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WOMEN'S INVOLVEMENT IN URBAN FARMING: AN ANALYSIS OF THE ENVIRONMENTAL AND SOCIOECONOMIC IMPLICATIONS IN TASIKMALAYA, INDONESIA

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Abstract: A sustainable approach to urban problems, including poverty, food insecurity, and environmental deterioration is urban farming. Focusing on socioeconomic and ecological sustainability, this study investigates how women in Tasikmalaya and Banjar, Indonesia implement urban agriculture. The research, performed from February to December 2021, involved 250 participants chosen from 136 urban farming collectives in nine districts of Tasikmalaya. The findings show that urban farming experiences significant challenges in terms of market access, resource allocation, and regulatory frameworks, despite having 100% institutional support. The roles of natural, economic, sociocultural, human, and physical capital in attaining economic, social, and environmental results were evaluated using the Integrated Plantation Polyculture Farming (IPPF) model. Significant findings emphasise the importance of urban farming for empowering women, lowering poverty, and promoting environmental sustainability. This study offers a paradigm for urban farming as a pillar of sustainable urban development in Indonesia for practitioners and policymakers. To optimise the advantages of urban farming, the study suggests community cooperation, improved market connections, and structured policies. This study offers a paradigm for using urban farming as a pillar of sustainable urban development in Indonesia for practitioners and policymakers.

Keywords: Socioeconomic impact, environmental sustainability, community empowerment, food security, agri-urban development.

Introduction

An urban area is a geographic space or area that is always changing and growing, which can have positive or negative impacts on human survival (Otsuka *et al*., 2010). The composition of the functions of urban areas includes centres of economic activity, innovation, education, technological acceleration, and providing employment opportunities. In 2019, urban population growth in the world was 55.7%, in Asia 50.5%, and in Indonesia 56% (World Bank, 2018). Simulation results show that in 2030, urban population growth in the world will be 60.4%, in Asia 56.7%, and in Indonesia 62.8% (FAO, 2017; 2018). The growth of the city population in Asia is very rapid and the fastest-growing city population is in Indonesia (Jakarta). Currently, city residents account for 50% of the world's population or 49.6% of Asia's population, living in cities as urban residents (Wilkinson *et al*., 2016; World Bank, 2018).

Population growth in cities will create competition for resources and increase pressure on limited green open space (World Bank, 2018). WHO (2018) and Russo and Cirella (2018) recommend the availability of a minimum green open space of 9 m^2 per person with an Urban Green Space (UGS) value of 50 m^2 per capita. The government has implemented a green city policy to improve the urban situation through

urban agricultural activities (Baumüller, 2018). Urban agriculture is an activity that contributes to the UN Sustainable Development Program SDGs 1, 2, 3, 11, 12, and 13, (UN, 2015; UN-FAO, 2015). The UN's global initiative the SDGs program, underscores the importance of sustainable agriculture and cities (SDG11.3). Urban agriculture is a second food source that can meet city residents' needs. Growing food crops in cities is a global challenge (Mugenyi, 2013). Food systems can be damaged by external factors such as extreme weather and internal factors such as regional regulations (Didomenica & Gordon, 2016). Gittleman *et al*. (2012) understand urban agriculture as food production in cities and peripheries, there is no area as a measure. Community gardens are common in Australia's suburbs and towns, providing active local food sources where people raise the crops (Pollard *et al*., 2017).

Sustainability and food security are gaining huge attention globally and in Australia, leading to a resurgence of interest in and ties to the origins of our food. In Brazil, agriculture is transitioning towards sustainability by utilising vast grasslands and hills. This will prevent damage to native vegetation and biodiversity for agriculture (Daum & Birner, 2020). Investigation results of 310 agricultural sectors concluded that the level of education and working on one's land were positively related to economic limitations, which were negatively associated with the adoption of smart and innovative farming technologies.

Targeted policies and training interventions are needed to exploit smart agricultural technologies in the Piedmont region, North-West Italy (Cavallo *et al*., 2016; Caffaro & Cavallo, 2019). Urban agricultural action in several parts of the world was initiated by the food or economic crisis in that region. In Indonesia, urban agriculture was undertaken because environmentalists were concerned about the large amount of abandoned land and increasing urban air temperatures (Prasetjaningsih, 2012; Bauw & Suharko, 2015). Innovative methods in urban agriculture have led to rapid development in developed countries, but not so in developing countries (Hernandez & Manu, 2018).

The development of urban agriculture has begun to grow massively, even becoming a global policy as part of the world's contribution to the success of sustainable development goals (SDGs 1-17) programmed by the UN (CADFOD, 2015) and become part of Indonesia's development focus (BAPPENAS & GGGI, 2015; 2016; 2017). Urban agricultural activities have become a lifestyle in developed countries. The increasing awareness of urban communities to live a healthy lifestyle and make a significant contribution to urban life.

Materials and Methods

The research was conducted from February 2021 to December 2021 among 250 respondents of 2,884 members of the Urban Farmer Group. Respondents were chosen using a stratified random sample procedure to ensure diversity in demographics, farming expertise levels, and engagement in urban farming activities. Structured interviews were undertaken to collect information on their agricultural practices, issues, and thoughts on urban agriculture. The primary goal of these interviews was to examine the impact of community gardens on food security, sustainability, and social involvement in urban environments. The research was determined purposively to explore the characteristics of women urban farmers who generally do not work as farmers. The positivistic paradigm was designed using a survey method in Tasikmalaya City, West Java Province, Indonesia.

Research Object and Location

The characteristics of cities in West Java are divided into towns with urban nuances such as Bogor City, Bekasi City, Depok City, and Bandung City; cities with village nuances such as Tasikmalaya City, Sukabumi City, and Banjar City. The objects of this Urban Farming research are urban communities that carry out Urban Farming activities with a village nuance. The research area was determined purposively. The

cities chosen are Tasikmalaya City and Banjar City, which are administrative cities where the rural feel is still dominant in terms of population and non-agricultural areas.

Tasikmalaya Municipality is one of the cities in West Java Province. The city is located at 108°08′38″ – 108°24′02″ East Longitude and 7°10′ – 7°26′32″ South Latitude in the southeastern part of West Java Province. The climatic factors considered in this study are the average temperature of 24,900°C, the minimum temperature of 19,600°C, and the maximum temperature of 32,200°C. Tasikmalaya City is included in the high rainfall category, with an average monthly rainfall of 269.27 mm and an average daily rainfall of 21.73 mm.

Research Study Model

The framework illustrates the various kinds of capital that contribute to the success of the Integrated Plantation Permaculture Farming (IPPF) system and provides a conceptual framework for assessing its capital (Figure 1). Resources are divided into natural, economic, sociocultural, human (HR), and physical capital. Each category has unique characteristics such as land, money, collaboration, education, and technology. Together, these capitals serve the economy, social welfare, and environmental sustainability by enabling IPPF to function. Along with ecological indicators, including ecosystem integrity, biodiversity, and carrying capacity, the framework also links IPPF to social impacts, economic results, and well-being measures. This framework emphasises a multidimensional strategy for sustainable agriculture that incorporates social, financial, and environmental factors (Figure 2).

Urban Farming Zoning

Tasikmalaya Municipal Agriculture Service and the private community coordinate urban farming by urban women. The research zone is in District Cibeureum, Cihideung, Cipedes, Indihiang, Kawalu, Mangkubumi, Purbaratu, Tamansari, and Tawang. There are 136 urban farmer groups that carry out urban farming activities. There are 136 urban farmer groups in the Municipality of Tasikmalaya. The research involves urban farmers purposively selected to represent each district. The largest district is the Kawalu area of 42.33 km^2, the smallest is the Cihideung area of 5.45 km^2. However, the limited space is

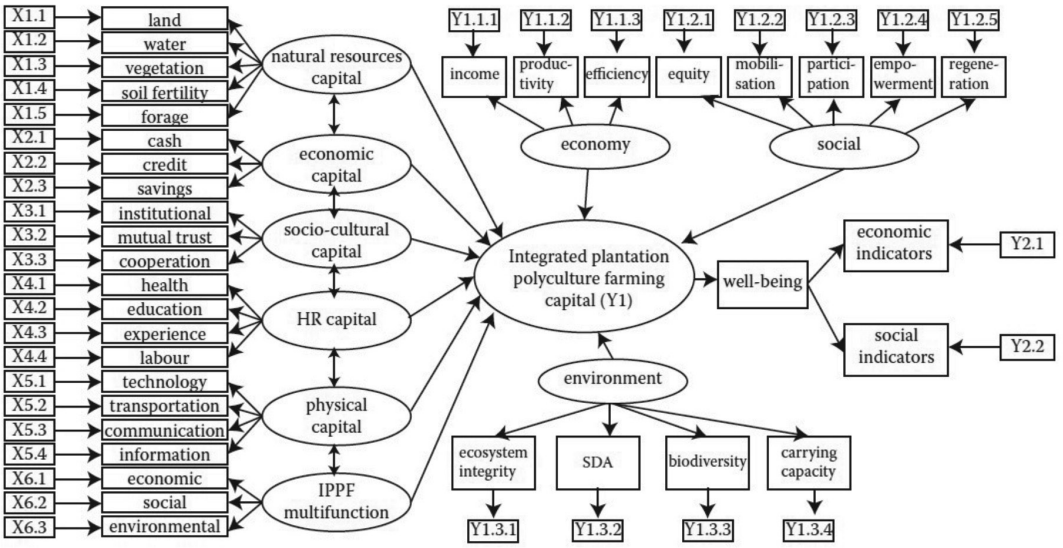

Figure 1: Framework of integrated plantation polyculture farming, showing how different types of capital contribute to economic, social, and environmental sustainability

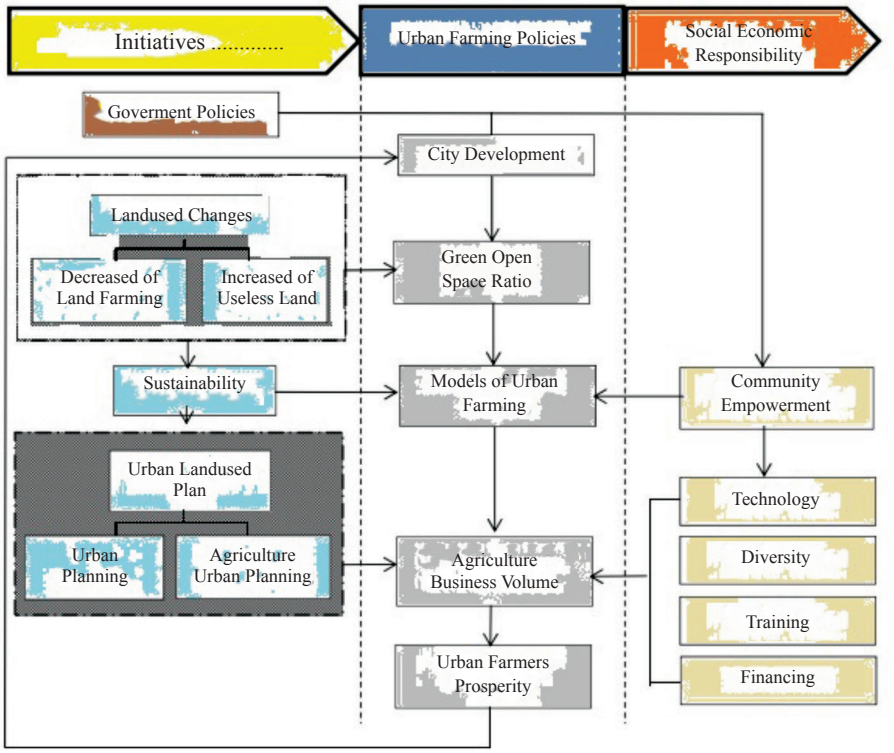

Figure 2: Research study model for implementation and focus of the study

inhabited by a large and dense population and the dominance of non-agricultural activities. The broader scope of agricultural activity still exists.

Data Collection

Data were collected through both secondary and primary sources. The methods used were both quantitative and qualitative to gain representative information about the overall women's urban farming activity, women and urban farming development, and the impact on household prosperity.

Primary Data

Primary data were collected through a focused group discussion with the members of the Urban Farmer Group, using a structured interview technique and a questionnaire. The samples were selected by invitation to attend urban farmer groups' meetings. The collected primary data were tabulated and analysed descriptively. The questionnaire had both closed and open-ended questions. The questionnaire section was devoted to acquiring urban farmer characteristics, including age, education, income, status, occupation, and motivation. The second part addresses questions about commodity-based production input resources, planting medium, location, post-harvest handling, collaboration – Corporate Social Responsibility (CSR) implementation, marketing, and zero waste (people, planet, profit).

Secondary Data

Secondary data was obtained from various related parties through observation techniques, desk studies, and documentation studies (BPS, 1392; 2022; Kota Tasikmalaya, 2020) and also Statement of Agricultural Service Municipal Tasikmalaya (Walikota Tasikmalaya, 2021).

Secondary data collection challenges may develop due to limited accessibility, old or inconsistent sources, and difficulty validating reliability. Researchers use a systematic strategy to solve this, including cross-referencing multiple sources and obtaining expert validation. Furthermore, direct engagement with stakeholders via surveys, interviews, or official requests ensures a comprehensive and reputable data set while encouraging transparency and cooperation.

Data Analysis

Data were analysed using statistical descriptive methods, frequencies, percentages, and comparative graphs. The data were constructed in time series. The analysis tools used were Microsoft Office Professional Plus-Excel 2016, IBM SPSS, Statistix 8.1, and Origin Lab.

Results

Cities are the habitat for 55.8% of Indonesia's human population and are projected to continue to increase in 2025, namely or 170.4 million people (59.3%) of Indonesia's total population of 287 million people (Table 1) (The World Bank Group, 2017; Arshad *et al*., 2018; D'Abramo, 2021) [Figure 3 (A & B)]. With more than half of Indonesia's population living in urban areas, the quality of the carrying capacity of urban areas will become an increasingly important issue to address.

The ecological carrying capacity of the city will become a leading resource for the survival of its citizens. This includes all environmental ecosystem needs and services for urban residents to maintain their physical and mental health and well-being.

Implementation Model for Sustainable Urban Farming Development

Axiology makes the results of a scientific study more than just a theoretical reference in the form of citations ideally, but also becomes a practical reference for all related parties, which, in the end,

Table 1: Population composition of Banjar City and Tasikmalaya City

Subdistrict	Amount of Ward	Area (km^2)	Altitude (mdpi)	Population	Population Density (Org/km^2)	Amount of WFG
Kawalu	10	42.33	310	97590	2.305	16
Tamansari	8	37.00	370	78250	2.115	29
Cibeureum	9	18.39	340	69060	3.755	18
Purbaratu	6	12.63	320	44850	3.551	17
Tawang	5	6.91	350	60810	8.801	3
Cihideung	6	5.45	370	72730	13.345	4
Mangkubumi	8	23.99	380	98810	4.119	17
Indihiang	6	10.86	420	58390	5.377	10
Bungursari	7	17.62	440	61550	3.493	13
Cipedes	4	9.04	360	81880	9.057	9
Total	**69**	**184.22**		**723921**	**3.98**	**136**
Banjar	7	26,24	79	58530	2251	41
Purwaraharja	4	18,27	32	24550	1344	39
Pataruman	8	54,05	49	61970	1147	48
Langensari	6	33,41	35	57810	1730	36
Total	**25**	**131.97**		**202860**	**6472**	**164**
Grand Total	**94**	**316.19**		**100.477**	**6475.98**	**300**

Source: BPS (2024)

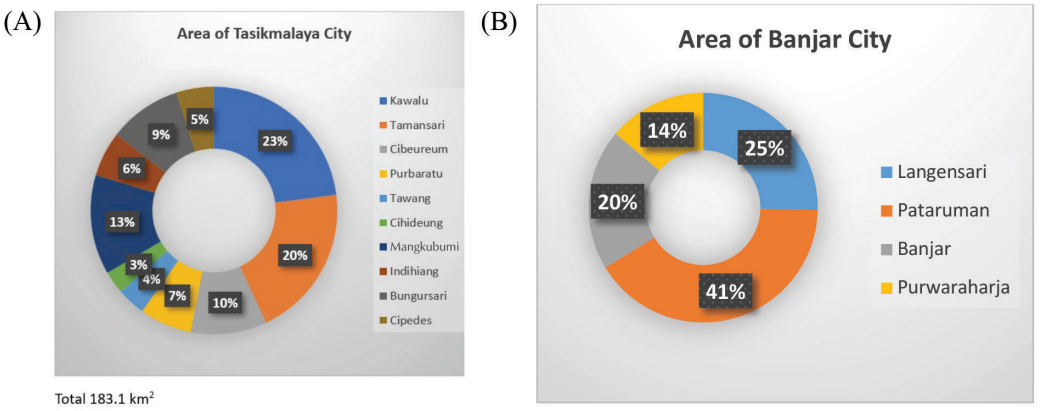

Figure 3: Area of Tasikmalaya City and Banjar City by district (%) in 2021

these two uses together will become a theory. Regarding the body of knowledge, these two axiological substances emphasise that a study is not just curiosity and developing knowledge but also offers alternative solutions for problem-solving and decision-making (Figure 4).

The sustainable urban farming development model has not yet been conceptually and structurally established. Still, ideally, it will arrive at an urban farming model that can be implemented. Of course, the generalisation is not only a policy recommendation but also for practitioners at the household and community level.

In 2021, male unemployment was 9.47%, an increase from the previous year's (9.02%), but female unemployment was 4.86%, a decrease from the previous year's (6.37%). Overall, 7.66% decreased from the prior year, namely 7.99% (BPS Kota Tasikmalaya, 2019; 2020; 2022). Urban farming is one way to alleviate poverty among urban residents in densely populated locations.

The rate of economic growth in the last three years has decreased. In Tasikmalaya City, in 2019, the rate was 5.97%, decreasing to negative 2.01% and then increasing again in 2021 to 3.57%, but it has not returned to 2019. Likewise,

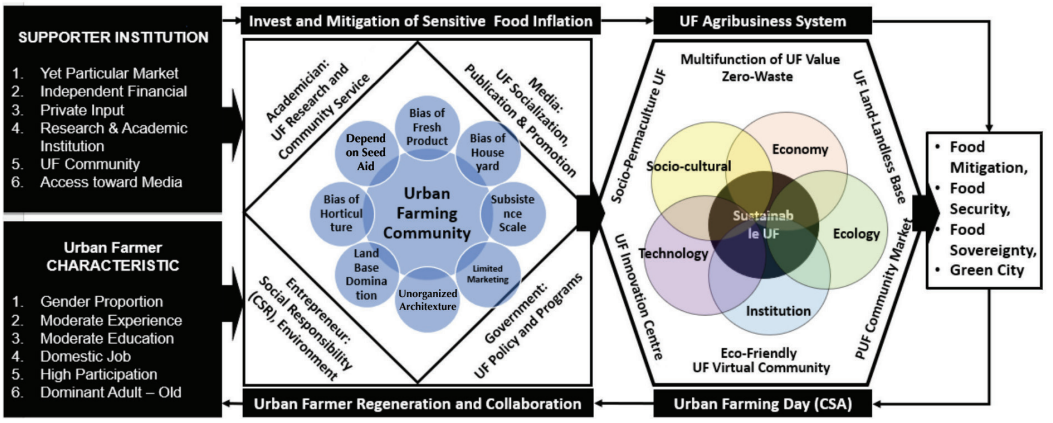

Figure 4: Agribusiness systems, investment methods, urban farmer traits, the responsibilities of supporting institutions, and cooperative efforts to advance sustainable urban farming, food security, and green city initiatives are all depicted in this urban farming community dynamics framework

in Banjar City, the same thing happened, albeit less negatively (BPS Kota Tasikmalaya, 2022) (Figure 5). Table 2 shows the poverty index and percentage age of poor people in Tasikmalaya City and Banjar City.

Supporting Institution of Urban Farming

The success of urban farming starts with communities in every RW/sub-district in Tasikmalaya City and Banjar City. This community or group forms an organisational structure and then registers it with the Department of Agriculture for legal purposes.

The government is an organisation that has the authority to regulate certain areas. Government comes from the word command, which means words intended to be carried out to carry out an activity that must be done. The government is people, bodies, or apparatus, and gives orders.

One component of institutional support is from the government. The results of the Likert scale calculation showed that government institutions 100% support urban farming activities in Tasikmalaya City and Banjar City.

The agricultural policy initiated by the city Government could have been more successful

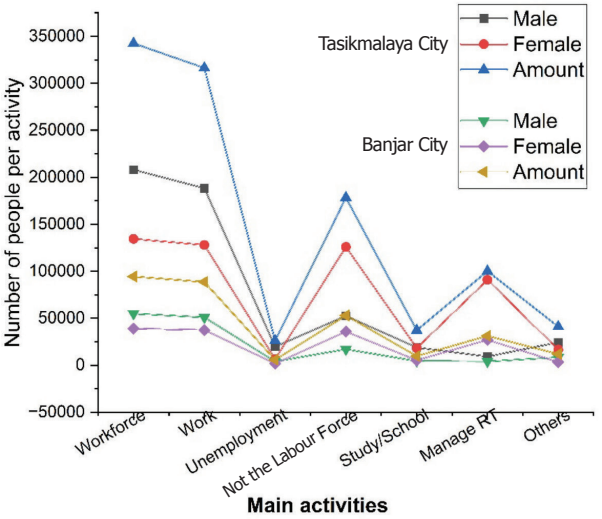

Figure 5: Classification of residents aged 15 and above based on type of activity

Table 2: Poverty index and percentage age of poor people in Tasikmalaya City and Banjar City

Year	Tasikmalaya City			Banjar City		
	Depth Index	Severity Index	Poverty (%)	Depth Index	Severity Index	Poverty (%)
2014	3.12	0.86	15.95	0.91	0.19	6.95
2015	2.85	0.69	16.28	0.76	0.11	7.41
2016	2.37	0.57	15.60	0.73	0.14	7.01
2017	2.01	0.42	14.80	0.54	0.08	7.06
2018	1.52	1.98	12.71	0.79	0.19	5.70
2019	0.31	0.53	11.60	0.57	0.10	5.50
2020	1.75	0.39	12.97	0.70	0.12	6.09
2021	2.42	0.69	13.13	1.19	0.28	7.11

in meeting the food needs of the city's people. So, innovation through urban farming is formed by the city government through the Food and Agriculture Security Service (DKPP). Meanwhile, market failure occurred in urban farming in Bandung City due to public discomfort with the products circulating.

Performance Metrics Responses of Stakeholders

Particularly in sectors like government regulation, the figure shows a discrepancy between ideal expectations and actual performance, suggesting that regulatory efficacy should be enhanced [Figure 6 (A)]. According to the data, market institutions need to guarantee better locations, which may indicate that farmers need help accessing markets [Figure 6 (B)]. The findings suggest that the performance metric decreases as the assistance level becomes more localised. It suggests that local organisations needed more infrastructure or resources to adequately address agricultural demands, even when higher-level entities (such as provinces) might have robust frameworks [Figure 6 (C)]. The results point to the need for cost-effective input methods, suggesting that while affordability might be improved, usability and accessibility are comparatively high [Figure 6 (D)].

Accessibility and affordability parameters show a large discrepancy between ideal and actual, indicating the urgent need for smallholder farmer-specific financial assistance systems. This disparity points to possible budgetary restraints in the agriculture industry, which might impede output and expansion [Figure 6 (E)]. Smartphones and social media are ranked higher than more conventional outlets like mass media, suggesting that agricultural stakeholders are increasingly communicating via digital platforms [Figure 6 (F)]. The performance measures show a discrepancy between ideal and actual values, particularly regarding the partnership between the business sector and the research institution. This disparity emphasises the need for closer ties between research and practice to spur innovation and tackle pressing agricultural issues [Figure 6 (G)].

Discussion

An ecosystem is an arrangement of environmental elements that form a holistic whole and influence each other in creating balance, stability, and productivity in the environment (Undang-undang Republik Indonesia Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup, 2009). The urban farming ecosystem includes all the flora, fauna, and humans who inhabit the city. Apart from buildings and other physical infrastructure, cities have open parks, green belts, lakes, and other undeveloped areas, which are the core of urban ecosystems dominated by humans (Marjani *et al*., 2024).

The urban farming ecosystem also provides basic needs such as food, clean water, and a system for controlling disease. In terms of environmental benefits, urban ecosystems offer benefits such as clean air, the potential to reduce energy use for air conditioning (Grard *et al*., 2018; Sanyé-Mengual *et al*., 2020) and food mitigation efforts. Plant vegetation in cities helps improve air quality and reduce noise pollution, providing social spaces for citizens to interact (Chinseu *et al*., 2022).

Another vital function is to provide a system to survive disasters such as floods, soil erosion, and other impacts of climate change, as well as flood mitigation (Arshad *et al*., 2020; Ashraf *et al*., 2021). Human mobility and household energy needs for urban communities, including utilities and consumption, absorb the most significant resources. Urban farming helps meet these needs. Urban farming is mainly carried out by urban communities, primarily initiated by communities that care about the environment, rather than food production (Yudiarini *et al*., 2017). The benefits of urban farming are significant in developing countries where agriculture is a large part of the culture.

However, on the contrary, urban farming's development is more visible in developed

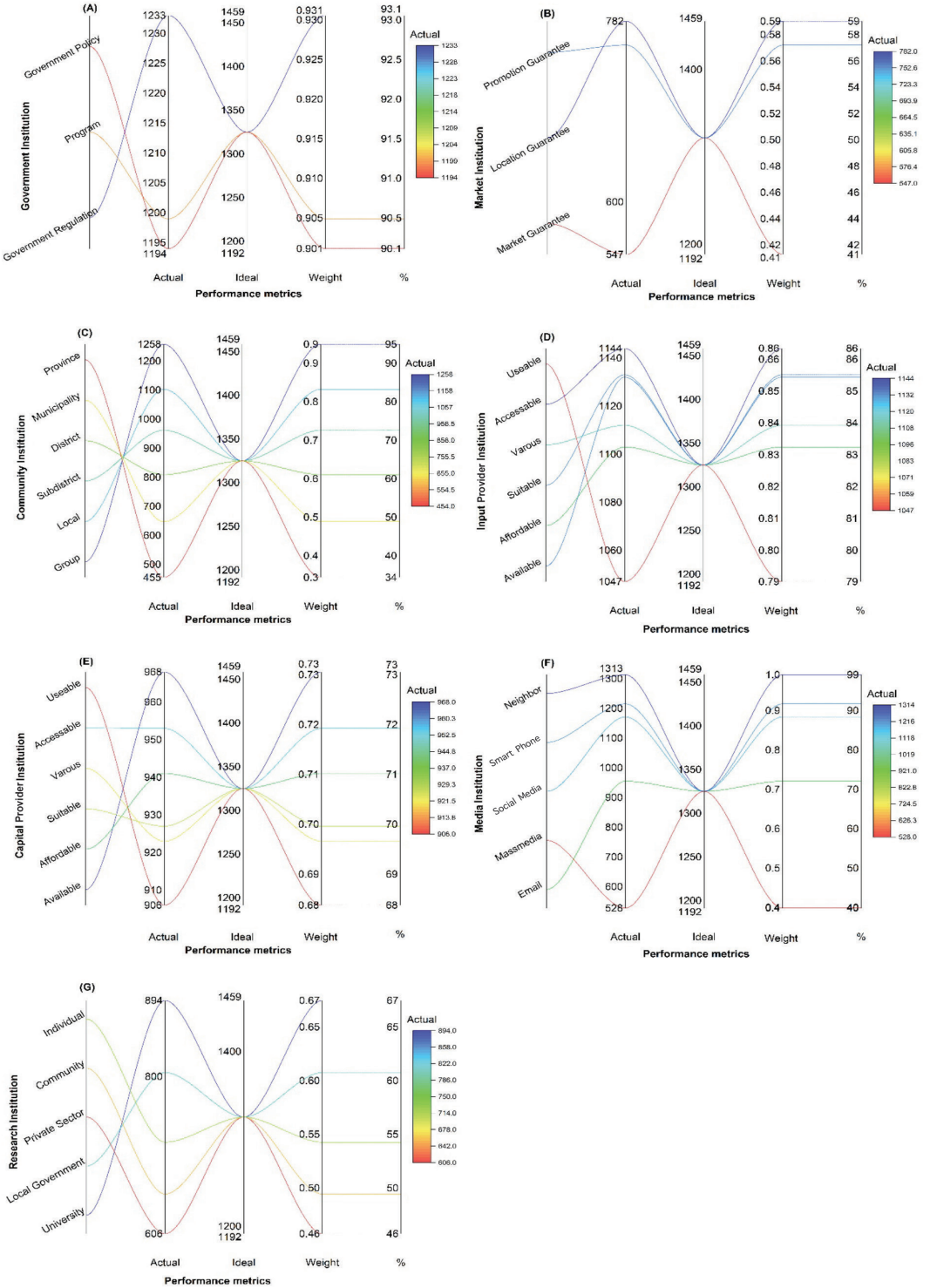

Figure 6: Metrics of performance assessment of diverse institutional support systems for agricultural stakeholders in various groups

countries (Hernandez & Manu, 2018). The occurrence of agricultural involution has caused concern among environmental observers, especially in cities where changes and shifts in land use cannot be avoided (Antara, 2009; Syahyuti, 2014). In order to prevent the involution and reproduction of agribusiness businesses, community growth must be followed by an increase in productivity (Setiawan, 2015; Setiawan *et al*., 2019), particularly among urban farmers. In previous years, urban farming activities were only based on programs launched by the government, but after the program's implementation, urban farming activities were completed. Several factors caused this failure, especially policy failure and market failure (Margareth *et al*., 2021).

Ensuring food safety, managing natural resources, and defending farmers' rights depend on effective regulations (Sys *et al*., 2017). Agricultural stability can be undermined by problems like water mismanagement, ineffective pest control measures, and insecure land tenure, which can occur when inadequate or ineffective regulatory frameworks (Abdoellah *et al*., 2023). Farmers may need access to the resources and assistance they need in developing nations, where laws are often not enforced, which would limit their output.

Regulatory frameworks must be strengthened to create a more resilient agriculture industry and consistent execution must be guaranteed (Otsuka *et al*., 2010). For smallholder farmers, who frequently struggle to find consistent buyers and deal with price swings, market accessibility is essential. Markets provide farmers with up-to-date information on consumer preferences and quality standards (Purnomo *et al*., 2023). Establishing agricultural cooperatives can increase farmers' negotiating power and facilitate access to domestic and foreign markets in areas with limited market access (Adolwa *et al*., 2017).

Community-based organisations are crucial for social cohesiveness and local agricultural assistance, particularly in rural areas. They assist in planning training, exchanging resources, and handling typical agricultural problems like pest and water management (Sanou *et al*., 2023). High input costs are a significant obstacle for smallholder farmers, who often lack the funds to invest in high-quality inputs. Affordability of inputs is essential for increasing crop resilience and productivity, particularly when soil degradation and climate change further tax agricultural systems (Borsellino *et al*., 2020). One of the most enduring problems in agriculture is the need for inexpensive financing, especially for smallholders who often require additional collateral. Farmers can only adopt contemporary agricultural methods or invest necessary resources without assistance (Andersson *et al*., 2024). Thanks to digital media, farmers can receive fast updates on weather forecasts, pest outbreaks, and market pricing, which can fill information gaps.

Problems with the digital divide still exist since rural areas still need Internet connectivity and farmers would require instruction in digital literacy to use these tools efficiently (Beuermann *et al*., 2012). Cooperation between researchers and practitioners is essential for agricultural innovations to address real-world issues and be feasible for farmers to implement. Research in sustainable agricultural methods, pest control, and crop development is fundamental in light of resource constraints and climate change (Yudiarini *et al*., 2017; Smith *et al*., 2017; Chinseu *et al*., 2022).

Conclusions

Urban areas' ecological carrying capacity must be prioritised to protect the health and well-being of inhabitants, as urban populations are expected to increase dramatically and account for 59.3% of the total population by 2025. Particularly in highly populated areas, urban farming has the promise to improve food security, reduce poverty, and encourage green urban development. Initiatives involving urban farming need solid institutional backing such as legislative acceptance, changes to governmental regulations, and collaborations between the public and private sectors. Even though the study

locations showed 100% institutional support, these programs' full potential remains untapped due to deficiencies in local infrastructure, market access, and regulatory efficacy.

The performance measures, for example, highlight the need for better resource allocation and policy execution by showing a significant gap between the ideal and actual levels of affordability, accessibility, and institutional collaboration. Employment data and the poverty index highlight the potential of urban farming to relieve economic issues.

Urban farming could be a significant factor in empowering communities and lowering unemployment, especially among women and non-labour force segments, even if Tasikmalaya and Banjar Cities have seen fluctuations in economic growth and poverty rates. The study suggests developing a conceptual and organised urban farming model adapted to local situations to attain long-term sustainability. This approach should incorporate technological advancements, collaborative efforts, and agribusiness systems to increase resilience and productivity. Maintaining urban farming projects requires strengthening legal frameworks, cultivating collaborations with academic institutions, and guaranteeing market accessibility.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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