Productive Foodscape: Improving Urban Landscapes for Makassar Food Security

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Project Team

United States:

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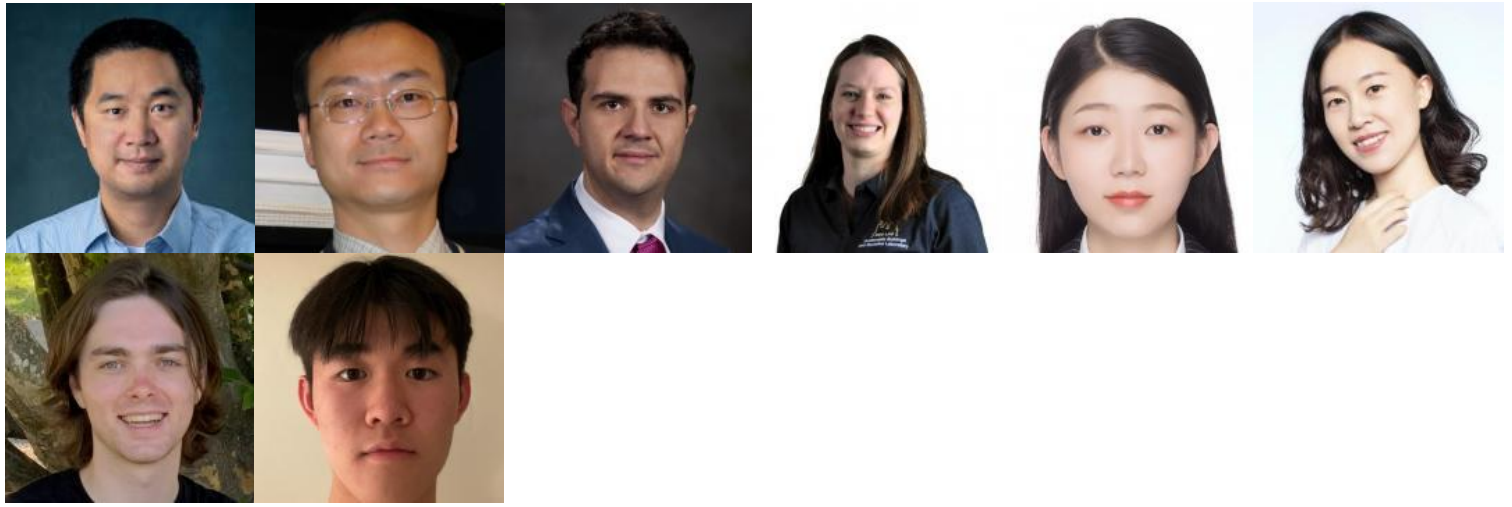

Indonesia:

- Universitas Gadjah Mada
- Institut Teknologi Bandung
- Universitas Hasanuddin
- Makassar City

Acknowledgment

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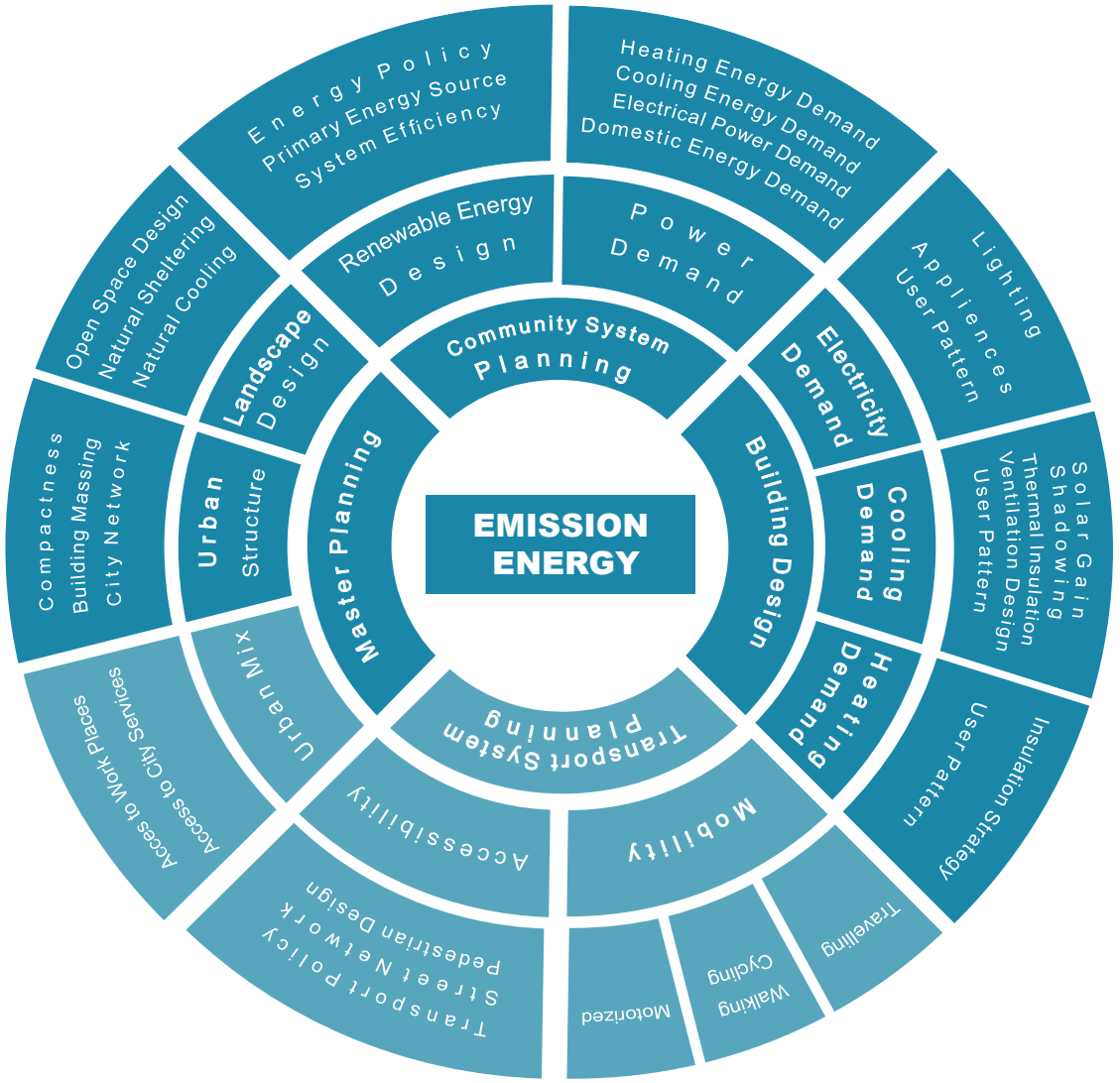
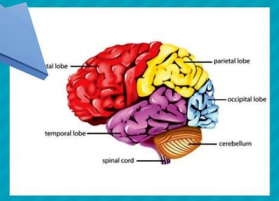
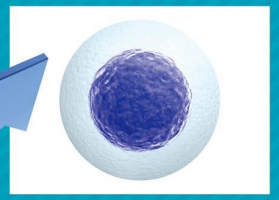
- U.S. Department of State
- Bank of Indonesia
- City of Makassar
- Pennsylvania State University


EMISSION ENERGY
Community System Planning
Master Planning
Building Design
Transport System Planning
Landscape Design
Renewable Energy Design
Power Demand
Urban Structure
Electricity Demand
Cooling Demand
Heating Demand
Urban Mix
Accessibility
Mobility
Compactness
Building Massing
City Network
Open Space Design
Natural Sheltering
Natural Cooling
Energy Policy
Primary Energy Source
System Efficiency
Heating Energy Demand
Cooling Energy Demand
Electrical Power Demand
Domestic Energy Demand
Lighting
Appliances
User Pattern
Solar Gain
Shadowing
Thermal Insulation
Ventilation Design
User Pattern
Insulation Strategy
User Pattern
Traveling
Walking
Cycling
Motorized
Transport policy
Street Network
Pedestrian Design
Access to City Services
Access to Work Places

PHILOSOPHY





BRAIN → MAYOR / GOVERNMENT

CELL → COMMUNITY / ALLEY

QUALITY OF HUMAN'S BODY → QUALITY OF LIFE'S COMMUNITY

ALLEY = CITY CELL

STRATEGIES

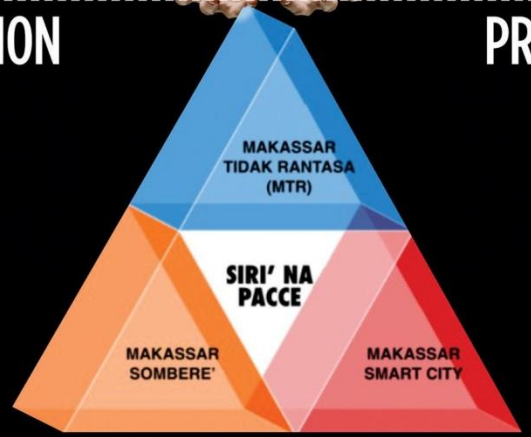
VISION-MISSION
8
ROAD TO FUTURE

BUILDING

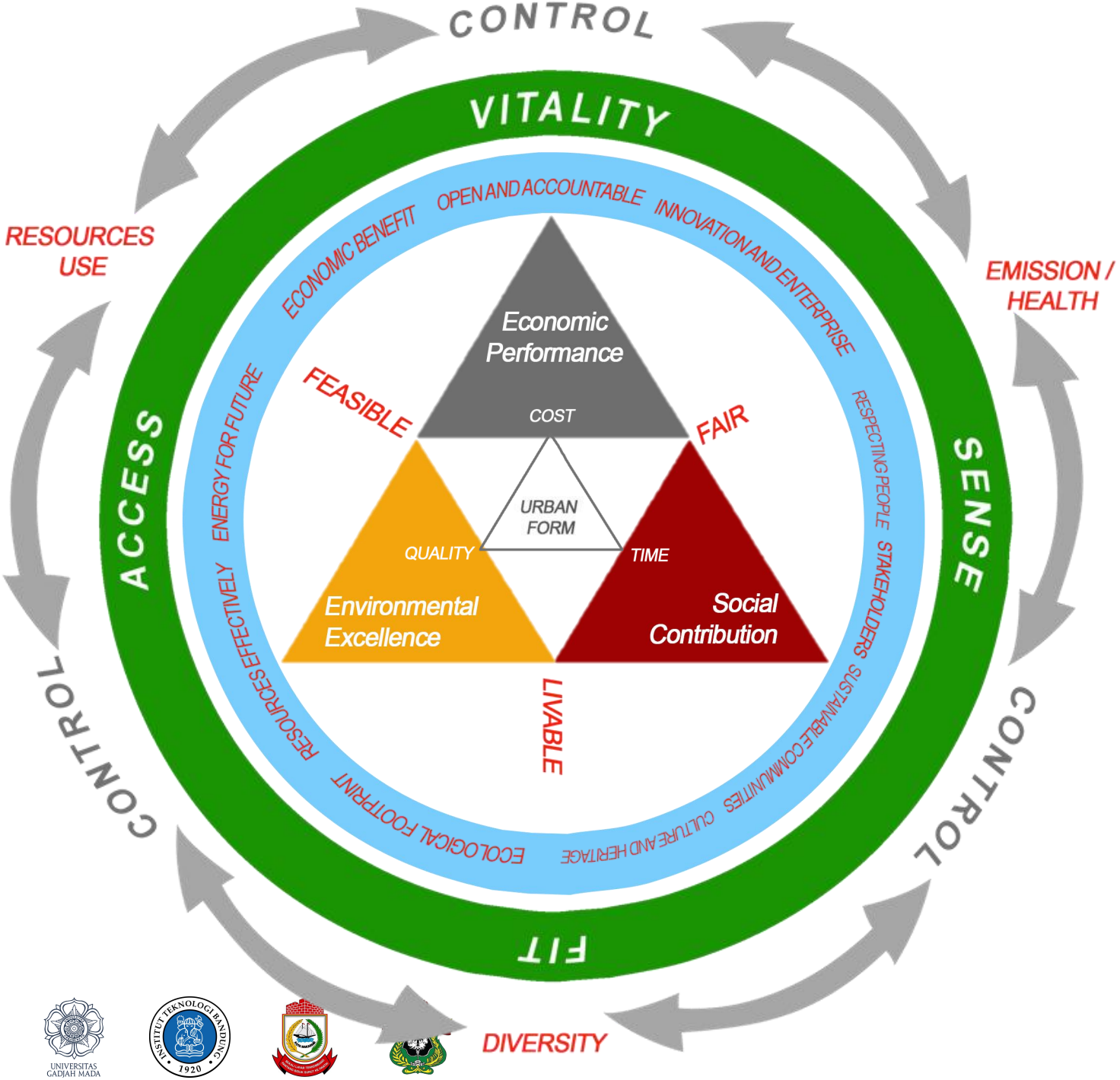
ALLEY RESTORATION

TOUCHING HEART PROTOCOL

3
STRATEGIC PROGRAM



FOUNDATION



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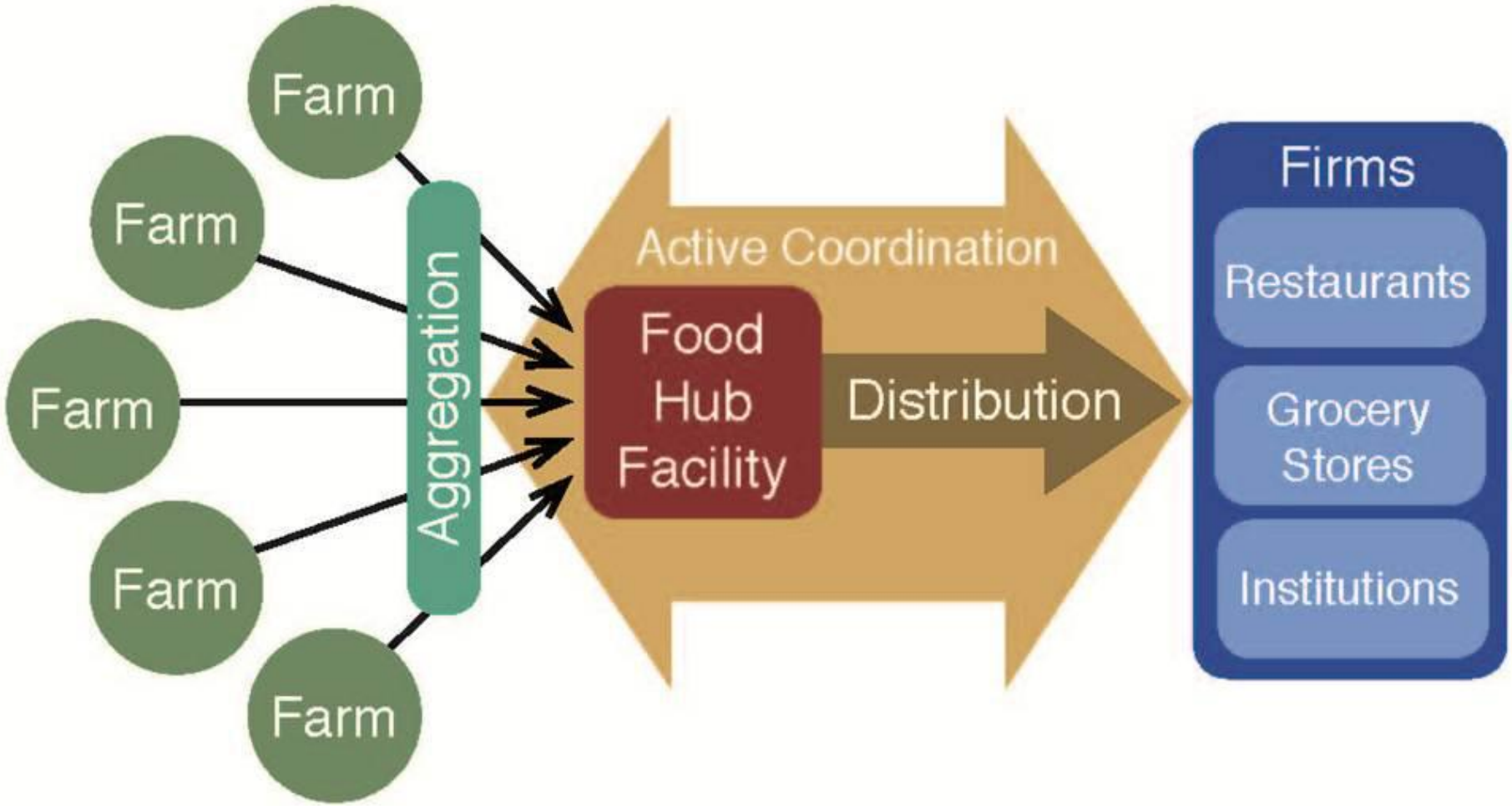


Food Hub diagram courtesy of Craig Page.

INDONESIA MAP

INFOGRAPHIC

1 SUMATRA

2 JAVA

3 KALIMANTAN

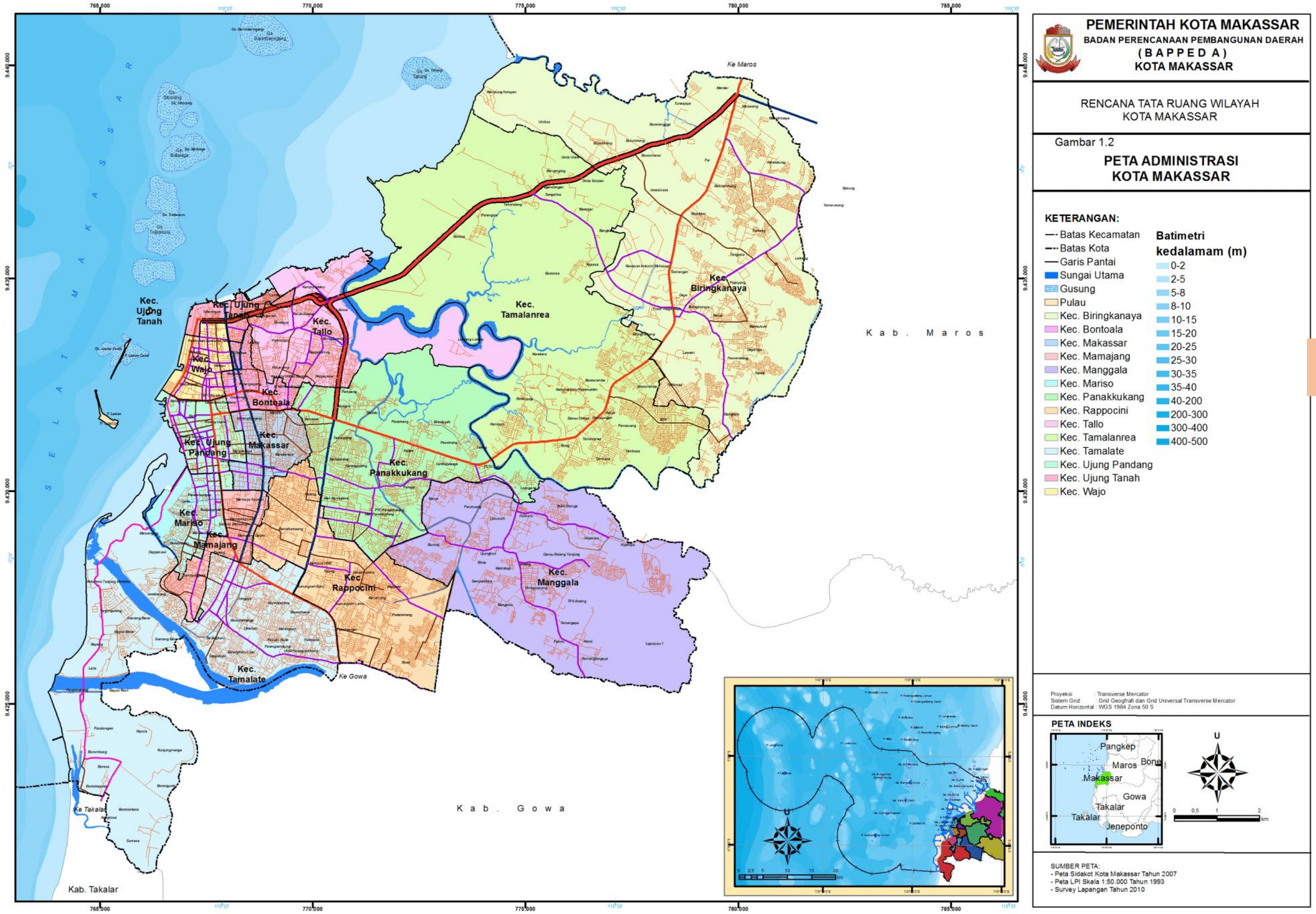
4 BALI

5 SULAWESI

6 MALUKU

7 PAPUA

MAKASSAR CITY



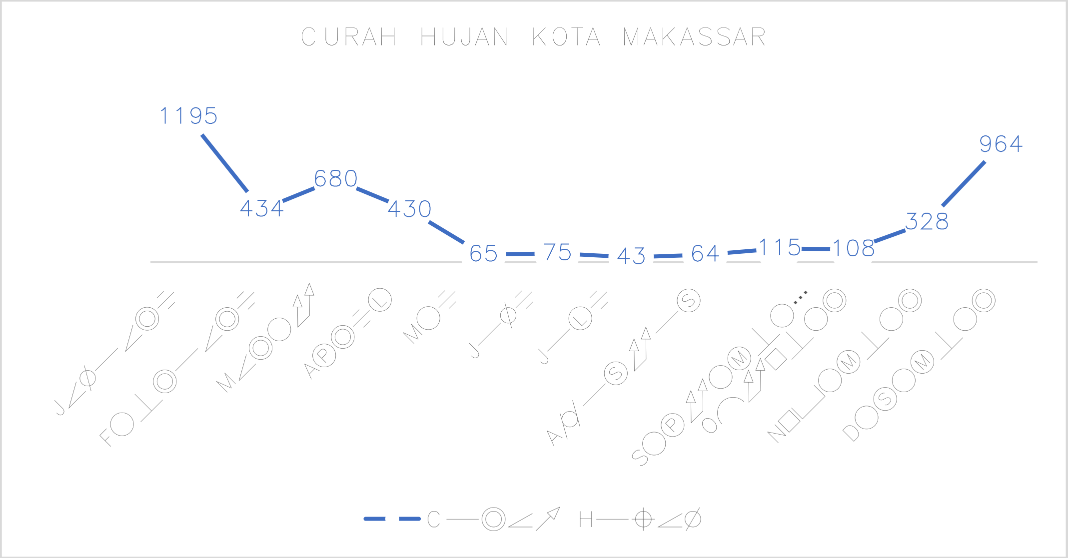
NORTH :

SOUTH :

WEST :

EAST :

IKLIM



BAPPEDA (2022)

1190 24'17'38"

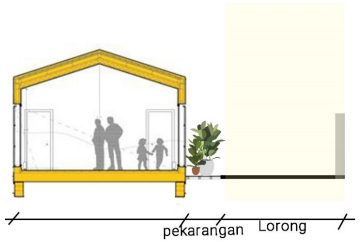
50 08'06'19"

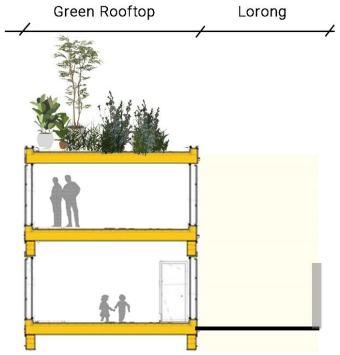
175.77

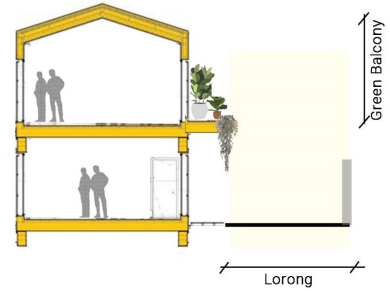
15

01

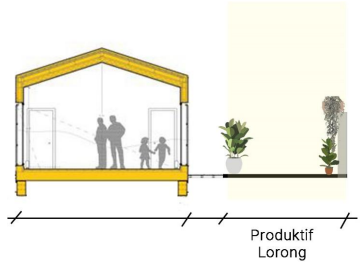
02 **Scope of urbanfarming typology**

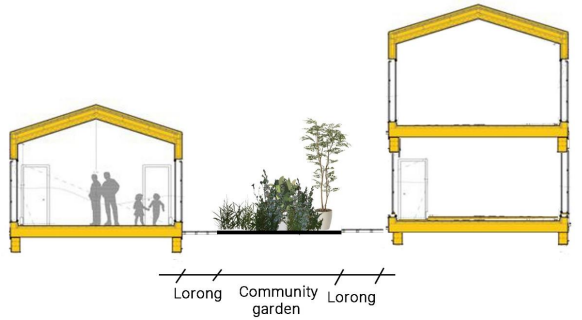






Utilization of urban farming with the onsoil method





03 **Scope of Food Groups (Makassar City Food Security Office 2022)**

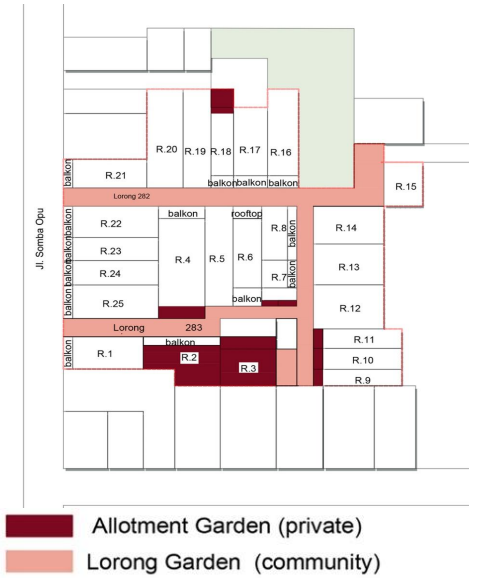
- Padi Field UF
- Starchy foods
- Sugarcane
- Fruits
- Milk
- Fishery
- Oily fruits/seeds
- Vegetables
- Meat
- Egg
- Oils and Fats
- Others (Herbs/medicines/spices)

Urbanfarming Spatial Typology Classification

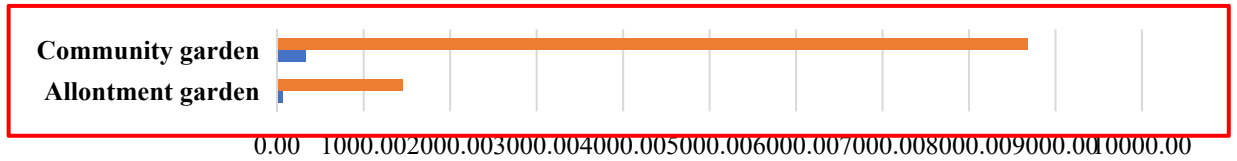
1. Private Garden

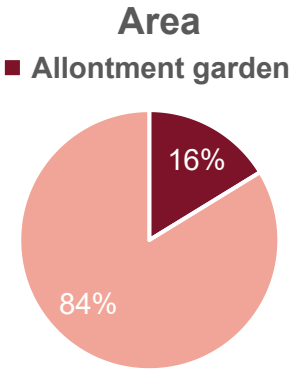
2. Community Garden (Alley)

The most widely found spatial typology of urban farming is the "Community Garden (alley)" typology, the highest utilization productivity for urban farming is "Allotment Garden (private)".



Productivity of urban farming utilization based on typology type





	Allontment garden	Community garden
Area tidak produktif	1448	8674.37
Area Produktif	63.49	327.22
Productivity	**4.38%**	**3.77%**

Community Garden (Alley)

Area ↑ Productivity ↓

Allotment Garden (Private)

Area ↓ Productivity ↑

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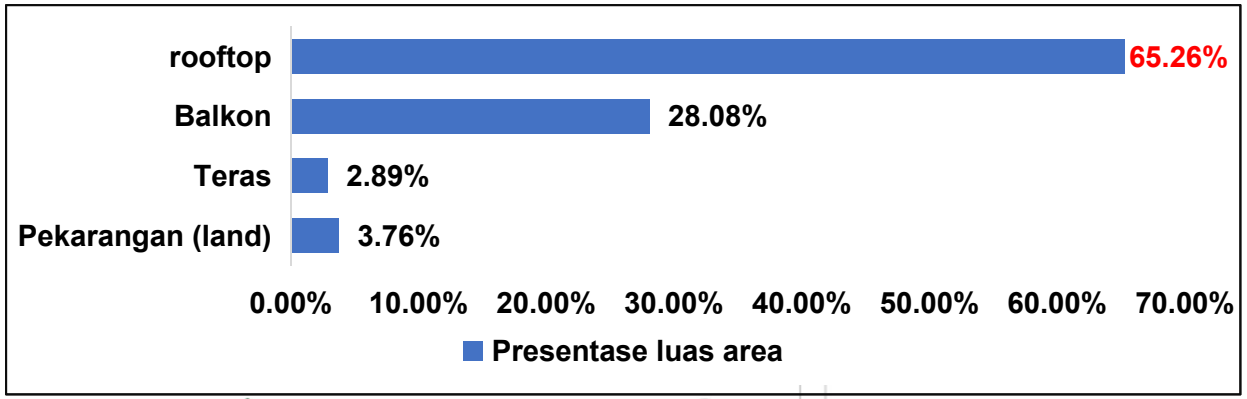
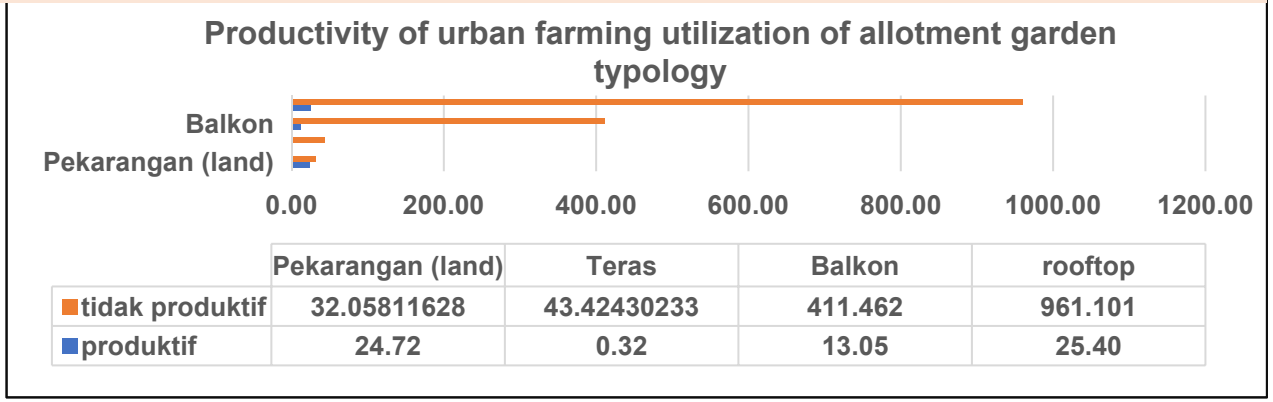
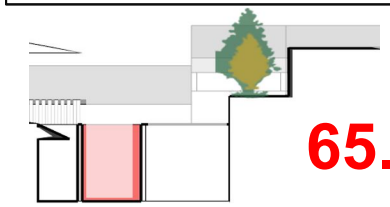
Classification of private garden typology

"Rooftop" is the type of typology in allotment gardens that has the "highest area" and the type of "soil typology" has the "highest productivity"'.



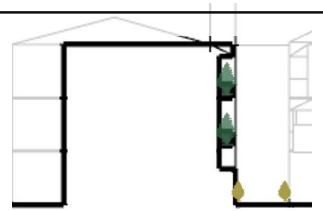


	Pekarangan (land)	Teras	Balkon	rooftop
tidak produktif	32.05811628	43.42430233	411.462	961.101
produktif	24.72	0.32	13.05	25.40



65.26%

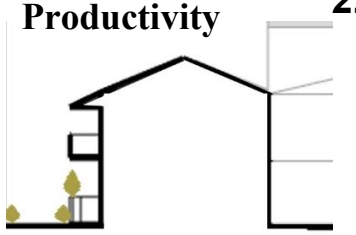
Rooftop



28.08%

Balcony

Productivity 2.64%



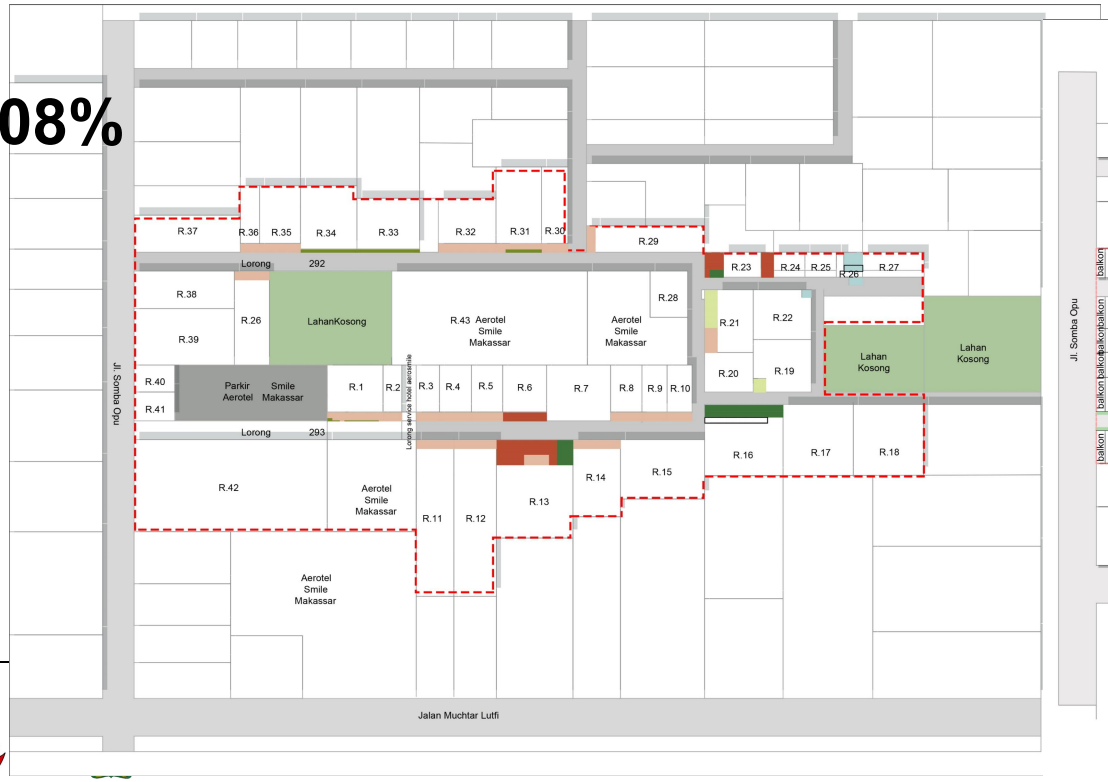
Productivity 3.17%

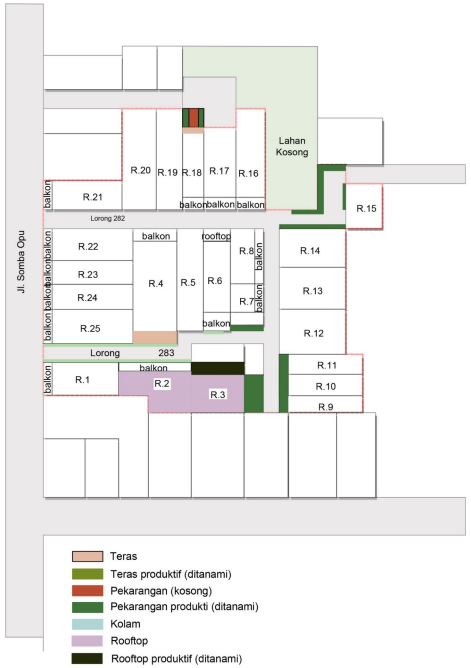
Terrace 2.89%

Productivity 0.01%

Soil 3.76%

Productivity 77.10%





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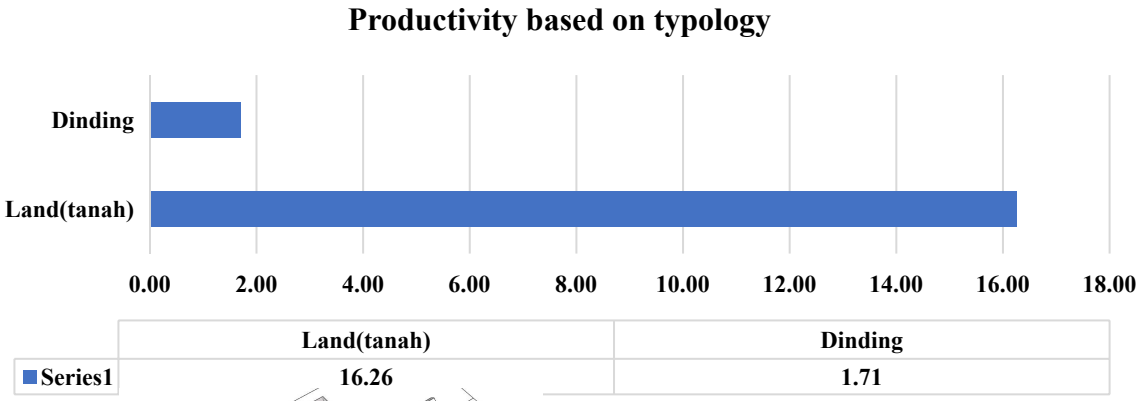
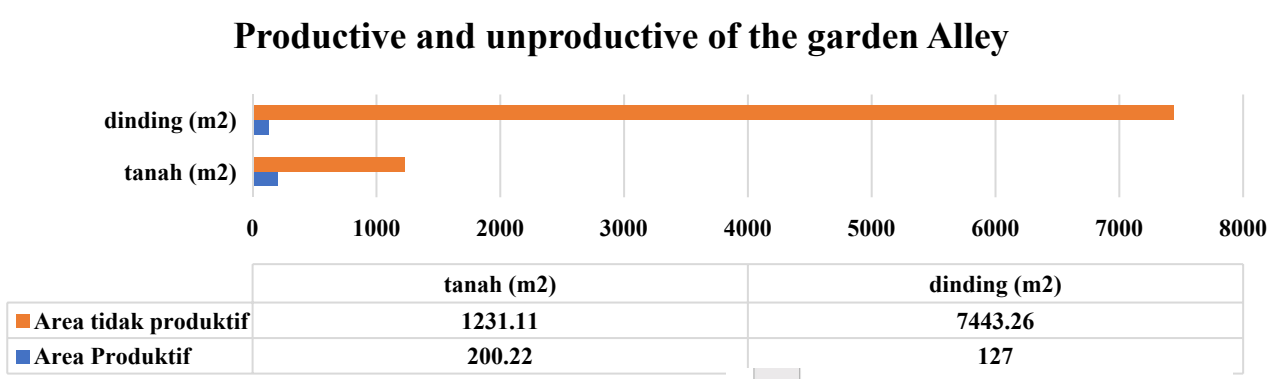
Classification of community garden typology (alley)

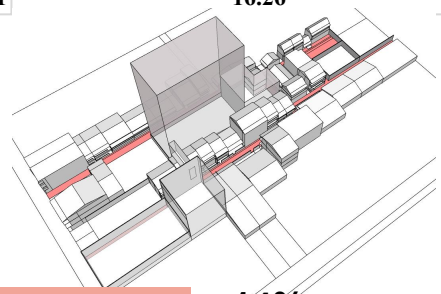
"Alley-wall" is a type of typology in community gardens that has the "highest area" and the "land-hallway" type has "highest productivity".



	Land(tanah)	Dinding
Series1	16.26	1.71

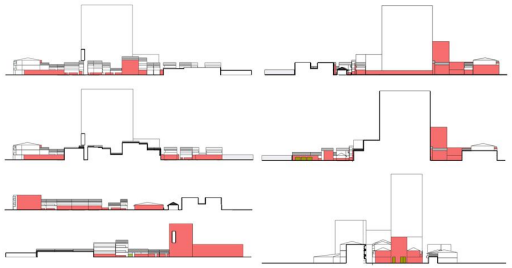


	tanah (m2)	dinding (m2)
Area tidak produktif	1231.11	7443.26
Area Produktif	200.22	127

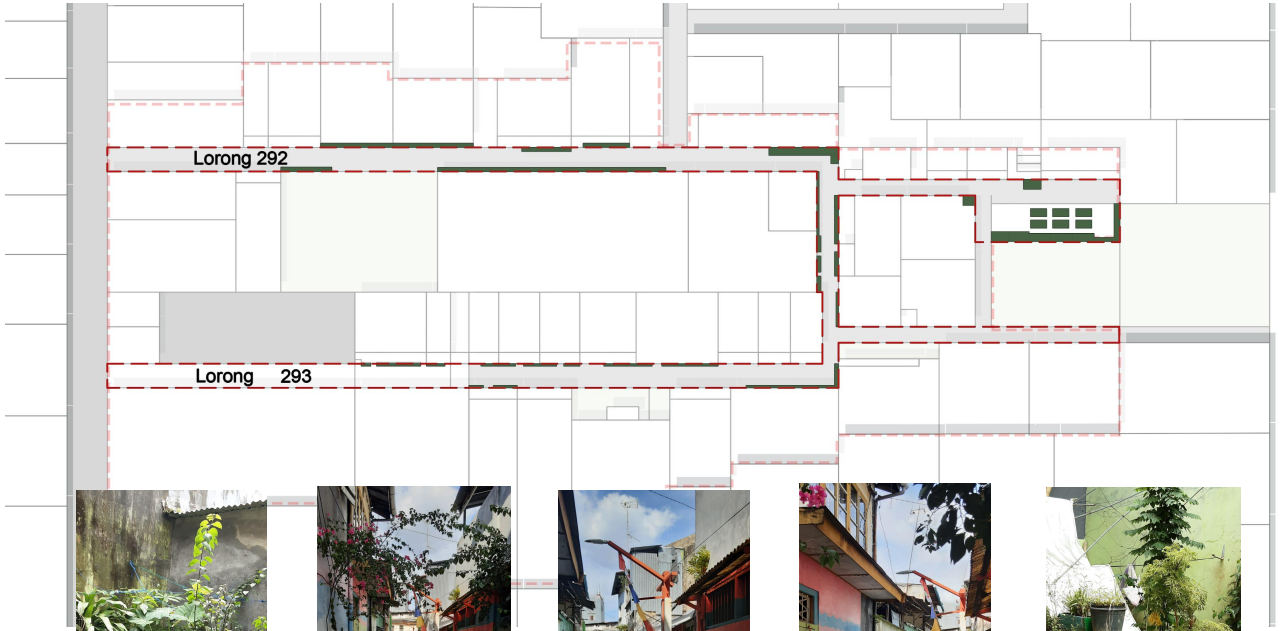


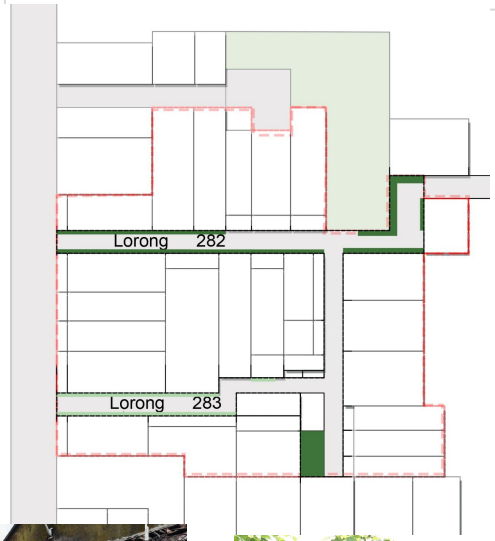
On the street 14%

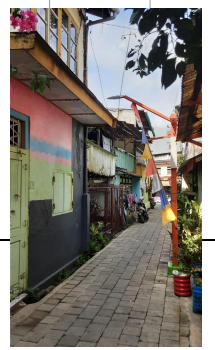
Productivity 13%

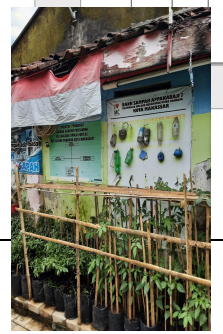


wall 86%









Produktivitas 2%

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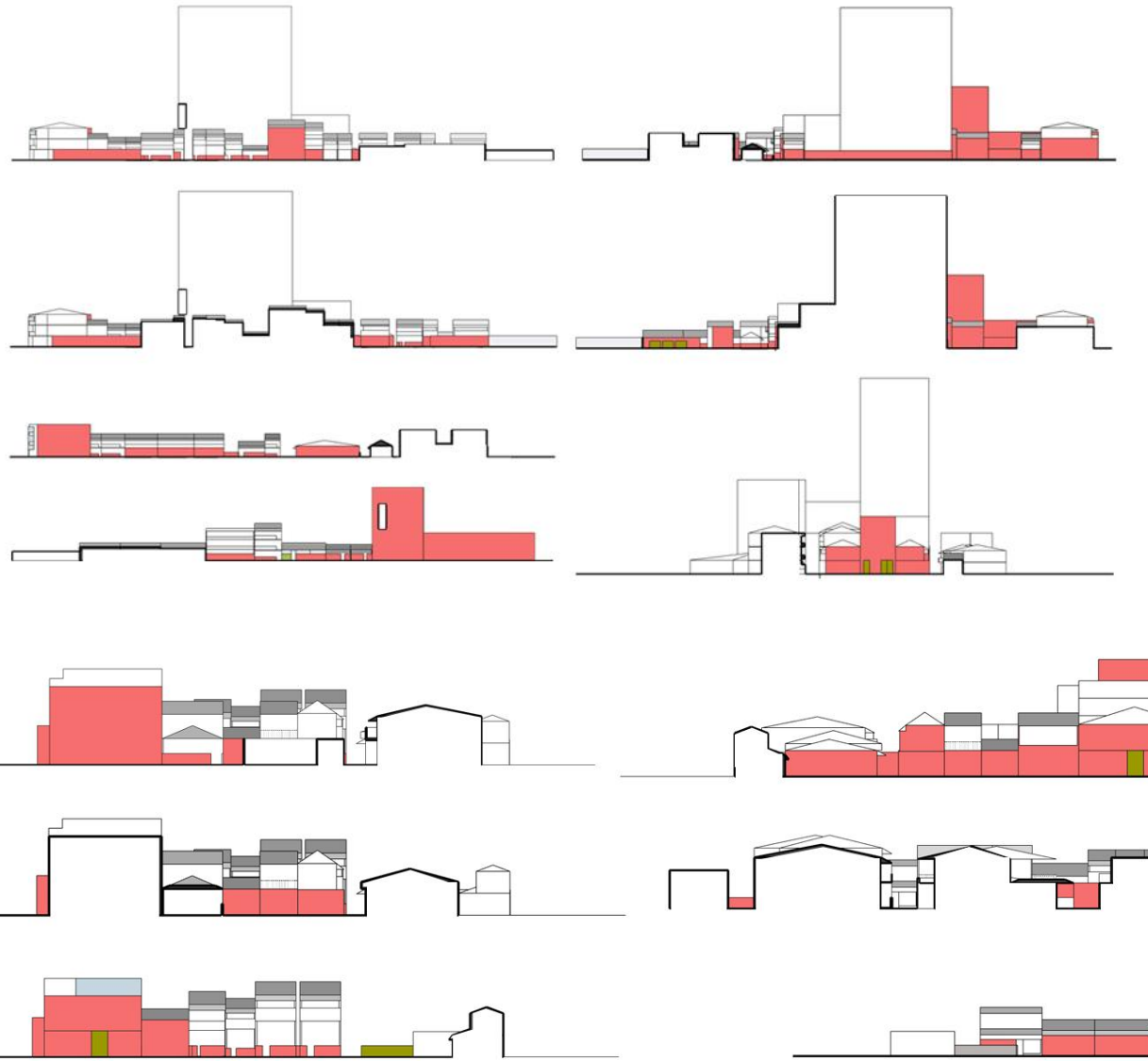
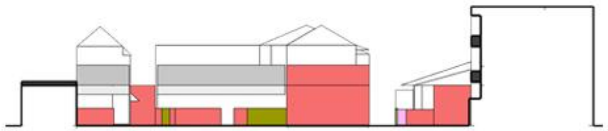
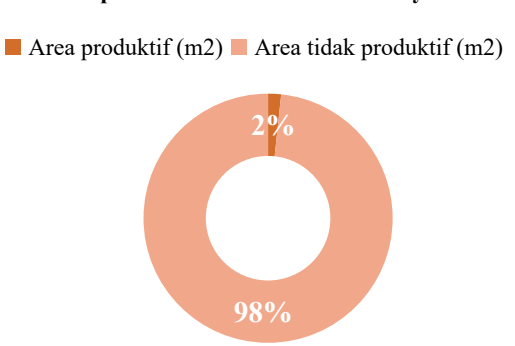
Classification of private garden typology

Productivity garden Alley by community (Wall)

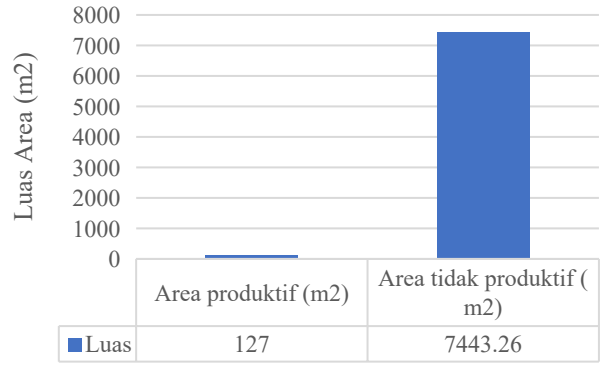




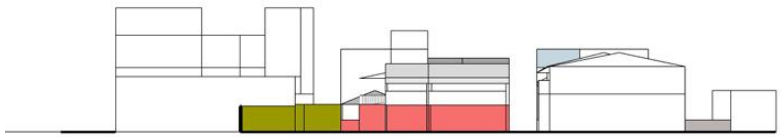
The percentage of productive and unproductive walls in the alley

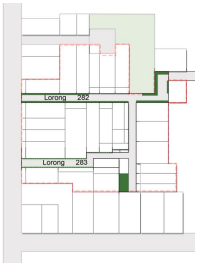


Area of productive and unproductive walls in the Alley

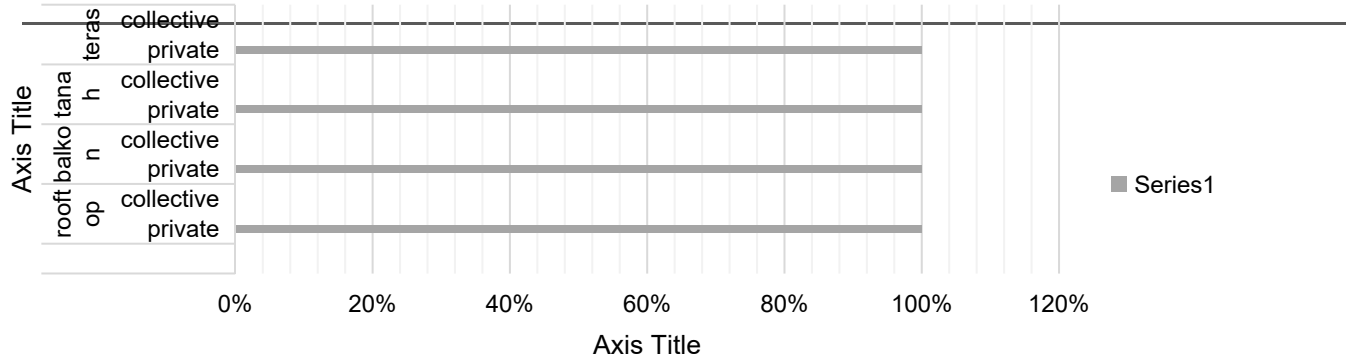


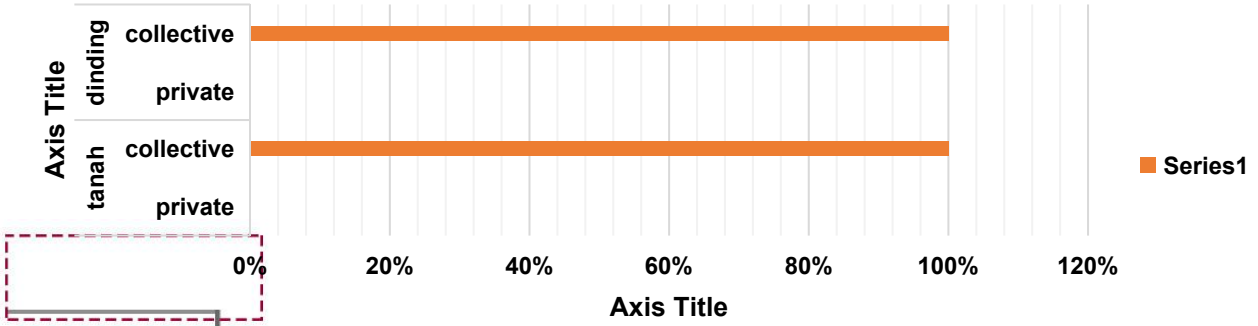
	Area produktif (m2)	Area tidak produktif (m2)
Luas	127	7443.26

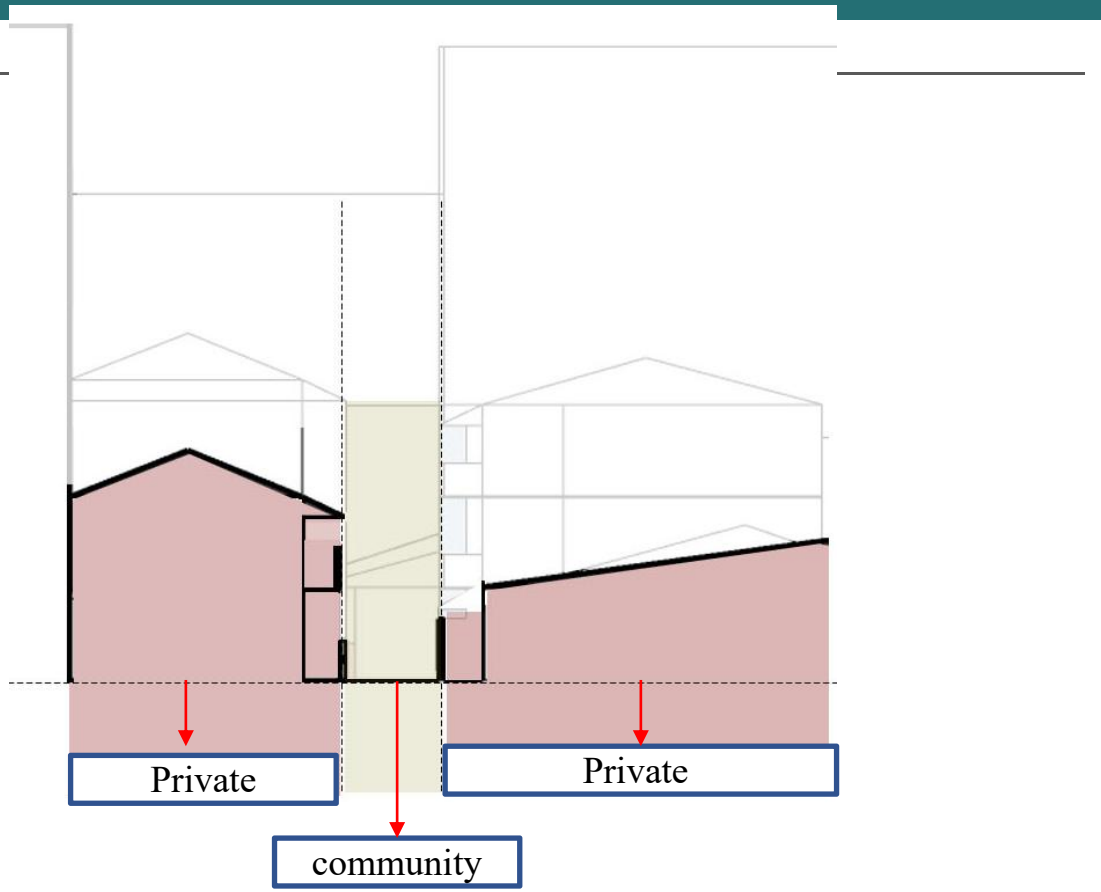


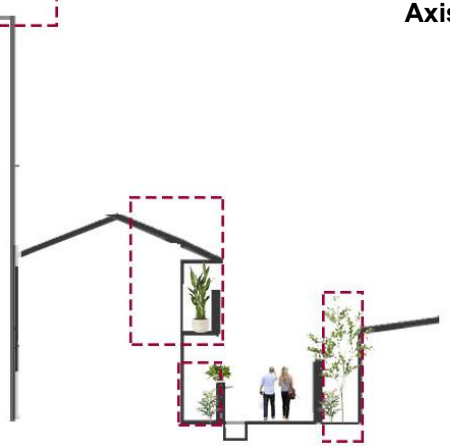


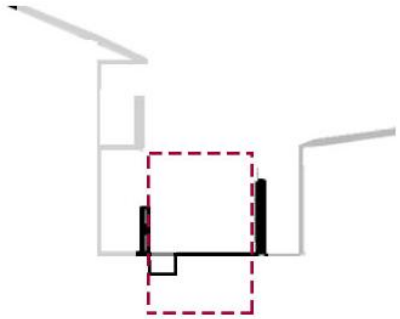
Classification of ownership types of Urban farming Typology

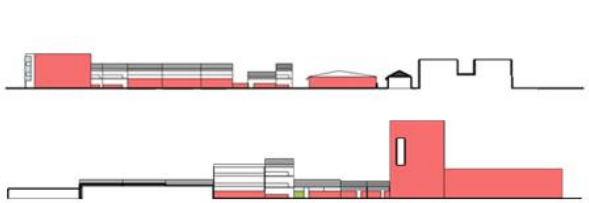


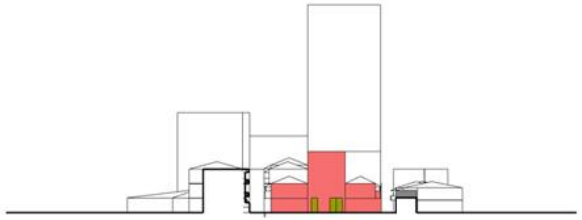






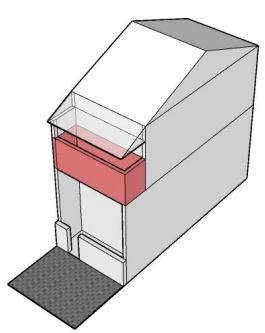






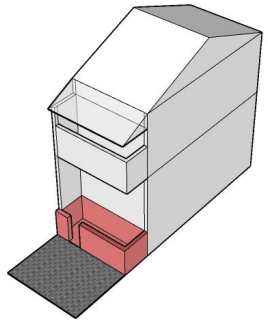
Size of Urban farming Typology

Size of private garden typology (private)



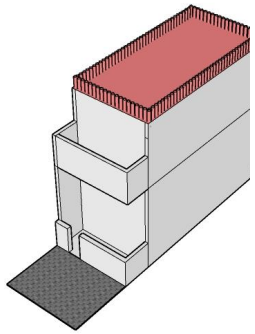
Balcony

Avrg: 6.85 m2
Max : 25.50 m2
Min : 4.31 m2



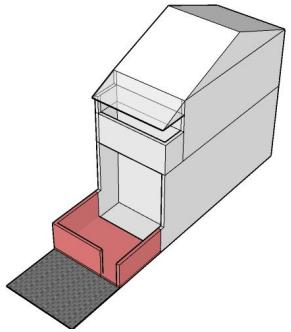
Terrace

Avrg : 3. 59 m2
Max : 12.86 m2
Min : 4.20 m2



rooftop

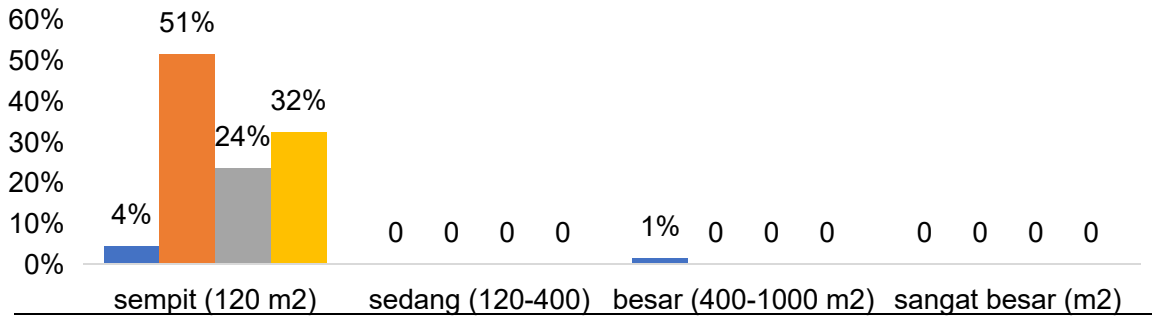
Avrg : 20.29 m2
Max : 872.26 m2
Min : 0 m2



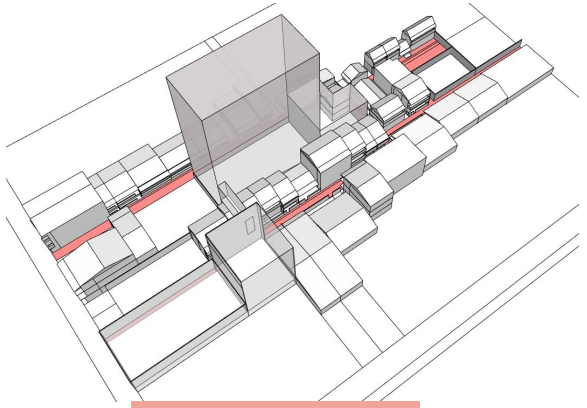
Terace 2

Avrg : 2.87 m2
Max : 31.94 m2
Min : 9 m2

The size of urban farming of the garden alley type is included in the "narrow" classification

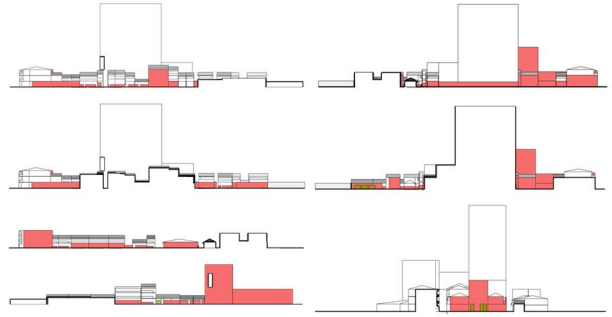


Community garden typology size



Street Alley

Avrg : 615.55 m2
Max : 848.04 m2
Min : 383.04 m2



Wall - Alley

Avrg : 3.721.63 m2
Max : 5.331.35 m2
Min : 2.111.91 m2

The size of garden alley type urban farming is included in the "very wide" classification

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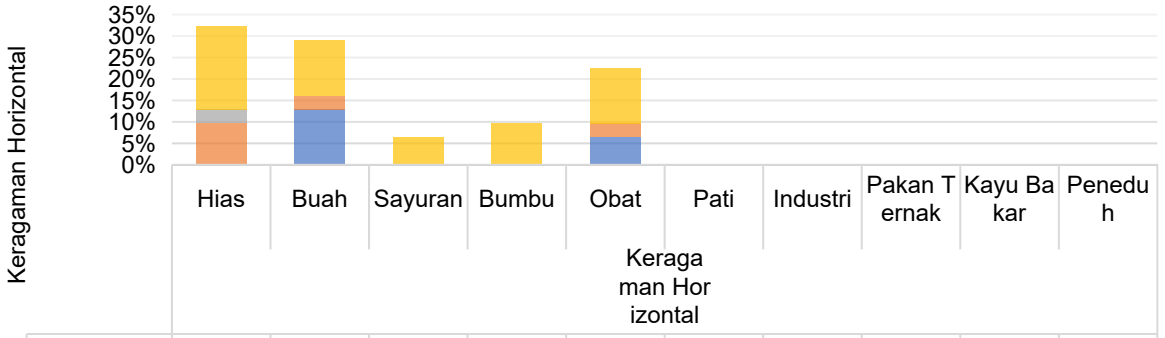
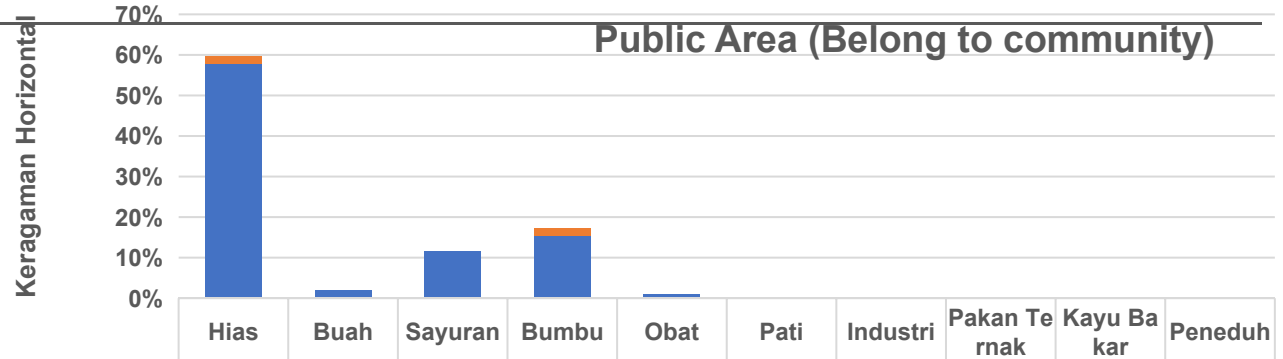
Plant Diversity in Alley

Private Garden

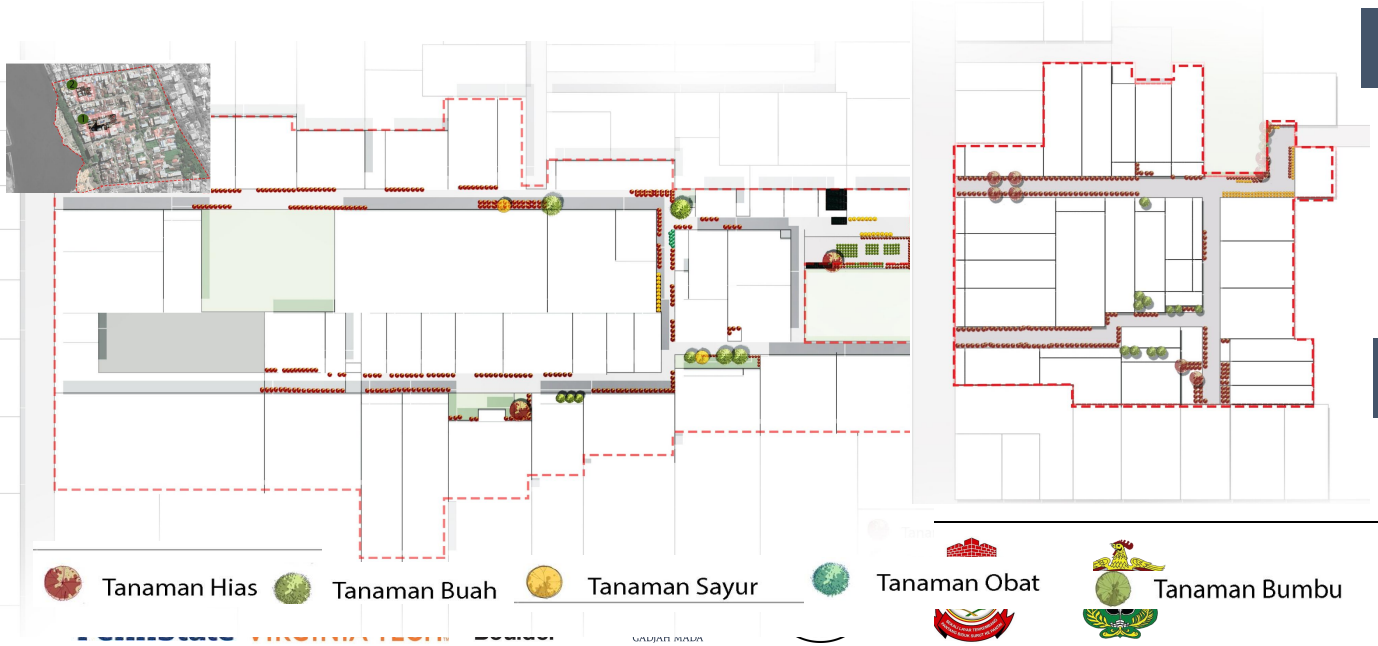


	Hias	Buah	Sayuran	Bumbu	Obat	Pati	Industri	Pakan Ternak	Kayu Bakar	Peneduh
KH tanah	19%	13%	6%	10%	13%	0%	0%	0%	0%	0%
KH teras	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%
KH balkon	10%	3%	0%	0%	3%	0%	0%	0%	0%	0%
KH rooftop	0%	13%	0%	0%	6%	0%	0%	0%	0%	0%

Public Area (Belong to community)



	Hias	Buah	Sayuran	Bumbu	Obat	Pati	Industri	Pakan Ternak	Kayu Bakar	Peneduh
dinding	2%	0%	0%	2%	0%	0%	0%	0%	0%	0%
tanah	58%	2%	12%	15%	1%	0%	0%	0%	0%	0%



Private Garden

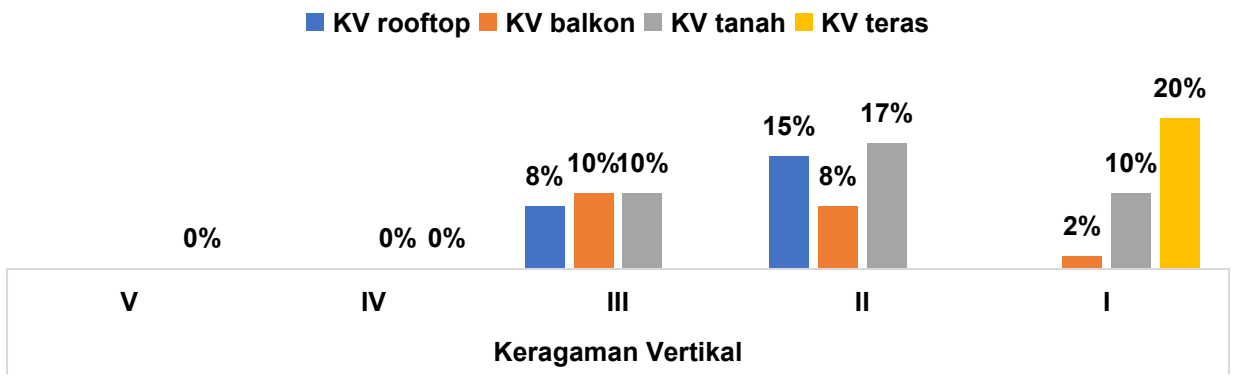
Decorative plant	Herb and spices	Vegetable	medicinal	Fruits
19% Tanah	13% Rooftop	6% Soil	13% Soil	13% Rooftop and Soil

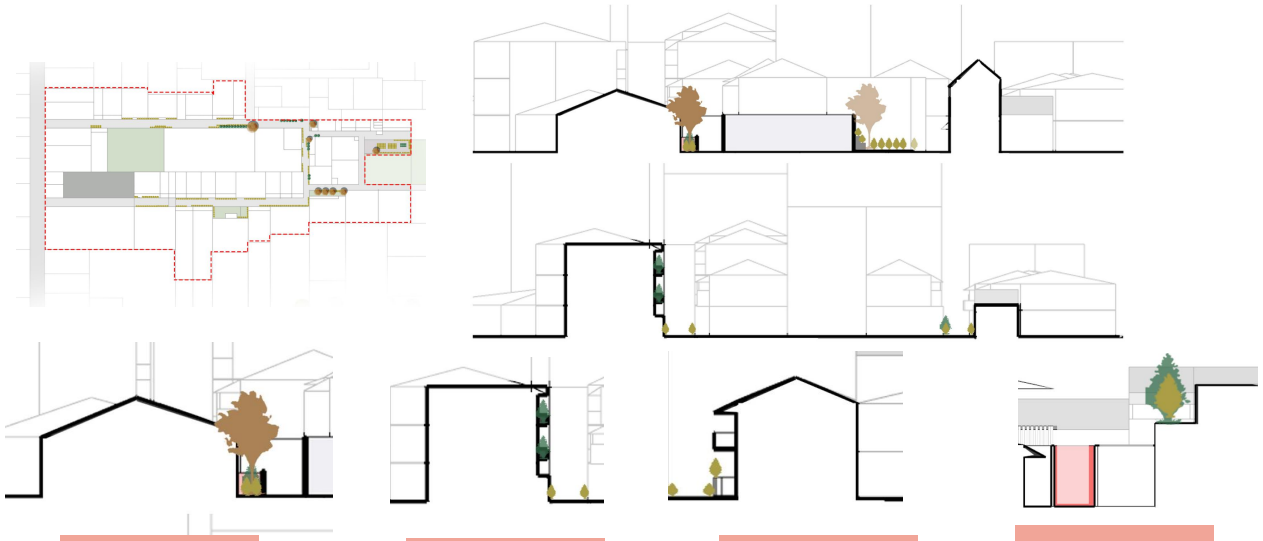
Public Area (belong to community)

Decorative plant	Herb and spices	Vegetable	medicinal	Fruits
58% Soil	15% Soil	12% Soil	1% Soil	2% Soil

Vertical Area Diversity

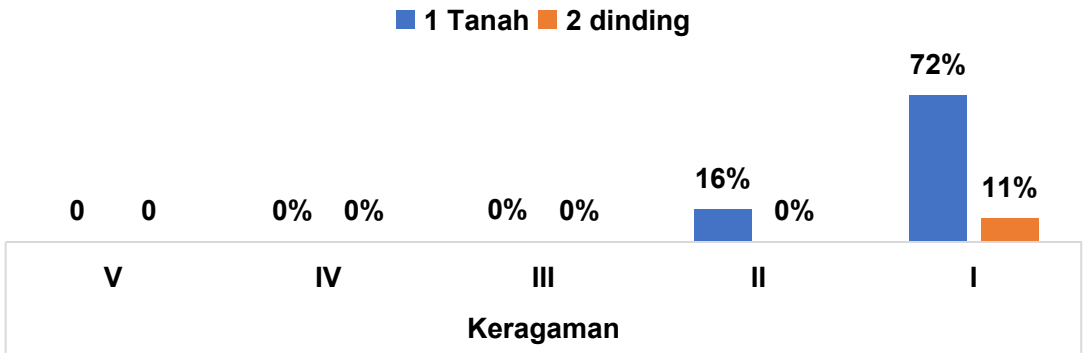
Private

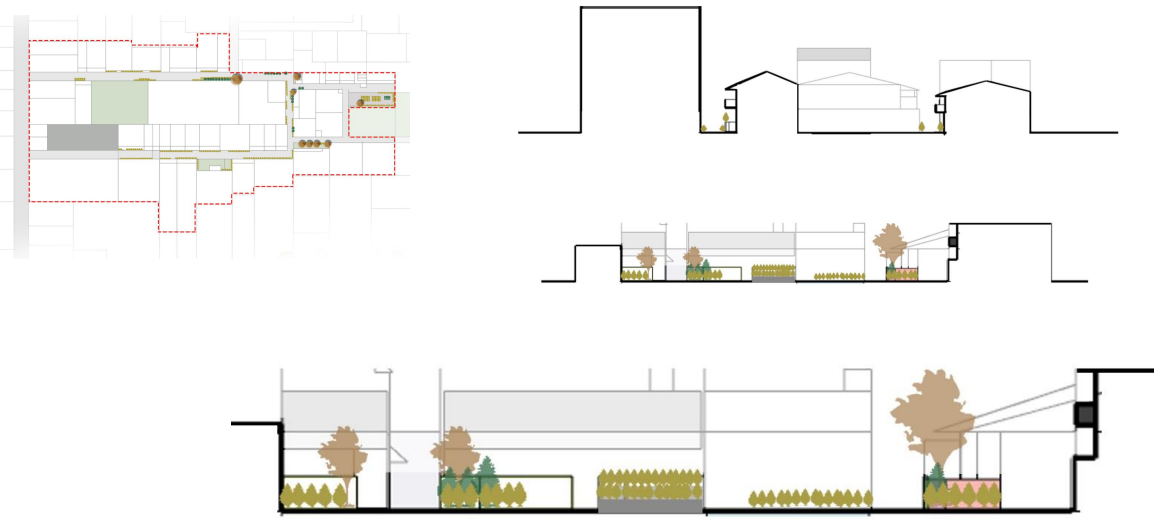




Soil	Balcony	Terrace	Rooftoop
19%	10%	20%	15%
Strata 2	Strata 3	Strata 1	Strata 2

Public (belong to community))



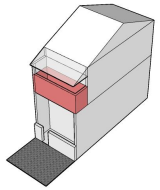


Soil	Wall
72%	11%
Strata 1	Strata 1

Urban farming Typology base on Function of the Ownership Type Space

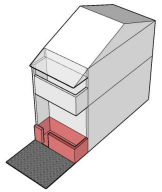
Private)

Housing



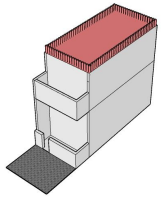
Balcony

Function:
Planting area with containers
Drying clothes
Sit around



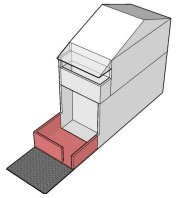
Terrace

Function:
Planting area with containers
Drying clothes
Sit around
Parking



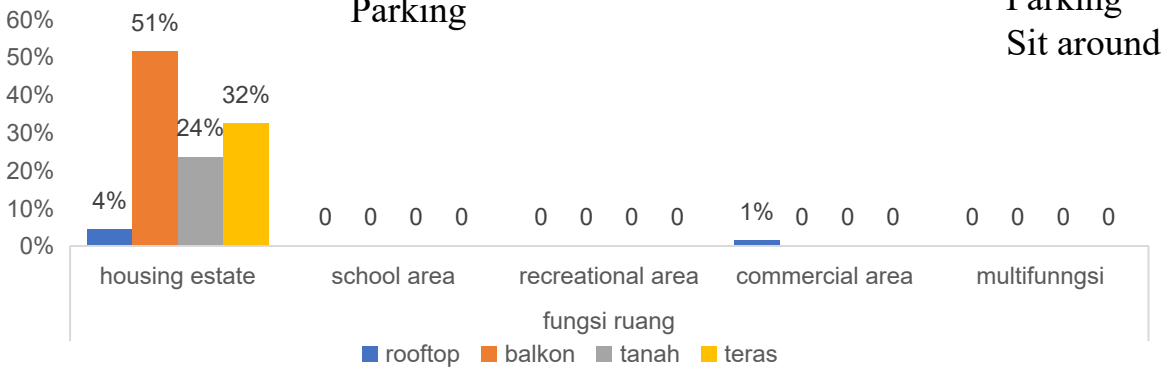
Rooftoop

Function:
Planting area with containers
Drying clothes



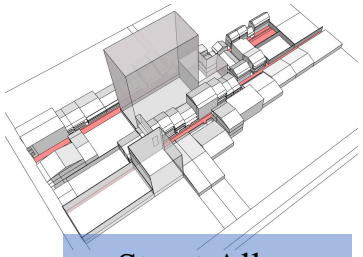
Tanah

Function:
Planting area in the ground and containers
Drying clothes
Parking
Sit around



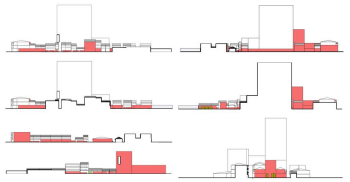
Public

Multifunction Building



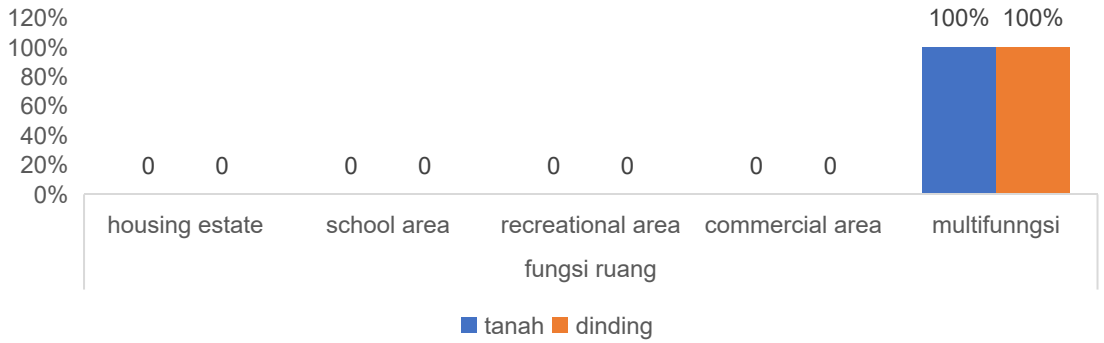
Street Alley

Function:
Public roads
Drying clothes
Sightseeing activities
Planting (urbanfarming)



Wall - Alley

Function:
Sightseeing activities
Planting (urbanfarming)



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Indicators/M&E

Key outcomes:
- Appropriate & scalable applications & feedback mechanisms based on deep human & social needs assessment
- Low-cost distributed sensor networks with heterogeneous data collected through 6 garden alleys across Makassar

Collaboration with Makassar City and research teams in ALL thrusts

Thrust I

Data Collection

Culturally- and Human-Centric, Scalable Applications

HCD

Residents

City

Needs

Feedback

Needs

Feedback

Data

Needs

Algorithms

Thrust II

Machine Learning Framework

Data-Driven Feedback, Optimization, and Decision Making

Key outcomes:
- Novel heterogeneous multi-task machine learning framework for quality of life and system assessment of garden alleys
- Data-driven garden alley system optimization, user feedback, & government intervention/incentive mechanisms

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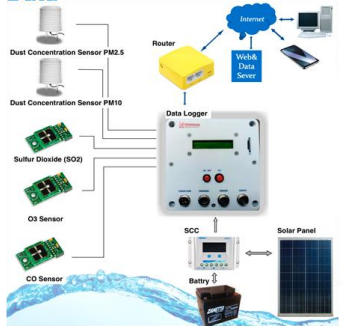
1. Data Collection for Air Quality Data and Social Data

Custom designed air quality monitoring system for ASEAN Cities

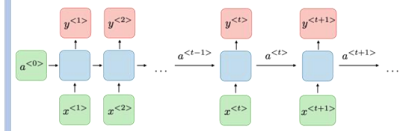


2. Design a Recommendation System for Urban Farming

Input
- Solar radiation
- Irrigation
- Fertilizer
- Precipitation
- Maintenance
- Air quality

Machine Learning Model

Recurrent Neural Network



Output

Growth of edible plant

Growth of inedible plant

USASCP U.S.-ASEAN Smart Cities Partnership

[YOUR LOGO]

Conclusion

1. The typology of urban farming, namely the typology of allotment garden (private) consists of the use of terraces, balconies, rooftops, and yards (land) and community gardens (hallways) of hallways directly on the ground and on the walls. The most extensive spatial typology of urbanfarming is the typology of community gardens (alleys) with an area of 84% and allotment gardens (private) around 16%.

2. The productivity of urban farming area utilization is inversely proportional to the area. The productivity of community gardens is 3.77% while the allotment garden is 4.38%.
3. The widest allotment garden typology is rooftop (65.26%) and the lowest is the terrace typology around 2.89%. However, the type of typology carried out on the ground (yard) directly has the highest productivity, which is around 77.10%, while the lowest productivity is the terrace typology with a utilization productivity of around 0.01%.

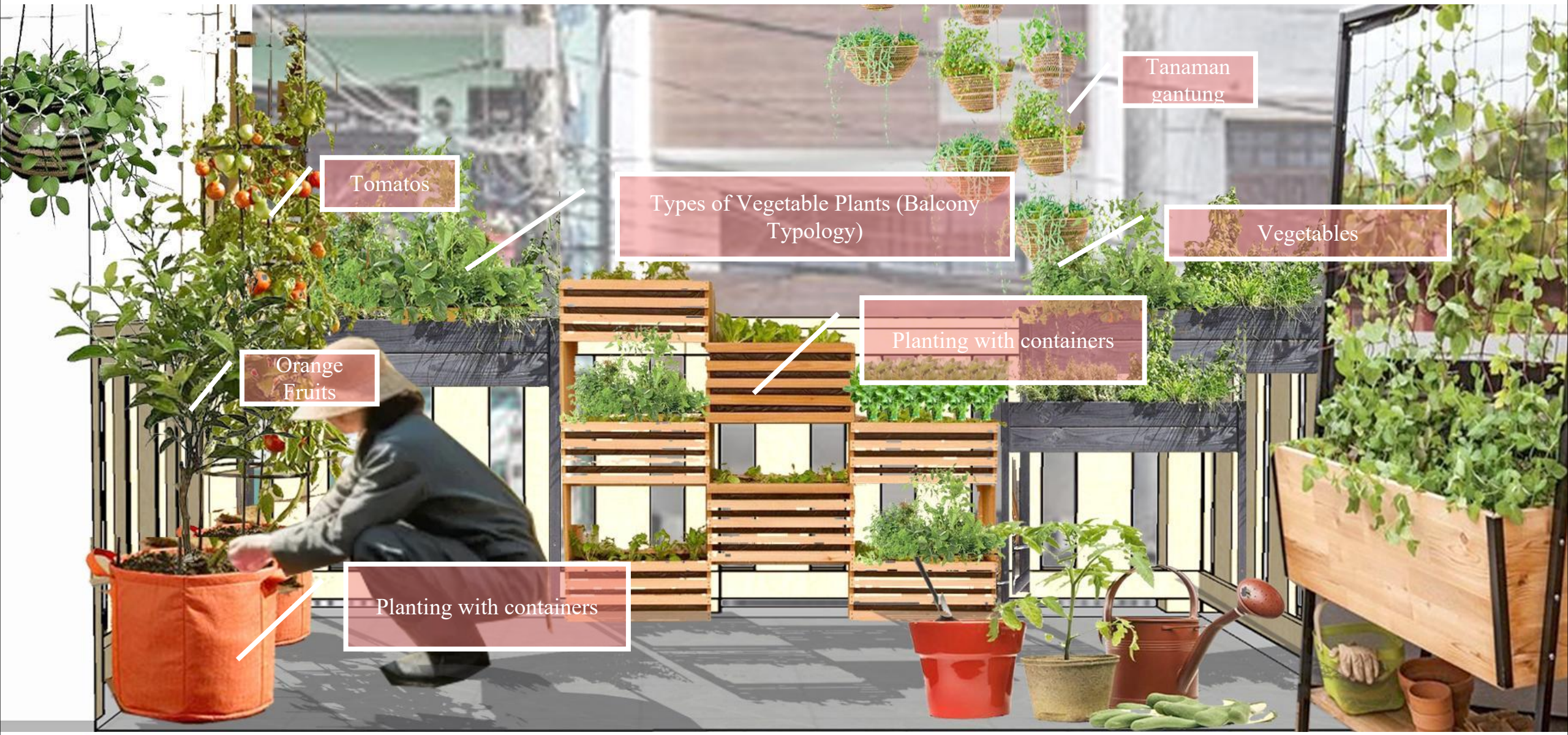
4. **The typology of urbanfarming community gardens (alleys), namely the type of typology of hallways on the wall, has the highest area of around 86% and hallways that are used directly on the ground are around 14%, but the productivity of using hallways directly on the ground is higher at around 13% while on the wall is only 2%.**

5. The most common type of food is the type of food in the fruit group around 73% or about 243.24 kg/year for the allotment garden typology, while for the community garden typology, the most is the vegetable food group with 12% or about 40.63 kg/year.

6. Food adequacy based on production results and consumption needs was obtained that for the typology of allotment gardens, the fruit and vegetable group experienced more pagan availability and other food groups lacked around -261.29 kg/capita/year. As for the typology of the community garden (alley), the rice food group experienced a shortage of about -49.20 kg/capita/year, vegetables lacked about -236.34 kg/capita/year, and the fruit category experienced an excess of about 5 kg/capita/year.

Recommendations for Urbanfarming in Garden Alley

Recommendations for Urbanfarming on the Balcony



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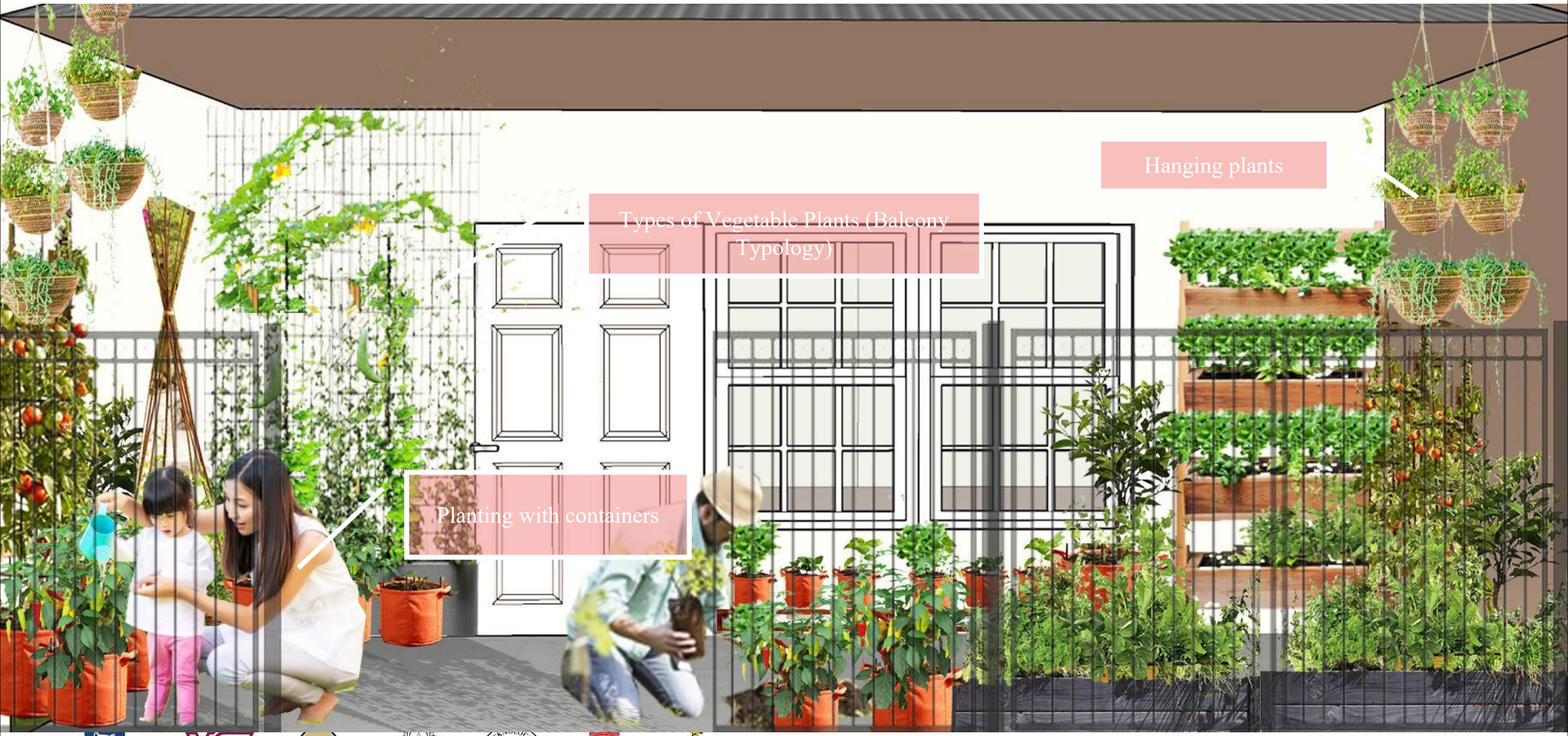
Recommendations for Urbanfarming in Teracce



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Recommendations for Urbanfarming in the Yard

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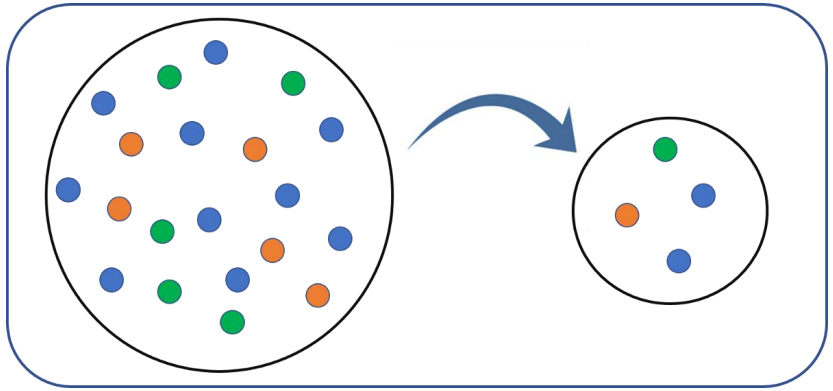
Scale-up: from 6 to 7000 Alleys



Perform statistic analysis to determine the minimum number of alleys to be sampled according to

- Function
- Location
- Orientation
- Other impact factors

Produce 5 more sensors to collect the data at sample alleys

THANK YOU