study examines the unprompted comments that 96 of these gardeners offered as
21 observations when visiting their allotment plots.

22 *Findings*

23 Participants recorded high levels of social and community activities including the sharing of
24 surplus food produce, knowledge exchange, awareness and interaction with wildlife,
25 emotional connection to their allotment, appreciation of time spent outside and aesthetic
26 delight in the natural world around them.

27 *Originality*

28 At a time when waiting lists for allotment plots in the United Kingdom are on the rise, and
29 allotment land is subject to multiple pressures from other forms of development, this study
30 demonstrates that these spaces are important sites not only for food production but also
31 health, social capital and environmental engagement.

32 **Keywords**

33 Urban horticulture; wellbeing; allotments; citizen science

34

35 **1. Introduction**

36 Urban horticulture (UH) is an area of research becoming increasingly relevant to policy; it
37 has been highlighted by The Intergovernmental Panel on Climate Change as a potential way
38 to ensure food security in an increasingly globalised world (Mbow *et al.*, 2019), and recent
39 research has demonstrated that there is a promising level of yields potential from expanding
40 UH land in cities (Edmondson *et al.*, 2020; Mcdougall *et al.*, 2020). However, food provision
41 is not the only benefit of UH. Participation in UH also has the potential to increase wellbeing
42 in a number of ways.

43 Two prominent British gardening organisations, Sustain (<https://sustainweb.org>) and Garden
44 Organic (<https://gardenorganic.org.uk>) have publicised this with the message that UH can

45 provide multiple benefits for both physical and mental health (e.g. increasing fruit and
46 vegetable consumption, increasing overall activity levels, increasing social interactions, and
47 reducing stress levels; Schmutz *et al.*, 2014). A systematic review of occupational health
48 literature (Genter *et al.*, 2015) found that allotment gardening, a key form of UH in the
49 United Kingdom, provided similar wellbeing benefits to more formal therapy gardening
50 groups, and a meta-analysis by Soga *et al.* (2017a) found across-the-board positive benefits
51 of gardening on health. Gardeners' own opinions support these findings, with recreation and
52 mental health coming top of a list of reasons that 144 gardeners in Philadelphia participated
53 in food growing (Blair *et al.*, 1991). In Tokyo, a survey of 332 people found that those who
54 participated in allotment gardening reported better physical and mental health than those who
55 did not (Soga *et al.*, 2017b). Results from the European Quality of Life Survey also support
56 these findings, where people who grew their own food reported feeling happier than those
57 who did not (Church *et al.*, 2015). These wellbeing benefits of UH have been found to occur
58 even after a single gardening session (Wood *et al.*, 2016), and for a number of different
59 groups of people, such as refugees (Harris *et al.*, 2014); prisoners (Richards and Kafami,
60 2008); and school groups (Ohly *et al.*, 2016). However, the review of research specifically on
61 allotment gardening (Genter *et al.*, 2015) found that there was a paucity of studies of
62 individual allotment gardeners in comparison to those participating in group gardening
63 sessions, and recommended that further investigation is needed in the research to explore the
64 impact of everyday allotment gardening for individuals.

65 More broadly, there is an established evidence base of the benefits of spending time outdoors,
66 and developing nature connectedness, on physical and mental wellbeing (Martin *et al.*, 2016).
67 Doctors' surgeries in Scotland have piloted 'prescribing' outdoor activities to treat mental
68 and physical health complaints (Fleischer, 2018). The idea of a 'nature deficit disorder'
69 (Louv, 2005) has become a popular lens through which to discuss the lack of nature

70 connection amongst children and adults in the twenty-first century. This is particularly an
71 issue in urban areas, which present an obvious challenge for people to connect with wildlife
72 and greenspace when contrasted to the lives of people living in rural areas; indeed, rural
73 dwellers experience less life stress in childhood as a result of their nearby access to
74 greenspace (Wells and Evans, 2003). The British population is forecast to be 90% urban by
75 2050 (United Nations, 2019), meaning that barriers to nature connectedness specifically faced
76 by city dwellers are relevant topics for most of the population. It is as important for people to
77 experience wildlife in their ‘own backyards’ as in a holiday or tourism setting (Curtin, 2009),
78 suggesting that spaces within urban areas where people can encounter wild animals and birds
79 are particularly precious. The psychological benefits of spending time in green spaces in
80 urban areas also increases as biodiversity (or perceived biodiversity) increases (Fuller *et al.*,
81 2007).

82 The wellbeing benefits of nature connectedness become even more important when placed in
83 the context of the state of mental health in the UK. The OECD estimated in 2018 that mental
84 health problems cost the UK over one billion Euros per year, or 4% of GDP (OECD, 2018).
85 Against this general background, there can additionally be marked increases in demand on
86 mental health services generated by specific national or global pressures, as demonstrated by
87 the current coronavirus crisis, which is expected to directly cause at least half a million more
88 people in the UK to experience mental ill health (NHS Providers, 2020). Mental health in the
89 UK worsened by an average of 8.1% during the first two months of lockdown and social
90 distancing (Banks and Xu, 2020), and with the impacts of lockdown particularly acute in
91 urban areas, long-term mental health impacts for city dwellers may be severe.

92 In the above context, and with the additional recognition of its potential role in increasing
93 food security, particularly in urban areas (Edmondson *et al.*, 2020; Mcdougall *et al.*, 2020), it
94 is timely ever to investigate the potential opportunities to ameliorate poor mental health, and

95 engage in physical activity and connection to nature, that are presented by participation in
96 UH. Allotments are a key form of UH in the UK (Crouch and Ward, 1997; Acton, 2015),
97 with around 330,000 allotment plots nationwide (Campbell and Campbell, 2013). They cover
98 a land area of 135 km² across the country. Plottolders rent their allotment plot for a yearly
99 fee, and most plots consist of a patch of land (approximately 250 m²) adjacent to other plots,
100 forming allotment sites, which can vary in their size depending on the number of plots.

101 Allotments are predominately owned by local authorities, with, in many cases, individual
102 allotment societies renting the land and letting plots out to tenants, although some privately-
103 run sites also exist. Allotments were originally conceived as a means to widen access to food
104 production for urban dwellers (Crouch and Ward, 1997), and plottolders are legally obligated
105 to maintain minimum cultivation levels of fruit and vegetables on their plot. However, many
106 allotment gardeners also grow ornamental plants and have space on their plot for relaxation,
107 such as garden chairs and tea making facilities.

108 Although widely recognised as an important opportunity for people to benefit from growing
109 their own food, particularly in urban areas, there has been relatively little systemic research
110 into the practices, resource use, and personal benefits derived from allotment gardening. Here
111 we report some of the results from a UK-wide citizen science project, which involved
112 gardeners keeping year-long allotment diaries, recording a range of things such as time spent
113 on different activities and water and fertilizer use, but also included an opportunity for
114 recording unprompted notes. These notes are the focus on this analysis, and overall they
115 provide a positive picture of the impact of allotment gardening on mental and physical
116 wellbeing. Our findings add to the growing evidence base suggesting a strong link between
117 allotment gardening and a spectrum of benefits for the individual, such as community
118 cohesion, mental health and nature connectedness, and specifically address the research gap

119 identified by Genter *et al.* (2015) concerning a lack of data on individual, as opposed to
120 community group, allotments.

121

122 **2. Methods**

123 Allotment gardeners across the UK were recruited through online and in-print advertising
124 (primarily Facebook, the MYHarvest website at <https://myharvest.org.uk>, and the Royal
125 Horticultural Society magazine). In total 437 people, all of whom were individual allotment
126 gardeners, signed up to complete a year-long (2018) allotment diary from all four constituent
127 nations of the United Kingdom. Ethical approval was given by the University of Sheffield
128 (Application 01284) for the project, and participants consented to the use of their data in this
129 research project, and agreed that they could drop out of the project at any time if they so
130 wished. They were asked to detail the amount of time they spent on their plot, resources used
131 such as water or compost, and planting and harvesting activities. At the end of the year,
132 participants were sent a stamped addressed envelope to return their diary pages, which were
133 then scanned (so that originals could be returned to those who had requested this) to and data
134 extracted manually. 163 participants returned their diaries, forming a geographical
135 distribution across England and Wales. Unfortunately, no diaries were returned from
136 Scotland or Northern Ireland.

137 To the best of our knowledge, none of the allotment gardeners responding to this study were
138 engaged in more formal horticultural therapy, but all practiced allotment gardening for the
139 primary purpose of the production of fruit and vegetables, as is typical (and indeed, legal
140 obligated) in the United Kingdom. Participants were not directly asked about wellbeing, but
141 on each diary page (corresponding to a visit to the allotment) there was a space specifically
142 for 'Notes' which participants could use for any thoughts or observations they wanted to

143 make. Ninety-seven of the 163 participants chose to write spontaneous observations and
144 thoughts in this section for at least some of their allotment visits, giving 342 entries in all. We
145 extracted the text of the Notes section for these entries. Participant start dates spanned late
146 2017 to early 2018, and as a result the full year was slightly varied in actual dates for each
147 participant. The extracted Notes span a date range of 27 December 2017 to 25 February 2019.
148 Two entries were undated notes written at the end of the participants' diaries.

149 These notes described wildlife encounters, non-plot related activities such as participating in
150 communal building projects, social interactions on the plot, use of surplus harvests, and so
151 on. As it was a free space to write in, the comments we received were very wide ranging.
152 Therefore, we then analysed these notes to extract the different broad themes of the texts,
153 coding comments into eleven dominant thematic strands. These categories were deduced a
154 posteriori, after grouping comments together and seeing where dominant themes emerged (a
155 "cutting and sorting" technique, as described in Ryan and Bernard, 2003; Popping, 2016;
156 Vaughn and Turner, 2016). After comments had been assigned a dominant theme, any
157 comment related less strongly to another theme as well as its main one was also given a sub-
158 category so it could be included when analysing the comments theme by theme. Each
159 comment was also coded to be positively, or negatively, related to its dominant theme, where
160 this was applicable (such as negative or positive attitudes towards the weather). For example,
161 "Educating children of visiting family re allotment culture" (09/08; hereon this denotes the
162 date of example comments; see Supplementary Info for full list of comments, dates, and
163 anonymised participant ID) was categorised primarily as 'Social' and secondarily as
164 'Knowledge', with no positive / negative coding as there was no obvious emotion
165 communicated by the participant in this comment. However, "So very very dry – no rain still,
166 not a lot of pollinators in sight, no bees probably little nectar in such dry weather" (10/07)
167 was coded primarily as 'Weather', secondarily as 'Wildlife', and with a negative associated

168 emotion. Coding was carried out by hand in Microsoft Excel and statistical analysis to
169 produce figures was undertaken using R 4.0.0 (R Core Team, 2020).

170

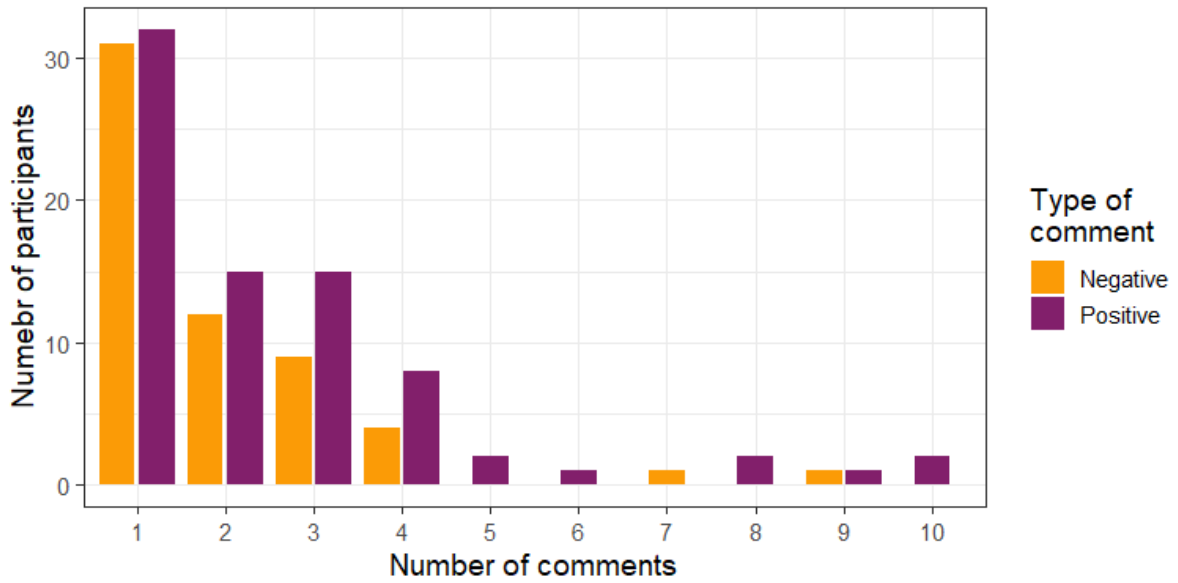
171 **3. Results**

172 *3.1. Overall thematic observations*

173 Some participants had included more notes entries over the year than others, which led to a
174 slight bias in the thematic interpretation of the data. However, as shown in Figure 1, which
175 demonstrates the number of comments per participant per emotion, the bias effect was
176 minimal, with the vast majority of participants noting only one, two or three comments of
177 either emotion (positive / negative) over the course of the year (Figure 1).

178 Overall, comments related to social activities or expressing emotions were the most common
179 across the aggregation of primary and secondary thematic types (Table 1). Comments related
180 to social activities were the most commonly expressed in positive terms, and comments
181 related to the weather were the most commonly expressed in negative terms (Table 2). On
182 average, there were a median of 6 negative and 13 positive comments made each month.
183 Positive entries started earlier in the year and ended later than negative responses; June and
184 July were the only months with more negative than positive responses, and these months
185 were dominated by the theme of weather in the negative comments (Figure 2). See
186 Supplementary Information for a full list of comments with their associated themes.

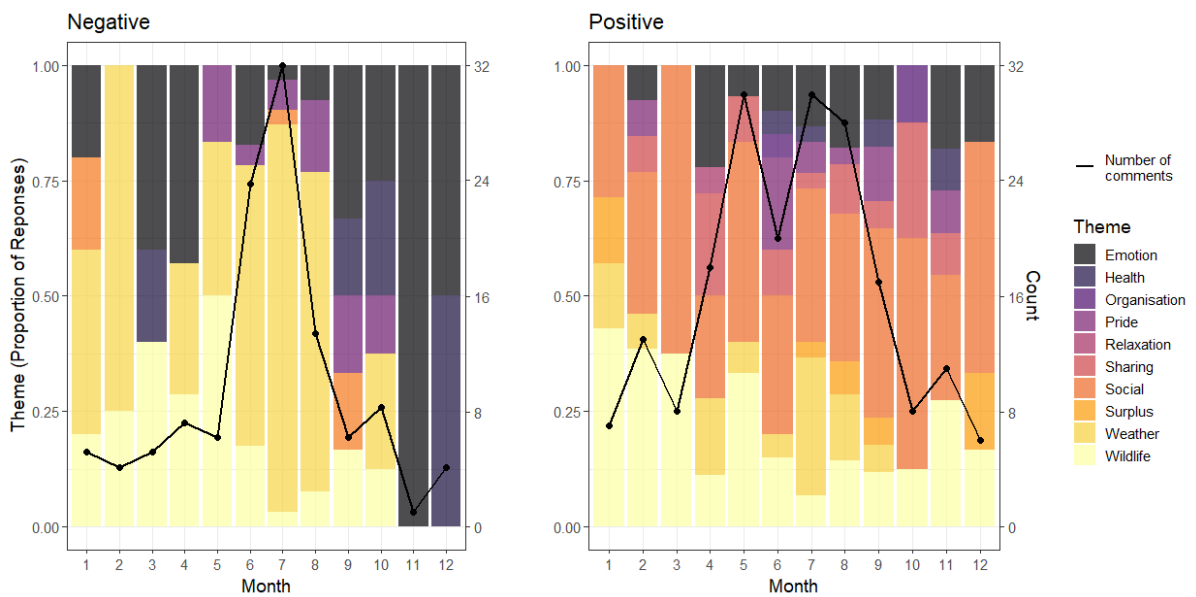
187



188

189 **Figure 1.** Graph showing the number of comments received per participant of a negative or positive nature in
 190 allotment diaries over the course of the year.

191



192

193 **Figure 2.** Graphs showing the count, and distribution of themes, within negative and positive notes made in
 194 allotment diaries for each month of the year.

195

196 **Table 1.** Thematic analysis of notes written in allotment diaries over the course of a year.

Theme	Number of entries, primary theme	Number of entries, secondary theme	Total number of entries associated with theme
Emotional	44	22	66
Health	10	3	13
Knowledge	4	5	9
Organisation	19	11	30
Pride	12	3	15
Relaxation	4	1	5
Sharing	18	10	28
Social	86	11	97
Surplus	6	9	15
Weather	83	11	93
Wildlife	56	9	65

197

198

199 **Table 2.** Analysis of positive or negative emotions associated with different primary themes of notes written in
200 allotment diaries over the course of a year.

Theme	Positive comments	Negative comments
Emotional	25	19
Health	4	6
Knowledge	0	0
Organisation	2	9
Pride	11	0
Relaxation	1	0
Sharing	18	0
Social	71	3
Surplus	6	0
Weather	23	60
Wildlife	39	17

201

202

203

204 *3.2. Specific themes and examples*

205 Comments related primarily to the Emotional theme comprised 13.1% of responses. They
206 generally captured a spontaneous observation of a participant's emotional response to their
207 presence on the plot, for example, "A lovely morning: just right to be down on the
208 allotments!" (18/11). Positive comments such as this were 57% of the Emotional theme; the
209 other 43% were negative. The negative responses were often related to outside influences,
210 such as "Dictatorial council inspected the allotments!!" (31/03), or "Today was a sad day. I
211 helped [a fellow plotholder] to bury his pet dog at the bottom of his allotment" (16/06).

212 Primarily health-related responses made up 3% of responses. These were often related to
213 physical health, both pertaining to events occurring in the course of allotment gardening, such
214 as "Hurt my back :(" (25/03), or general health consequences of gardening, such as "Who
215 needs the gym!! I'm 70 next year!!" (16/06). Mental health was also discussed, always in
216 positive language, such as "The plot is my safe place. It is my mental health balancer"
217 (31/12). Negative health-related comments were all to do with accidents while gardening,
218 such as the above participant who hurt their back, and positive comments were more general
219 and related to the overall benefit of having an allotment for physical and mental health.

220 The theme of knowledge made up 1% of responses, either through advice such as "Hoe when
221 you can't see a weed and you will never see a weed" (08/05) or uncertainty such as "Still not
222 sure about funny courgettes, if they're squashes or not. Only time will tell" (11/08). All these
223 comments were neutral emotionally, not positive or negative.

224 Organisation-related responses were 6% of the total. These were defined as comments
225 primarily relating to the organisation of allotments at a site-wide level, such as participation
226 in community events or the management of a site and involvement in committee activities.
227 Committee activities ranged from annoyance such as "As a member of the committee -

228 covered a vacant plot with tarpaulin to prevent weeds spreading. Also tidied up a bit of
229 rubbish. It's amazing what some ploholders dump!" (20/05) to positive engagement such as
230 "Allotment Association Working Party with 5 helpers" (14/01) and "Helped sort out seed
231 potatoes in the shop = main reason for visit. Put up notices re volunteers for working party,
232 shop opening & shop rota" (13/03). Of these comments, 81% were negative and related to
233 having to deal with outside influences on the plot, such as the local council or new rules,
234 suggesting that people have a strong sense of plot ownership and personal space that they do
235 not like to be interfered with.

236 Comments on the theme of Pride were another 3% of responses. These were intrinsic
237 observations or external validation from competition results, and all were positive comments.
238 For example, "Autumn show 4 bunches herbs - 3rd, carrot - 2nd, sweetcorn - 1st place, melon
239 - 1st place, sugar snap peas - 3rd. Proud day :)" (08/09) and the more general "Allotment
240 looking good" (02/11).

241 Another 1% of comments were on the theme of Relaxation. For example, visiting just to
242 spend time on the plot – "Just looked around" (30/06) – or satisfaction after hard work -
243 "Pooped now. Time for a beer!" (20/04).

244 The theme of Sharing occurred in 5% of comments. These were always related to having
245 surplus produce, or social connections: "Left all my dahlia tubers in a box near the allotment
246 gates with a note saying 'For anyone who wants them'" (22/05), "The "April" cabbage seed I
247 planted are ready to move on. I will have far more than I need so will share!" (19/09), and
248 "Brought tray of green broccoli plants from home to plot greenhouse. Gave some away to
249 plot neighbours" (21/04). Along with the Social and Surplus categories, Sharing related
250 comments demonstrate the networks of free exchange and mutual help that exist as part of
251 having an allotment. All Sharing comments were positive.

252 Social observations were the most dominant form of response, with primary-type Social
253 comprising 25% of observations. Mostly this was related to chatting and socialising with
254 fellow plotheholders, such as “Cut a cucumber for a friend on another plot. Drank a bottle of
255 sparkling apple juice and had a laugh with two fellow allotmentees!” (08/07) and “Spent too
256 much time talking and not enough gardening! Must try harder tomorrow” (12/11). There were
257 also incidents of bringing non-plotheholders onto site such as “Took a walk around the
258 allotment site to show a friend the place and just to enjoy it in its spring glory!” (05/05) and
259 contributing to the wider community such as “Spent the morning 11am-1300 at my old
260 allotment site encouraging them to vote” (28/10). Of these comments, 96% were positive.

261 The theme of Surplus related to having surplus produce and made up 2% of responses, such
262 as “Didn't pick veg because too much waiting in the kitchen to be eaten already!” (28/08).
263 This also connected to sharing of such produce, including in the wider community, such as
264 “Spinach and loads of courgettes which we put outside the house "Help Yourself!"” (06/07).
265 All such comments were positive.

266 Weather was the second most dominant category for the primary response type, with 24% of
267 entries discussing the weather. The allotment survey was conducted in 2018, where record-
268 breaking heatwaves and drought hit the United Kingdom during the summer, which may
269 explain a heightened and more emotional focus on the weather than would otherwise be
270 expected. For example, “No-one can remember when it last rained”, “No rain for at least two
271 months” (24/06 and 18/07, from the same participant), and “RAINED AT LAST!!” (30/07).
272 Weather was most often talked about in negative terms due both to the effect of the drought
273 on crop productivity but also structural damage to plot items such as greenhouses in autumn
274 and winter storms. Negative comments about the weather made up 72% of occurrences.

275 Wildlife was the dominant theme in 16% of responses. These were of varying emotions, such
276 as “B***** squirrel. It had all my cobnuts & 80% of my apples” (14/10). When wildlife
277 was not interfering with the ploholders’ gardening, observations were mostly made of animal
278 behaviour, such as “Two seagulls fighting over scrap of food. A crow joined in like a boxing
279 referee. The gulls fought so much they dropped the food and the crow nipped in and stole it!
280 You had to be there” (04/05) and “Fox sitting at gate – resident on site” (14/01). 70% of
281 comments about wildlife were positive.

282 **4. Discussion**

283 Here, we have uncovered the different ways that allotment gardeners interact with their
284 growing space through unprompted thoughts and observations related to several key themes.
285 These themes demonstrate that whilst the overarching purpose of allotment gardening is one
286 of food production, co-benefits for participants’ nature connectedness, social capital and
287 mental wellbeing also arise as strong themes. Previous research, demonstrating that
288 participation in UH can improve quality of life, is therefore supported by our findings here;
289 and there is no evidence that the benefits uncovered in this paper do not occur more widely in
290 other UH contexts. Further to this, we have also found that the benefits of allotment
291 gardening have the potential to extend beyond the gardeners themselves, with participants
292 talking about friends and family visiting and helping on their plots, as well as the potential to
293 share surplus produce amongst the wider community. Overall, our results confirm the
294 findings of Genter *et al.* (2015) that “Allotment gardening provides stress-relieving refuge,
295 contributes to healthier lifestyle, creates social opportunities, provides valued contact with
296 nature, and enables self-development”. This study has demonstrated that these findings of
297 Genter *et al.* on allotment gardening groups also apply to individual allotment gardeners.

298 The observations offered by participants in this project fell broadly into two categories:
299 interactions with other humans, and interactions with the natural world.

300 Interactions with other humans were generally spoken of in positive terms, except for
301 negative interactions with outside authorities such as the council, or when ploholders were
302 dealing with vandalism or break-ins at the plot. Most interactions, however, demonstrate that
303 allotment gardeners have strong social links with other members on their sites, participating
304 in knowledge exchange regarding plot management practices, free sharing of tools, surplus
305 produce and seeds, and participation in activities related to the organisation of the site. Many
306 ploholders spoke of bringing friends, children or grandchildren onto their plot to help them
307 with food growing activities, and a large amount of the time spent on allotments is shown by
308 this study to be involvement in social activities such as chatting and sharing cups of tea.

309 Participants also demonstrated a high level of engagement with the natural world and
310 wildlife, from comments about the beauty of flowers and being outside, to specific
311 observations about wildlife. When observing wildlife, participants mentioned the same
312 animal (for example, a particular fox or frog) on multiple occasions, which shows that
313 repeated visits to a specific place, such as an allotment, create human-nature bonds that are
314 revisited throughout the year. As may be expected, participants also demonstrated a high
315 level of engagement with the weather and changing seasons. Most comments about the
316 weather were negative, and whilst this may corroborate British stereotypes, it also
317 demonstrates an awareness and connection to the changing weather systems that show
318 allotment gardeners have a depth of knowledge of the effect of weather patterns on their plot
319 productivity, and ability to successfully cultivate their land

320 The overall benefit of a year spent visiting an allotment, which requires an average of 55
321 visits, and 190 hours (Edmondson *et al.*, 2020), was mentioned in positive terms in regard to

322 mental health and time spent outdoors observing and directly participating in activities related
323 to nature and growing. A sense of pride and ownership of successful gardening was a strong
324 theme, showing that food growing can help people feel fulfilled and productive. Overall
325 negative comments about organisation-related activities such as local council involvement
326 with allotments, combined with the positive comments regarding prizewinning at allotment
327 shows, demonstrate that a strong sense of personal ownership is prevalent amongst allotment
328 gardeners.

329 Allotment gardens clearly provide a multiplicity of benefits for their tenants. However, the
330 number of allotments in the UK has declined by almost two-thirds since the 1950s, with the
331 most deprived urban areas experiencing eight times the level of closures as the least deprived
332 (Dobson *et al.*, 2020). Research has demonstrated that gardening can be an important way for
333 deprived communities to improve mental and physical health as well as create stronger, more
334 resilient community networks (Travaline and Hunnold, 2010; Milbourne, 2012; Poulsen *et*
335 *al.*, 2014). Our findings add to these by demonstrating that nature connectedness can also be
336 added to the list of benefits for these communities; lower levels of green space access are
337 associated with loneliness (Maas *et al.*, 2009), and more deprived communities in the UK
338 have less access to greenspace (Jones *et al.*, 2009). Improving access to land for UH, not only
339 in the form of allotments but also the broader swathe of soil-based UH such as community
340 gardening projects, could therefore be one avenue to improve the standards of living in
341 deprived urban areas. Further research would be needed to elucidate whether allotment
342 gardening is addressing specific mental or physical health problems, or more generally
343 contributing to overall wellbeing; this would allow policymakers to target horticultural
344 therapy interventions to deal with specific issues. In general, this study should provide
345 valuable evidence to policymakers of the benefits to be gained for communities from
346 maintaining, preserving and increasing access to allotment gardening: it demonstrates a broad

347 spectrum of issues (such as individual mental health, nature connection and social capital)
348 that are benefited by allotment gardens. As cities expand their urban horticultural activities,
349 this study demonstrates that focusing on co-benefits beyond food production means that
350 urban horticulture can be addressed from a number of policy perspectives, such as physical
351 health, nutrition, mental health and community cohesion.

352 The findings of this article also present a number of possible future avenues for research.
353 Firstly, the definition of the term ‘horticulture’; here, we have focused on allotments
354 cultivated for fruit and vegetables, but gardeners often also cultivate ornamental flowers.
355 Horticultural therapy literature often covers both the cultivation of fruit and vegetables, and
356 the cultivation of ornamental plants; in future research, investigating whether wellbeing
357 benefits differ between those who do and do not also cultivate flowers could present some
358 interesting findings. Secondly, this project discussed only allotments cultivated privately by
359 individuals or families; a targeted study comparing the wellbeing benefits of allotments for
360 gardeners such as our participants, and other allotment-based projects such as allotments for
361 schoolchildren or refugee communities, could elucidate the specific nature of gardens where
362 wellbeing is maximised, to provide clear evidence to produce policy guidelines to maximise
363 wellbeing on a plot. Using unprompted comments, such as we have done here, has resulted in
364 a non-standardised data set; this is both a limitation and a unique aspect of this study. Further
365 research mirroring the approach of us here where we assess gardeners year-round should
366 involve targeted questions about wellbeing at different points in the year; but also preserve
367 the space for unprompted comments, as many unique observations from participants arose in
368 this way. One way to do this would be to conduct longer semi-structured interviews with
369 gardeners at regular intervals throughout the year; more detailed insight from gardeners rather
370 than the brief entries we have analysed here could provide some interesting results.

371 In conclusion, the findings of this project echo the statement, “‘Local food projects’ in urban
372 areas are not really about food, and are best described as community projects with food as the
373 pretext and a vector for social agency and the development of community capacity” (Maye
374 2019). This was captured by one participant’s end of year reflection: “Read back the year's
375 diary. Sat + reflected upon the year. The plot is my safe place. It’s my mental health balancer.
376 Peaceful, but sociable, accepting, a place to connect, to disconnect. A place to grow, to write,
377 to accept that things die and turn to compost. To be me without being judged. To eat and
378 share food, drink + friendship. Not tidy or regimented, it changes + develops. It flowers and
379 envelopes blossoms and blooms or freezes and browns. The bird song at all times, the outside
380 industrial noises of the docks, roads, next door's motorbike, generator, chainsaw, rotavator,
381 strimmer, friends, but mostly... it's mine. It's my little piece of earth, the planet. I aim for no
382 chemicals, using rainwater, last year's seeds, cuttings, pots donated, second hand stuff made
383 into plant containers. A calm place to listen, to cry, to eat, to welcome friends, to walk around
384 + know deep in my heart here, I feel connected, balanced (despite the wobbly deckchair) and
385 recharged. I'm drawn here in the winter to the stark bareness of it all. Stripped back to the
386 structure, paths + beds defined, perennials on show, spring bulbs daring to peek out... It's time
387 for soup. Thank you for this diary. It helps me to write so some days you've helped my
388 mental health” (31/12).

389 As the quote demonstrates, there is a spectrum of benefits aside from food production that
390 allotment gardening can provide: peace, health, social interaction, nature connectedness,
391 commensality, recycling and a feeling of autonomy, pride and ownership of one’s allotment
392 plot. In an increasingly disconnected, socially isolated society where the idea of ‘nature
393 deficit disorder’ in cities is connected to increasing mental health problems (Louv, 2005), this
394 study has shown that the activity of allotment gardening, and by implication other forms of
395 urban horticulture, can play a role in helping people to deal with many aspects of the issues

396 facing communities in urban areas. Waiting lists for allotments are often long (Campbell and
397 Campbell, 2013), suggesting that increased allotment provision could bring these benefits to
398 many more people than presently provided for.

399

400 **References**

- 401 1. Acton, L. (2015). *Growing Space: A History of the Allotment Movement*. Five Leaves
402 Publications, Nottingham.
- 403 2. Banks, J., & Xu, X. (2020). The mental health effects of the first two months of
404 lockdown and social distancing during the Covid-19 pandemic in the UK. *IFS*
405 *Working Paper W20/16*. [https://www.ifs.org.uk/uploads/WP202016-Covid-and-](https://www.ifs.org.uk/uploads/WP202016-Covid-and-mental-health.pdf)
406 [mental-health.pdf](https://www.ifs.org.uk/uploads/WP202016-Covid-and-mental-health.pdf). (Accessed 12 June 2020)
- 407 3. Blair, D., Giesecke, C. C., & Sherman, S. (1991). A dietary, social and economic
408 evaluation of the Philadelphia urban gardening project, *Journal of Nutrition*
409 *Education*, Vol 23 No 4, pp.161-167.
- 410 4. Campbell, M., & Campbell, I. (2013). Allotment waiting lists in England 2013.
411 *Transition Town West Kirby, National Society of Allotment and Leisure Gardeners,*
412 *United Kingdom.*
413 http://www.transitiontownwestkirby.org.uk/files/ttwk_nsalg_survey_2013.pdf
414 (Accessed 20 March 2020)
- 415 5. Church, A., Mitchell, R., Ravenscroft, N., & Stapleton, L. M. (2015). ‘Growing your
416 own’: A multi-level modelling approach to understanding personal food growing
417 trends and motivations in Europe. *Ecological Economics*, Vol 110, pp.71-80.

- 418 6. Crouch, D., & Ward, C. (1997). *The allotment: its landscape and culture*. Five Leaves
419 Publications, Nottingham.
- 420 7. Curtin, S. (2009). Wildlife tourism: The intangible, psychological benefits of human–
421 wildlife encounters. *Current Issues in Tourism*, Vol 12 Nos.5-6, pp.451-474.
- 422 8. Dobson, M. C., Edmondson, J. L., & Warren, P. H. (2020). Urban food cultivation in
423 the United Kingdom: Quantifying loss of allotment land and identifying potential for
424 restoration. *Landscape and Urban Planning*, Vol 199(103803).
425 <https://doi.org/10.1016/j.landurbplan.2020.103803>
- 426 9. Edmondson, J. L., Cunningham, H., Densley Tingley, D. O., Dobson, M. C., Grafius,
427 D. R., Leake, J. R., McHugh, N., Nickles, J., Pheonix, G. K., Ryan, A. J., Stovin, V.,
428 Taylor Buck, N., Warren, P. H., & Cameron, D. D. (2020). The hidden potential of
429 urban horticulture. *Nature Food* Vol 1 No 3, pp.155–159.
430 <https://doi.org/10.1038/s43016-020-0045-6>
- 431 10. Fleischer, E. (2018). Doctors in Scotland can now prescribe nature. *World Economic*
432 *Forum Agenda*, [https://www.weforum.org/agenda/2018/10/doctors-in-scotland-can-](https://www.weforum.org/agenda/2018/10/doctors-in-scotland-can-now-prescribe-nature)
433 [now-prescribe-nature](https://www.weforum.org/agenda/2018/10/doctors-in-scotland-can-now-prescribe-nature) (Accessed 29 January 2020)
- 434 11. Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007).
435 *Psychological benefits of greenspace increase with biodiversity*. *Biology letters*, Vol 3
436 No 4, pp.390-394.
- 437 12. Genter, C., Roberts, A., Richardson, J., & Sheaff, M. (2015). The contribution of
438 allotment gardening to health and wellbeing: a systematic review of the literature.
439 *British Journal of Occupational Therapy*, Vol 78 No 10, pp.593-605.
- 440 13. Harris, N., Minniss, F. R., & Somerset, S. (2014). Refugees connecting with a new
441 country through community food gardening. *International Journal of Environmental*

- 442 *Research and Public Health*, 11(9), 9202-9216.
- 443 <https://doi.org/10.3390/ijerph110909202>
- 444 14. Jones, A. P., Brainard, J., Bateman, I. J., & Lovett, A. A. (2009). Equity of access to
445 public parks in Birmingham, England. *Environmental Research Journal* Vol 3 Nos.2-
446 3, pp.237-256.
- 447 15. Louv, R. (2005). *Last child in the woods: saving our children from nature-deficit*
448 *disorder*. Algonquin Books of Chapel Hill, Chapel Hill, NC.
- 449 16. Martin, G., Clift, R., & Christie, I. (2016). Urban cultivation and its contributions to
450 sustainability: nibbles of food but oodles of social capital. *Sustainability*, Vol 8 No 5,
451 pp.409-427.
- 452 17. Mass, J., van Dillen, S. M. E., Verheij, R. A., & Groenewegen, P. P. (2009). Social
453 contacts as a possible mechanism behind the relation between green space and health.
454 *Health Place*, Vol 15 No 2, pp.586-595.
455 <https://doi.org/10.1016/j.healthplace.2008.09.006>
- 456 18. Maye, D. (2019). ‘Smart food city’: conceptual relations between smart city planning,
457 urban food systems and innovation theory. *City, Culture and Society*, Vol 16, pp.18-
458 24.
- 459 19. Mbow, C., Rosenzweig, C., Barioni, L. G., Benton, T. G., Herrero, M., Krishnapillai,
460 M., Liwenga, E., Pradhan, P., Rivera-Ferre, M. G., Sapkota, T., Tubiello, F. N., & Xu,
461 Y. (2019). Food Security. In: *Climate Change and Land: An IPCC Special Report on*
462 *Climate Change, Desertification, Sustainable Land Management, Food Security, and*
463 *Greenhouse Gas Fluxes in Terrestrial Ecosystems* [Shukla, P. R. et al. (eds.)]. In
464 press.

- 465 20. Mcdougall, R., Rader, R., & Kristiansen, P. (2020). Urban agriculture could provide
466 15% of food supply to Sydney, Australia, under expanded land use scenarios. *Land*
467 *Use Policy*, Vol 94, 104554. <https://doi.org/10.1016/j.landusepol.2020.104554>
- 468 21. Milbourne, P. (2012). Everyday (in)justices and ordinary environmentalisms:
469 community gardening in disadvantaged urban neighbourhoods. *The International*
470 *Journal of Justice and Sustainability*, Vol 17 No 9, pp.943-957.
471 <https://doi.org/10.1080/13549839.2011.607158>
- 472 22. NHS Providers (2020). Coronavirus briefing: The impact of COVID-19 on mental
473 health trusts in the NHS. [https://nhsproviders.org/media/689590/spotlight-on-mental-](https://nhsproviders.org/media/689590/spotlight-on-mental-health.pdf)
474 [health.pdf](https://nhsproviders.org/media/689590/spotlight-on-mental-health.pdf). (Accessed 12 June 2020)
- 475 23. OECD/European Union (2018). *Health at a Glance: Europe 2018: State of Health in*
476 *the EU Cycle*, OECD Publishing, Paris/European Union, Brussels,
477 https://doi.org/10.1787/health_glance_eur-2018-en.
- 478 24. Ohly, H., Gentry, S., Wigglesworth, R., Bethel, A., Lovell, R., & Garside, R. (2016).
479 A systematic review of the health and well-being impacts of school gardening:
480 synthesis of quantitative and qualitative evidence. *BMC Public Health*, 16, 286.
481 <https://doi.org/10.1186/s12889-016-2941-0>
- 482 25. Popping, R. (2015). Analyzing open-ended questions by means of text analysis
483 procedures. *Bulletin de Méthodologie Sociologique*, Vol 128, pp.23-39.
- 484 26. Poulsen, M. N., Hullah, K. R. S., Gulas, C. A., Pham, H., Dalglish, S. L., Wilkinson,
485 R. K., & Winch, P. J. (2014). Growing an urban oasis: A qualitative study of the
486 perceived benefits of community gardening in Baltimore, Maryland. *Culture,*
487 *Agriculture, Food and Environment* Vol 36 No. 2, pp.69-82. [https://doi.org/](https://doi.org/10.1111/cuag.12035)
488 [10.1111/cuag.12035](https://doi.org/10.1111/cuag.12035)

- 489 27. R Core Team (2020). R: A language and environment for statistical computing. R
490 Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org>
- 491 28. Richards, H. J., & Kafami, D. M. (2008). Impact of horticultural therapy on
492 vulnerability and resistance to substance abuse among incarcerated offenders. *Journal*
493 *of Offender Rehabilitation*, 29(3-4), 183-193. https://doi.org/10.1300/J076v29n03_11
- 494 29. Ryan, G. W., & Bernard, H. R. (2003). Techniques to identify themes. *Field Methods*
495 Vol 15 No 1, pp.85-109.
- 496 30. Schmutz, U., Lennartsson, M., Williams, S., Devereaux, M., & Davies, G. (2014).
497 The benefits of gardening and food growing for health and wellbeing. *Garden*
498 *Organic and Sustain.*
499 https://www.sustainweb.org/secure/GrowingHealth_BenefitsReport.pdf (Accessed 28
500 January 2020)
- 501 31. Soga, M., Gaston, K. J., & Yamaura, Y. (2017a). Gardening is beneficial for health: A
502 meta-analysis. *Preventive Medicine Reports*, Vol 5, pp.92-99.
- 503 32. Soga, M., Cox, D. T., Yamaura, Y., Gaston, K. J., Kurisu, K., & Hanaki, K. (2017b).
504 Health benefits of urban allotment gardening: improved physical and psychological
505 well-being and social integration. *International journal of environmental research*
506 *and public health*, Vol 14 No 1, pp.71-84.
- 507 33. Travaline, K., & Hunold, C. (2010). Urban agricultural and ecological citizenship in
508 Philadelphia. *The International Journal of Justice and Sustainability*, Vol 15 No 6.
509 <https://doi.org/10.1080/13549839.2010.487529>
- 510 34. United Nations (2019). Department of Economic and Social Affairs, Population
511 Division. *World Urbanization Prospects: The 2018 Revision. (ST/ESA/SER.A/420).*

- 512 35. Vaughn, P., & Turner, C. (2016). Decoding via coding: Analyzing qualitative text
513 data through thematic coding and survey methodologies. *Journal of Library*
514 *Administration*, Vol 56 No 1, pp.41-51.
- 515 36. Wells, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among
516 rural children. *Environment and Behaviour*, Vol 35 No 3, pp.311-330.
- 517 37. Wood, C. J., Pretty, J., & Griffin, M. (2016). A case-control study of the health and
518 well-being benefits of allotment gardening. *Journal of Public Health*, Vol 38 No 3,
519 pp.e336-e344.
- 520
- 521