Urban Agriculture in Great Bandung Region in the Midst of Commercialization, Food Insecurity, and Nutrition Inadequacy

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Abstract: The proliferation of commercialization in the development of urban agriculture (UA) within the Great Bandung region has precipitated the dislocation of numerous small-scale farmers, consequently engendering a reduction in the accessibility of locally cultivated sustenance. The resultant effect of this phenomenon is the exacerbation of food insecurity among low-income inhabitants who lack the financial wherewithal to procure the relatively expensive imported food items. Furthermore, the dearth of availability of unprocessed, high-quality sustenance has resulted in suboptimal dietary intake among a considerable proportion of the populace. A survey was conducted utilizing questionnaires to gather data from 137 units of respondents consisting of both subsistence and commercial urban farmers. The comparative analysis of the earnings of urban farmers was conducted vis-à-vis the minimum wages projected for the year 2023 in West Java and Bandung City. The utilization of the Food Insecurity Experience Scale (FIES) is a prevalent method for evaluating food insecurity through the analysis of self-reported food-related behaviors and experiences, both pre- and post-UA operations. A 24 h Food Recall Instrument examined nutrition adequacy in urban farmer households, which was analyzed using chi-square with descriptive presentation. Urban agriculture could help solve commercialization, food insecurity, and nutrition issues in the Great Bandung Region. Commercial urban farmers (51.09%) earned 280.46% of West Java provincial minimum wages or 136.82% of Bandung City minimum wages in 2023. The subsistence farmers' cohort (48.91%) earned 14.64% of West Java provincial minimum earnings or 7.14% of Bandung City minimum wages in 2023. In general, the prevalence of ties to food insecurity was predominantly observed subsequent to UA practices. The study revealed a prevalence of vitamin A surplus among urban farmers, while a preponderance of inadequacy in other nutritional aspects was also observed.

Keywords: commercial; subsistence; urban farmers; food recall
1. Introduction

The emergence of UA is intricately intertwined with the criticisms of national development strategies. The operationalization of the development engine is entrenched in power relations that necessitate a protracted gestation period before yielding tangible outcomes [1]. The pursuit of development objectives, particularly in the southern regions, is largely driven by extensive economic modernization initiatives. This, in turn, has significant implications for the proliferation of industrialized agricultural systems [2]. The economic turmoil of the 1980s ensnared the southern regions of the United States in a complex network of financial obligations that proved inextricable without a concomitant resolution of the matter of global lending. The facilitation of trade liberalization and promotion of exports pertaining to natural resource-based commodities are deemed essential for developing nations to secure loans from global multilateral institutions [3].

In some developing countries, agriculture frequently serves as the principal origin of peoples’ incomes [1]. Due to the political and economic changes that have occurred on a global level, the southern regions are undergoing a transition away from the cultivation of high-value export crops [4]. The input goods provided by transnational agrochemical input supply firms play a pivotal role in facilitating intensive monoculture agricultural production systems, which are imperative for meeting export standards [5]. The phenomenon in question has led to a plethora of ecological issues such as soil degradation, reduced agricultural output, depletion of freshwater resources, contamination of water bodies due to the use of pesticides and chemical fertilizers, and the breakdown of ecosystems [3].

This kind of agriculture was found especially in the Great Bandung Region. The commercial agriculture found in the peri-urban area of Bandung City used “so-called limited” pesticides and self-claimed “market safe” fertilizers, which mean a threat for the inner city of Bandung because the peri-urban area is settled in a higher location that surrounds the inner city, which has been proven as one of the potential causes regarding landslides, floods, and many of the natural disasters that occur in the inner city of Bandung.

The international environmental alliance and political ecologists expressed a concerned response regarding the social construction of environmental disasters and vulnerability. One possible reaction to this critique is a change in agricultural policy culture that prioritizes environmental congruence [6]. This represents a moderate stance in the trajectory towards neoliberal agricultural restructuring, presently emphasizing the promotion of sustainable agricultural methodologies. The emergence of UA in the field of agriculture is a noteworthy concept, as it aims to foster the development of sustainable cities [7]. The practice of UA has been found to have a multitude of beneficial impacts on the environment. These include but are not limited to the reduction of energy expenditure required for food transportation, carbon sequestration, mitigation of urban heat islands, preservation of wildlife, and the repurposing of materials [8–10].

In light of its salutary impact on the ecosystem, UA holds the promise of ameliorating the human condition by, inter alia, alleviating the economic strain of food procurement, augmenting individuals’ income, and eradicating food insecurity [11,12]. The evidence shows that growing crops at the household level is a good way to prevent malnutrition and food insecurity [13–15]. To enhance food security, it is imperative to augment the nutritional quality of locally accessible food within the community [16].

The potential for enhancing individuals’ dietary habits through UA is noteworthy, as it enables access to a wider range of nutritious food choices. The provision of sustenance through cultivation and the commercialization of such produce may result in heightened satiety. It has been postulated that a rise in disposable income may lead to an upsurge in the desire for a more diverse and nutritious selection of food within the communal food system [17,18]. The acquisition of meat and other non-cultivable food items can be facilitated through the utilization of the generated revenue.

The economic viability of urban farming is intricately linked to the complex interplay of economic forces that interconnect the global and local scales of power, as previously noted [19]. The commitment made by the United Nations to promote the amalgamation of
food security and nutritional requirements in urban planning, through the endorsement of
the Feeding the World strategy, is a clear illustration of how the goals of worldwide multilateral
organizations have influenced UA on a global level [20]. It is noteworthy that multilateral
organizations have initiated the integration of urban farming into their global agendas. The
concept of UA has been redefined as a multifaceted endeavor due to the participation of
global multilateral organizations, which have taken into account its economic, social, and
environmental implications [21,22].

The correlation between development initiatives categorized as “neo-liberalization
of nature” and the discussion on UA is noteworthy, as it facilitates the harmonization of
the goals of multi-sectoral development [23,24]. The concerns regarding the inadequacies
of the natural neo-liberalization strategy in achieving objectives related to sustainable
development, as evidenced by various criticisms, are raised [25,26]. The rationale behind
this is that the application of neoliberal principles will reinforce the supremacy of the market
and shift governmental efforts towards creating an environment that is favorable to trade
and investment [27]. The market plays a key role in making the UA sector a good place to
invest, which is why local actors are getting involved in commercial-style UA [28–30]. It
has come to our attention that there has been a recent discovery of commercial urban farms
that prioritize the provision of produce to foreign markets [31,32]. It can be inferred that the
practice of urban farming has resulted in a postponement of the complete mechanization
of the agricultural industry. The underlying reason for the adoption of capital-intensive
intensive farming practices by farmers can be attributed to the high production capacity
required to meet the robust demand of the export market.

The potential realignment of urban farming’s focus may ensue upon the wider im-
plementation of industrial agricultural practices in the urban context. The increasing
prevalence of commercialization in UA may pose a threat to environmental ethics in this
field. The underlying reason for the prevalence of synthetic agro-chemical inputs in com-
mercial UA is the need for high dependence on them. Furthermore, the inadvertent adverse
effects of intensive farming practices on UA cannot be overlooked, as evidenced by the
existing literature [33–35]. The implementation of UA is beset by a myriad of complex
issues that pose significant challenges to the attainment of its objectives, including the
amelioration of food and nutritional insecurity.

It is widely acknowledged that UA plays a significant role in enhancing food security
and nutritional adequacy. This is achieved through the provision of ample food, appropriate
nutrition, cost-effective supplies, and supplementary income. Additionally, UA serves
as a viable solution to mitigate urban risks such as unemployment and food deserts.
Notwithstanding, the exigency of commercialization engenders an additional potentiality
that may culminate in unsustainable methodologies. The research endeavor seeks to
ascertaining the extent to which UA in the Great Bandung Region contributes to income
generation, food security, and nutritional sufficiency, while taking into account the impact
of commercialization pressures.

2. Materials and Methods

After utilizing the R version 4.0.0, we were able to determine a minimal sample size
of 136. Upon conducting field sampling, we found that 137 units of respondents were
eligible for analysis, as previously reported [36]. Questionnaires were utilized to survey
the food security of both subsistence and commercial urban farmers. The classification
of urban farmers who cultivate crops primarily for personal consumption as subsistence
urban farmers and those who allocate more than half of their yield for commercial purposes
as commercial farmers has been documented in the literature [37]. The index of com-
mercialization pertaining to the household of the respondent is determined by computing
the percentage resulting from dividing the overall sales revenue of said household in a
given year by the total sales revenue generated by all crops produced, as indicated in
reference [38]. The assessment of the aggregate revenue pertaining to the urban agricultural
practices was juxtaposed with the minimum remuneration standards of West Java province (USD 132.37 per month) and Bandung City (USD 269.75 per month) during the year 2023.

The status of food insecurity is examined using a questionnaire adjusted to the many parts of the concept based on the FIES, which is an experience-based assessment of household or individual food security. The FIES Survey Module (FIES-SM) consists of eight questions about people’s access to enough food and may be simply integrated into various forms of population surveys. Was there ever a time in the recent 12 months when, due to a lack of money or other resources [39]:

1. You were worried you would not have enough food to eat?
2. You were unable to eat healthy and nutritious food?
3. You ate only a few kinds of foods?
4. You had to skip a meal?
5. You ate less than you thought you should?
6. Your household ran out of food?
7. You were hungry but did not eat?
8. You went without eating for a whole day?

The FIES-SM questions are about the experiences of the urban farmers as individual respondents or a respondent’s household as a whole. The questions focus on self-reported food-related behaviors and experiences connected with the condition regarding before and after UA practices.

Energy, protein, fat, carbohydrate, vitamin A, vitamin C, calcium, and iron adequacy from urban farmer households were measured using a 24 h food recall instrument based on a food consumption survey format [40]. Food recalls are carried out in several intervals, at least one time in 1 month. Food recall is also complemented with Pure Meal Equivalent (MEM) as a correction factor to achieve estimates of actual family consumption. The meal recall is calculated for each nutrient ingested and then compared with the household nutritional adequacy rate based on the minimal daily needs of family members according to gender and age mentioned in the Minister of Health Decree No. 28/2019 about the Suggested Nutrition Adequacy Rates for Indonesian People.

Validity and reliability tests, a test of normalcy, and the Wilcoxon test were used to examine the data on food insecurity before and after the UA practices occur. The data on nutritional adequacy were analyzed using chi-square method with descriptive presentation.

3. Results
3.1. The Demography

The findings presented in Table 1 indicate that the facilitators of UA in the Great Bandung Region are primarily female, with a majority of 62.04% compared to 37.96% male. The highest level of education attained by these individuals is senior high school, and their predominant occupation is that of a housewife. The urban agriculturalists were bifurcated into two distinct cohorts: those who engaged in farming for commercial gains (51.09%) and those who pursued farming for subsistence purposes (48.91%). It is noteworthy that a significant proportion of the farming population, specifically 62.04%, possessed less than five years of experience in the field of agriculture.

3.2. Incomes Contributions

As illustrated in Figure 1, the urban agricultural practices implemented in the Greater Bandung Region exhibit the capacity to yield 150.46% of the minimum earnings for the West Java province (USD 132.37 per month) or 73.40% of the minimum wages for the city of Bandung by the year 2023. The monthly cost amounts to USD 269.75. The cohort of commercial farmers exhibited the most substantial mean revenue, amounting to 280.46% of the minimum salaries in the province of West Java or 136.82% of the minimum wages in the city of Bandung. Throughout this period, it has been observed that the cohort of subsistence farmers has exhibited a comparatively lower level of participation in the provision of minimum wages in the West Java Province (14.64%) or Bandung City (7.14%).
### Table 1. The demography of UA enablers in Great Bandung Region.

<table>
<thead>
<tr>
<th>Details</th>
<th>Amount</th>
<th>%</th>
<th>Details</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
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<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td><strong>Address</strong></td>
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<td></td>
</tr>
<tr>
<td>Male</td>
<td>52</td>
<td>37.96%</td>
<td>Bandung Regency</td>
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<td>72.99%</td>
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<td>Female</td>
<td>85</td>
<td>62.04%</td>
<td>Bandung City</td>
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<td>13.87%</td>
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<td><strong>Education</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary School</td>
<td>37</td>
<td>27.01%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junior High School</td>
<td>30</td>
<td>21.90%</td>
<td>0–1 member</td>
<td>6</td>
<td>4.38%</td>
</tr>
<tr>
<td>Senior High School</td>
<td>52</td>
<td>37.96%</td>
<td>2 member</td>
<td>23</td>
<td>16.79%</td>
</tr>
<tr>
<td>College</td>
<td>18</td>
<td>13.14%</td>
<td>3 member</td>
<td>48</td>
<td>35.04%</td>
</tr>
<tr>
<td><strong>Residential</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native</td>
<td>115</td>
<td>83.94%</td>
<td>4 member</td>
<td>39</td>
<td>28.47%</td>
</tr>
<tr>
<td>Comer</td>
<td>22</td>
<td>16.06%</td>
<td>5 member</td>
<td>17</td>
<td>12.41%</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td>49</td>
<td>35.77%</td>
<td>6 member</td>
<td>2</td>
<td>1.46%</td>
</tr>
<tr>
<td>Entrepreneur</td>
<td>5</td>
<td>3.65%</td>
<td>7 member</td>
<td>5</td>
<td>3.64%</td>
</tr>
<tr>
<td>Housewife</td>
<td>70</td>
<td>51.09%</td>
<td>0–5 Year</td>
<td>85</td>
<td>62.04%</td>
</tr>
<tr>
<td>Teacher</td>
<td>1</td>
<td>0.73%</td>
<td>6–15 Year</td>
<td>16</td>
<td>11.68%</td>
</tr>
<tr>
<td>Private Employee</td>
<td>2</td>
<td>1.46%</td>
<td>16–25 Year</td>
<td>15</td>
<td>10.95%</td>
</tr>
<tr>
<td>Civil Servant</td>
<td>1</td>
<td>0.73%</td>
<td>&gt;35 Year</td>
<td>9</td>
<td>6.57%</td>
</tr>
<tr>
<td>Retired</td>
<td>9</td>
<td>6.57%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Member</strong></td>
<td></td>
<td></td>
<td><strong>Farming Experience</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–1 member</td>
<td>6</td>
<td>4.38%</td>
<td>0–5 Year</td>
<td>85</td>
<td>62.04%</td>
</tr>
<tr>
<td>2 member</td>
<td>23</td>
<td>16.79%</td>
<td>6–15 Year</td>
<td>16</td>
<td>11.68%</td>
</tr>
<tr>
<td>3 member</td>
<td>48</td>
<td>35.04%</td>
<td>16–25 Year</td>
<td>15</td>
<td>10.95%</td>
</tr>
<tr>
<td>4 member</td>
<td>39</td>
<td>28.47%</td>
<td>&gt;35 Year</td>
<td>9</td>
<td>6.57%</td>
</tr>
<tr>
<td>5 member</td>
<td>17</td>
<td>12.41%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 member</td>
<td>2</td>
<td>1.46%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 member</td>
<td>5</td>
<td>3.64%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Commercialization</strong></td>
<td></td>
<td></td>
<td><strong>Commercial</strong></td>
<td>70</td>
<td>51.09%</td>
</tr>
<tr>
<td><strong>Subsistence</strong></td>
<td></td>
<td></td>
<td><strong>Subsistence</strong></td>
<td>67</td>
<td>48.91%</td>
</tr>
</tbody>
</table>

### Figure 1. UA contribution towards incomes.

#### 3.3. Food Insecurity Experience Status

As is evidenced by the data presented in Figure 2, it can be inferred that the condition of social ties played a significant role in shaping the overall experience of food insecurity subsequent to the implementation of UA practices. At the juncture of food insecurity, it has been observed that 50.00% of commercial urban farmers have experienced a reduction in food insecurity, whereas only 11.94% of subsistence urban farmers have reported a similar outcome. The condition of uncertainty regarding the fulfillment of food needs is perceived by 42.86% of commercial and 80.60% of subsistence urban farmers, indicating a significant concern in these populations. The implementation of UA practices has resulted...
in a concerning trend regarding the inadequate nutrient intake of families, particularly among the commercial and subsistence urban farming cohorts, with rates of 64.29% and 74.63%, respectively. In the interim, it is noteworthy to observe that a reduction in the prevalence of food insecurity has been reported among 34.29% of commercial and 23.88% of subsistence urban farmers.

The implementation of UA techniques in the Great Bandung Region has been found to have a notable impact on food insecurity, resulting in skipped meals, limited meal quantities, food shortages, hunger, and inadequate food intake. It is noteworthy that among commercial urban farmers, there exists a higher incidence of food insecurity, with 42.86% of individuals experiencing this phenomenon. Additionally, a significant proportion of this population reports skipping meals (24.29%), limiting meal portions (20.00%), running out of food (14.29%), and experiencing hunger (12.86%). It is noteworthy that within the subsistence farmers’ cohort, a reduction in food insecurity was observed, with a decrease of 22.39%. Additionally, there was a decrease in the frequency of skipped meals by 11.94%, meal portion limitation by 14.93%, running out of food by 12.86%, hunger by 13.43%, and not eating by 10.45%.

With the advent of UA techniques, there has been a discernible uptick in the prevalence of food insecurity. It has been observed that subsistence urban farmers exhibit a higher prevalence of food insecurity (7.46%), family nutrient deficiency (1.49%), food limitation (1.49%), and food shortage (1.49%). In the interim, the cohort of commercial farmers exhibited a rise in the prevalence of food insecurity by 7.14%, a 1.43% increase in familial nutrient deficiency, and a 1.43% escalation in food limitation. It is noteworthy that commercial farmers exhibited a greater incidence of skipping meals (2.86%), restricting meal size (4.29%), and abstaining from eating (1.43%) in comparison to subsistence farmers, who reported no instances of missed meals, limited meal portions, or abstaining from food. Additionally, subsistence farmers reported zero occurrences of food insecurity.

3.4. Nutrition Adequacy

As per the results depicted in Figure 3, it can be inferred that a significant proportion of subsistence farmers, amounting to 83.58%, experienced a shortfall in energy, while a considerable proportion of commercial farmers, accounting for 67.14%, faced an energy deficiency.
The findings indicate that a notable proportion of farmers, specifically 28.57%, exhibited an energy surplus, whereas a smaller percentage of 4.29% experienced an energy shortfall. The dietary intake was found to be deficient in protein, fat, and carbohydrates. In relation to the micronutrient, it has been demonstrated that the sufficiency of vitamin A was discovered to be 5.71% among commercial farmers and 4.48% among subsistence farmers. Similarly, the sufficiency of vitamin C was found to be 7.14% among commercial farmers and 8.96% among subsistence farmers. Furthermore, the sufficiency of calcium was observed to be 1.49% among subsistence farmers. The study revealed that the proportion of iron adequacy was 12.86% among commercial farmers and 8.96% among subsistence farmers.

![Figure 3. Nutrition adequacy of urban farmers.](image)

The findings pertaining to the nutrition adequacy value (refer to Table 2) indicate that a majority of urban farmers are unable to fulfill the standard for nutrition adequacy, with the exception of vitamin A. The aggregate energy acquired by the urban farmers amounted to 1653.58 kcal, with the commercial farmers’ cohort registering a higher figure of 1699.95 kcal compared to the subsistence farmers’ cohort, which recorded 1609.58 kcal. The cohort of commercial farmers has been found to have the highest levels of protein (61.04 g), fat (65.80 g), carbohydrate (217.93 g), and vitamin A (1621.06 µg), as compared to the overall farmers and subsistence farmers’ cohort. In the interim, it is noteworthy that the cohort of subsistence farmers exhibited the most substantial levels of vitamin C (46.88 mg) and calcium (266.61 mg).

### Table 2. Average Nutrition Adequacy Value of Urban Farmers Consumption.

<table>
<thead>
<tr>
<th>Type</th>
<th>Energy (kcal)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Carbohydrate (g)</th>
<th>Vitamin A (µg)</th>
<th>Vitamin C (mg)</th>
<th>Calcium (mg)</th>
<th>Iron (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>2100</td>
<td>65</td>
<td>70</td>
<td>300</td>
<td>600</td>
<td>75</td>
<td>1200</td>
<td>12</td>
</tr>
<tr>
<td>Overall</td>
<td>1653.58</td>
<td>59.13</td>
<td>64.62</td>
<td>211.94</td>
<td>1581.48</td>
<td>46.25</td>
<td>258.31</td>
<td>8.92</td>
</tr>
<tr>
<td>Commercial</td>
<td>1699.95</td>
<td>61.04</td>
<td>65.80</td>
<td>217.93</td>
<td>1621.06</td>
<td>45.09</td>
<td>246.00</td>
<td>8.86</td>
</tr>
<tr>
<td>Subsistence</td>
<td>1609.58</td>
<td>57.65</td>
<td>64.26</td>
<td>204.58</td>
<td>1582.56</td>
<td>46.88</td>
<td>266.61</td>
<td>8.82</td>
</tr>
</tbody>
</table>
4. Discussion
4.1. The Demography of UA Enablers in Great Bandung Region

In the region of Great Bandung, diverse modalities of UA have been implemented, encompassing community gardens, rooftop gardens, and vertical farms. The triumph of UA in this region is subject to diverse factors, including but not limited to the demographic attributes of the community, resource accessibility, and the level of enthusiasm exhibited by community members towards UA, as previously noted [41]. The demographic characteristics of the community play a crucial role in determining the efficacy of UA in the Great Bandung Region. The high population density in the region poses a challenge for community members to secure land for UA. Furthermore, it is worth noting that a significant proportion of the populace residing within the Great Bandung Region comprises low-income households, thereby constraining their capacity to allocate resources towards the development of UA [42]. The existence of a substantial youth demographic may serve as a facilitator for UA in the region, given their proclivity towards embracing novel concepts and their heightened propensity to engage in communal undertakings [43,44].

The majority of urban farmers were individuals who were impacted by the COVID-19 crisis conditions. The ongoing COVID-19 pandemic has triggered a resurgence of interest in urban gardening and farming. The escalation of regional food production was a result of diverse pandemic-related outcomes, such as the scarcity of supermarket supplies during the initial stages of the pandemic, apprehensions regarding commercial food systems, leisure time due to furloughs and remote work, and even a yearning for physical exercise to counteract obesity, a COVID-19 co-morbidity [45,46]. A number of urban inhabitants in Great Bandung have been adversely affected by the COVID-19 pandemic, leading to a decline in their financial resources. The COVID-19 pandemic has resulted in a significant reduction in income for households in urban areas of Indonesia, thereby rendering them vulnerable to various socio-economic challenges [47]. The potential impact of reduced household income and the COVID-19 pandemic on susceptibility and demographic variables of urban farmers in the Great Bandung Region warrants further investigation.

The availability of resources is a crucial determinant that significantly influences the triumph of UA in the Great Bandung Region. The constraints on land, water, and other resources in urban settings can pose significant challenges to the engagement of community members in UA [48,49]. Furthermore, the dearth of access to pertinent information and technical support can serve as a constraint on the capacity of community constituents to engage in UA [50]. The existence of UA-related entities such as universities, government agencies, and organizations that offer technical support and training can serve to alleviate these obstacles and enhance the triumph of UA in the region [35].

The level of community engagement plays a pivotal role in determining the triumph of UA in the Great Bandung Region. It has been observed that the participation of community members in UA may be impeded by a dearth of knowledge or inclination towards the subject matter [51]. Furthermore, it is plausible that community constituents may exhibit reluctance towards engaging in UA as a result of time limitations or competing obligations [50,52]. The existence of community-based organizations that interact with community members and offer instruction and preparation on UA can serve to enhance involvement and enhance the efficacy of UA in the region.

The implementation of UA holds significant potential in mitigating food insecurity and enhancing the accessibility of wholesome sustenance within the Great Bandung Region. The triumph of UA in this locality is subject to diverse factors, encompassing the demographic attributes of the community, resource availability, and the inclination of community members to engage in UA. Hence, it is imperative to take into account these variables while formulating and executing UA programs in the Greater Bandung Region. Moreover, it is crucial to engage the community in the process of designing and executing UA initiatives, in order to guarantee their longevity and alignment with the community’s requirements.
4.2. Urban Agriculture Contribution towards Community’s Incomes

It is plausible that UA may serve as a means of bolstering the minimum wage by generating employment opportunities for small-scale farmers. The implementation of UA has the potential to serve as a viable means of income for farmers, thereby enhancing their capacity to meet the minimum wage requirements [53]. This can be of particular significance for farmers with limited financial means, who may face challenges in meeting the minimum wage requirements independently. Moreover, the implementation of UA has the potential to generate employment opportunities for various professionals, including horticulturists, technicians, and marketers. This can significantly enhance the economic capacity of both urban and rural regions to meet the minimum wage standards.

The augmentation of economic growth is an additional avenue through which UA can potentially contribute to the minimum wage. It has been posited that individuals engaged in UA, including farmers and other laborers, possess the capacity to generate income, thereby augmenting the economic stability of both commercial and subsistence farming cohorts [54]. As a consequence of this phenomenon, there could potentially be an upsurge in the labor market, leading to improved remuneration and an augmented capacity to meet the minimum wage standards. Furthermore, UA has the potential to facilitate economic growth through the creation of novel avenues for the distribution and sale of agricultural commodities. Consequently, this phenomenon can potentially result in augmented remunerations for agriculturists and other laborers operating within the domain.

The increases in food production by commercial urban farmers enables them to capitalize on economies of scale, leading to cost savings. As a result, they are able to curtail their production expenditures while concurrently augmenting their revenue stream from product sales [55]. Furthermore, it is noteworthy that commercial urban farmers may have access to state-of-the-art technologies and methodologies, which hold the potential to enhance the caliber and quantity of their yields, thereby resulting in a surge in their profits [56]. Commercial urban farmers may have expanded opportunities to access diverse marketplaces, both domestically and internationally, for the purpose of vending their agricultural yield [32,41]. They may have access to supplementary resources, such as marketing and distribution channels, that can facilitate their outreach to a larger clientele base, thereby augmenting their sales [57]. Commercial urban farmers could potentially qualify for more favorable policies and guidelines, such as economic aid in the shape of subsidies [58]. This has the potential to facilitate a reduction in costs while simultaneously augmenting revenue.

Conversely, urban farmers who rely on subsistence may encounter limitations in their access to crucial resources such as land, water, and financial capital, thereby impeding their ability to engage in large-scale food production [19,59]. This could pose a challenge for the farmers in terms of marketing their agricultural produce. Furthermore, it is noteworthy that subsistence urban farmers may encounter limitations in terms of accessing the same markets as their commercial counterparts, thereby impeding their capacity to vend their produce and augment their financial gains [55]. Subsistence urban farmers may not possess comparable levels of education, skills, and knowledge as their commercial counterparts, thereby constraining their ability to effectively administer their farms and enhance their financial gains [11]. Certain individuals engaged in subsistence urban farming may encounter limitations in accessing social safety programs that are otherwise available to their commercial counterparts. This predicament may impede their ability to effectively cope with unanticipated circumstances and subsequently curtail their financial gains [22].

The majority of subsistence urban farmers are individuals who have transitioned into the agricultural sector as a secondary career, with their primary source of household income being non-agricultural activities [55]. The primary source of revenue for commercial urban farmers was intensive agriculture, which was augmented by diversification into production, service, and edu-tourism. The practice of UA holds promise in mitigating the cost of sustenance, thereby serving as an additional avenue for augmenting the minimum
wage in certain localities. The UA practice also could provide a viable source of fresh, nutrient-rich sustenance for both urban and rural communities. Additionally, it presents the added advantage of reducing the financial burden of food expenses for households. The prospect of UA providing a viable means of supplying urban and rural regions with a source of fresh, nutrient-dense sustenance is a plausible one. As a result of this phenomenon, households will experience an increase in disposable income, thereby augmenting their capacity to make purchases beyond the subsistence level. This, in turn, may bolster their potential to generate revenue.

4.3. Food Insecurity Experience of Urban Farmers in Great Bandung Region

The practice of UA holds great promise in mitigating food insecurity among farmers, as it facilitates greater availability of fresh and wholesome food for both urban and rural communities [60]. The advancement of food sovereignty and self-reliance, alongside the generation of economic prospects for small-scale farmers, are among the means by which UA holds the potential to exert a favorable impact on food insecurity among farmers [11,61]. Furthermore, the implementation of UA has the potential to foster a cultural shift towards the appreciation of resilience and resourcefulness, ultimately leading to the enhancement of community relationships [22,35]. Notwithstanding, it is imperative to acknowledge that UA in isolation would not suffice to comprehensively address the predicament of food insecurity. Due to its limited scope, it may not be capable of providing sufficient sustenance to meet the needs of a whole community or geographical area [62].

The efficacy of UA practices in completely mitigating food insecurity remains uncertain. Given the modest scale at which UA is typically practiced by subsistence farmers, it may not always be sufficient to meet the dietary needs of an entire town or region [62]. However, with the different land-use situation, subsistence UA in Montreal could make food systems in North American cities much more self-sufficient and resilient [49]. Furthermore, it is imperative to note that subsistence UA is often contingent upon the availability of land, water, and other resources, all of which can pose significant challenges in urban settings. It is worth noting that UA may not possess the same capacity to offer a diverse array of sustenance, particularly when comparing the commercial and subsistence farmers’ cohort.

The availability of nutrients is a crucial component of ensuring food security, as it directly impacts the capacity of individuals to obtain adequate, wholesome, and nourishing sustenance [63]. One of the primary mechanisms by which UA can enhance nutrient accessibility for households is through the augmentation of fresh and wholesome sustenance availability. It has been posited that UA has the potential to offer a diverse range of nutrient-rich sustenance that may not be easily accessible in urban settings, including but not limited to verdant leafy greens, fragrant herbs, and succulent fruits [64,65]. The aforementioned food items are abundant in crucial vitamins and minerals, including but not limited to vitamin A, vitamin C, and iron, that are indispensable for the sustenance of optimal health. Furthermore, the implementation of UA has the potential to mitigate food insecurity by enhancing the accessibility of vital nutrients for households.

An additional mechanism through which UA can enhance nutrient accessibility for households is by advancing food sovereignty and self-reliance. The practice of UA has the potential to bestow upon households the ability to assume authority over their own food production and diminish their reliance on exogenous food sources [66]. It is imperative to note the significance of this phenomenon, particularly for low-income households that engage in subsistence UA. These households may encounter financial constraints that impede their ability to procure costly, nutrient-rich food items. Through the benefit cost analysis, UA rooftops in the Mediterranean revealed that the food production has more beneficial not only for energy generation [49]. Furthermore, UA has the potential to offer a diverse range of culturally relevant food options for the community, thereby enhancing the accessibility of vital nutrients for families and mitigating food scarcity concerns for communal consumption [22,67].
UA possesses the capacity to positively impact the accessibility of vital nutrients. The facilitation of nutrition education can be effectively achieved through the practice of UA. This approach can aid families in acquiring knowledge pertaining to the crucial importance of consuming a diet that is both diverse and nutritionally balanced, while also comprehending the impact of various foods on one’s overall health and well-being. This phenomenon has the potential to enhance a household’s ability to procure adequate, uncontaminated, and wholesome sustenance, while also empowering them to make judicious choices regarding their dietary intake. The provision of economic opportunities for small-scale farmers is an additional avenue through which UA can mitigate food insecurity and reduce the incidence of meal skipping. It is within the realm of possibility for agricultural practitioners to augment their earnings by engaging in UA, thereby enhancing their capacity to cultivate sustenance for their households and themselves. Furthermore, UA possesses the capacity to generate employment prospects, thereby fortifying the economic stability of households and reducing the frequency of food insecurity.

4.4. Urban Agriculture Contribution towards Nutrition Adequacy in Great Bandung Region

The concept of nutrient adequacy pertains to the degree to which a dietary pattern furnishes all indispensable nutrients in ample quantities to satisfy the requirements of individuals. The impact of UA, encompassing both commercial and subsistence farming practices, on nutrient adequacy is indeed a distinctive phenomenon that warrants further investigation. The findings depicted in Figure 3 indicate that the prevalence of nutrient inadequacy remains high among both commercial and subsistence farmers, with the exception of vitamin A.

It is noteworthy that both commercial and subsistence farmers predominantly engage in the cultivation of cash crops that exhibit low caloric densities. It has been observed that the botanical specimens cultivated by urban agriculturists are not necessarily the primary sources of sustenance for their diurnal dietary needs [68]. The agricultural collective demonstrated cognizance of their eventual reliance on the market system, yet they deemed the prospective economic benefits of cultivating lucrative crops on their own soil to be more advantageous than the plausible financial risks of succumbing to market dependence [13]. It is plausible that subsistence urban farmers may encounter constraints in accessing comparable technologies and methodologies employed by their commercial urban farming counterparts [69]. Consequently, the potential for augmenting agricultural productivity and enhancing the caliber of the commodities they generate may be restricted. Due to this circumstance, it may pose a challenge for them to contend with commercial urban farmers and enhance their productivity, ultimately leading to an inadequate energy supply.

The term commercial UA pertains to the cultivation of food for commercial purposes, frequently on a grand scale, utilizing sophisticated technologies and methodologies [35]. The implementation of urban agriculture has the potential to offer a plethora of nutrient-dense foods, including but not limited to leafy greens, herbs, and fruits, which may be challenging to procure within urban settings. It has been observed that vegetables, owing to their superior water and fertilizer efficiency, tend to be a more lucrative option for cultivation as compared to other crops, primarily due to the exorbitant cost of urban land, as noted in reference [70]. Given the abbreviated life cycles of vegetables, they have the potential to expeditiously fulfill the dietary requirements of burgeoning populations. It is noteworthy that commercial UA may prioritize high-value crops, which may not necessarily be the most nutrient-dense options. As a result, the nutrient adequacy percentage of such crops may not be as optimal as that of subsistence UA.

Conversely, subsistence UA pertains to the cultivation of sustenance for individual consumption and communal distribution within the locality. The implementation of UA has facilitated the provision of a diverse array of nutrient-rich sustenance, encompassing vegetables, fruits, herbs, staple foods, and animal-derived products. Furthermore, the practice of subsistence UA has the potential to offer a diverse range of culturally appropriate food options for the local community, thereby enhancing the overall nutrient adequacy
of their dietary intake [22]. The subsistence farming community is primarily led by the housewives, who play a crucial role in the production and consumption of a diverse range of foods. It is imperative to impart essential knowledge and guidance to these individuals regarding the various food groups that are abundant in carbohydrates, protein, fat, vitamins, and minerals. This will enable individuals to choose and categorize a broader spectrum of sustenance.

The integration of UA into the urban landscape has the potential to significantly enhance the nutritional adequacy of the diets of urban inhabitants. It is imperative to take into account the nature of urban agricultural practices, given that the impacts on nutrient adequacy can vary depending on whether the practice is commercial or subsistence farming. It has been observed that both commercial and subsistence farmers tend to cultivate a majority of high-value crops and vegetables, owing to the convenience of accessing markets for perishable produce [71]. It has been observed that the subsistence farmers cohort tends to be more closely associated with locally sourced livestock products, encompassing animal by-products and commodities such as meat, eggs, and feathers, in comparison to their commercial farming counterparts [72]. It has been posited that subsistence farmers may align their consumption patterns with the produce of urban farming, thereby accessing a diverse array of locally sourced, nutritionally-sufficient foodstuffs.

5. Conclusions

Urban agriculture within the Greater Bandung Region could potentially serve as a substantial contributor towards mitigating the prevalence of food insecurity and augmenting the availability of nutritious food alternatives for urban denizens. The potential success of UA in this locality is subject to various factors, including the type of urban agricultural activity undertaken, such as commercial agriculture or subsistence farming. The practice of commercial UA, which focuses on the cultivation of food for the primary purpose of large-scale distribution, has the capacity to provide a wide array of nutrient-dense food options while also generating financial gain for farmers. Conversely, it is plausible that the costlier and less attainable nature of such sustenance may curtail its availability to socioeconomically disadvantaged communities, thereby exacerbating the prevalence of inadequate access to nourishing sustenance and engendering food insecurity. Conversely, subsistence UA, with its emphasis on cultivating sustenance for personal use and communal sharing, may prove to be a viable option for communities with limited financial resources. Moreover, it may offer a diverse array of nutrient-rich edibles that align with the cultural preferences of the community. The practice of subsistence UA presents a valuable prospect for community members to acquire knowledge and engage in the cultivation of their own sustenance. The present scenario holds the potential to augment the accessibility of nutrient-dense food and, thereby, foster food security.

Moreover, the commercialization of UA within the Great Bandung Region holds the potential to impact the proportion of the populace’s earnings, insufficiency of food, and sufficiency of nutrition. The prospect of providing a means of livelihood for farmers and laborers holds promise for bolstering the overall economic resilience of both urban and rural communities. However, it is not without its drawbacks, as it may lead to a decline in food autonomy and the displacement of customary small-scale agriculturalists. Henceforth, it is imperative to strike a harmonious equilibrium between commercial and subsistence approaches to UA, so as to ensure optimal gains while concurrently curtailing any deleterious impacts on the community.

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