A GUIDE TO PRODUCTIVE ROOFTOP GARDENING

1 The Edible Roof book cover
Project Details

Author
Mathew Pryor

Title
Elevating Urban Agriculture

Output
Community enterprise-orientated landscape architecture research

Location
High density urban districts

Funding
Funded through GRF and HKU grants GRF, “Analytical study on the potential of urban roof farming in high density cities” (HK$595,188, Nov 2015) HKU TDG & KE Impact grants ‘Construction of demonstration project: HKU Rooftop Farm) (HK$185,000 + 100,000)

Area/Size
Relates to urban rooftop farming practices in high density cities

Dates
2013-2018
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1 City Farm, Quarry Bay (from the study’s survey of rooftop farms in Hong Kong)
Summary of the Work and its Significance, Originality, and Rigor

Numerous small-scale rooftop farms have spontaneously appeared over the last ten years on buildings in high-density urban districts worldwide. This wide-ranging study documented, tested and codified rooftop farms, and investigated the motivations of participants. Environmental and community limits in the design of rooftop farms were determined, together with their potential contribution to enhancing urban environmental and community well-being. Key conclusions of the study revealed both that extensive farmable roof space existed within dense (and aging) urban populations, and personal social values
motivated participants to initiate rooftop farms, indicating that government policy on urban agriculture policy should shift their focus on the generation of social capital rather than food production.

These findings indicate that urban agriculture could help address some mental health challenges that high density cities face. The conclusions, along with technical design information, were disseminated through an award-winning book and website. Through these outputs, practitioners inside and outside Hong Kong have developed communities of practice that allow them to coordinate their efforts and to advocate for the formalization of the practice with land and building processes.
The study was instrumental in encouraging Hong Kong Government to expand its 2016 New Agricultural Policy to include these new forms of urban agriculture, and actively promote them within development proposals. The study has attracted media attention from both local and international news organizations, and has been recognized with design awards both internationally and in Hong Kong. It has also helped to broaden thinking about the role of landscape architects in high density cities, and demonstrated the efficacy of community-enterprise projects and spaces generated through the activation of grassroots organizations.
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HKU Rooftop Farm Demonstration Project
(which I design and constructed to test the physical and operational factors of rooftop farms - now in its seventh year of operation)
1. 3D computer model of buildings in Hong Kong used in the estimation of potential farmable roof spaces within the study.
Originality

The study generated two unique outcomes that have developed the understanding of the role of urban agriculture in high density cities. Statistical analysis of the responses to participant opinion surveys and cost benefit analysis indicated that the perceived benefits to participants centre on issues of personal socialization. This challenges previous study conclusions that the benefits of urban agriculture relate primarily to urban food security and contributions to green urban environment.

The research also engages directly with issues of social cohesion, aging and mental health in high rise cities. Through
spatial analysis and building evaluations I have estimated that some 595ha of underused roof space exists within dense urban districts in Hong Kong could readily be activated for social enterprise-oriented farming—some 50% more than currently farmed land at the urban periphery.

The conclusions drawn from this study suggest that within strategic land-use planning, re-conceptualising the products of rooftop farming as being primarily social rather than food security or greening, and with policy and technical support of rooftop farming communities, could help address some of the acute mental health challenges that high density cities face around the world.
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mental health challenges that high
density cities face around the world.

1 The new URF Network Website created within
the study to bring the existing community of
rooftop farms together for mutual support and advocacy.
Research Questions

• What are the limits on the physical form and mode of operation of rooftop farming in Hong Kong (as a high density city)
• What are the motivations of the participating farmers
• What are the spatial and participatory potentials of the practice in Hong Kong
• What contribution could rooftop farming make to food supply, environment, and community well-being in the city.
Research Questions

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• What are the motivations of the participating farmers?

• What are the spatial and participatory potentials of the practice in Hong Kong?

• What contribution could rooftop farming make to food supply, environment, and community well-being in the city?

1 Mapping rooftop farms in Hong Kong in 2017 (Wang & Pryor)
Rigor

The small size and somewhat reclusive nature of the existing rooftop farming community has historically limited the opportunity for quantitative research methods. As a result, I deployed multiple methods to understand this previously unrecorded practice and to generate and verify data. Key research methods included:

• The construction and management of a 400sqm demonstration rooftop farm at HKU to test the environmental, building management and operational limits of farming on rooftops
• Systematic mapping site measurement and photographic and video documentation of all Hong Kong farms;
• Questionnaire surveys to determine the profile of farmers and the extent and reasons for their participation; and
• Semi-structured interviews with farm owners to determine historic patterns of use and operational constraints.

Cross referencing the data generated allowed a clear understanding of farming practice and participants to be established. The study used cost benefit analysis to determine the nature and degree of motivation, and land use/building, environmental and spatial analysis to determine the potential extent of farmable rooftop space across Hong Kong. Focus group interviews with long established farmers were also used to verify and test the results.
Significance

Beyond generating technical data to support the construction and operational of farms on top of buildings the study was successful in bringing the existing disparate, self-generated farms together within a collaborative URF Network to support each other and advocate for more support and recognition.

The study was also instrumental in transforming the HKSAR Government’s policy on the practice. Roof-top farming was excluded from green building regulations due to its ill-defined nature and ambiguous legal status. The government now recognizes the practice’s capacity to generate social capital, and a discourse on agro-urbanism in high-rise cities has emerged
in the city. Roof-top farming was incorporated into the government’s expanded Urban Agricultural Policy (2016) and is being formalized within government building controls.

The project has received international and regional awards from both the Landscape Institute (U.K.) and the Hong Kong Institute of Landscape Architects (HKILA). Within Hong Kong the study has broadened thinking about the role of landscape practitioners in high density cities, and demonstrated the efficacy and relevance of generating community-orientated projects and spaces through activation of grassroots organizations rather than the traditional top-down interventions.
Dissemination and Evidence of Peer Review

Research findings on the project’s findings, including the social motivations of participants and farmable roof space, were published in peer reviewed conference papers and formed the basis of the Productive Cities Working Group at recent APRU Sustainable Cities and Landscape Conferences (2017-2018). Findings have been presented at several international academic conferences.

The Edible Roof book, based on the demonstration project, contains technical data and possible operational structures for rooftop farming. More complete survey data has been made available to existing farms via the URF.
website to allow them to collaborate in developing a community of practice, holding events and advocating collectively for greater recognition.

The HKU demonstration project, now in its sixth year, has generated numerous community events, school outreach

1 Typological study of rooftop farms in Hong Kong
1 Results of the analysis of survey questionnaire responses indicating that the benefits of rooftop farming to participants were predominantly personal-social (Wang & Pryor)

2 08.2 Results of the analysis of survey questionnaire responses indicating that the benefits of rooftop farming to participants were predominantly personal-social (Wang & Pryor)
programs and media interest. It has also inspired the development of other rooftop farms within the district. Aspects of the study have been featured by a number of local and international news media outlets including articles and reports featured on CNN, BBC and German TV.

The study has been recognized through both international and regional competitive landscape design awards, the jury in the latter highlighting the contribution of the study to expanding the scope of landscape architectural practice, and creating new opportunities for greening in the city.
Appendix

Academic publications:


Other publications:


1 Late afternoon in the HKU Rooftop Farm

2 Image of the HKU Rooftop Farm community

3 City Farm Quarry Bay
Conference presentations


Pryor, M. “Urban Rooftop Farming in Hong Kong”. In URF Network Seminar. HKU, 2016.

Pryor, M. “Urban Rooftop Farming” In Seminar on Urban Agriculture in Hong Kong and Belgium, HKU and Liege U., 2016.


Pryor, M. “Urban Rooftop Farming in Hong Kong”. In URF Network Seminar. HKU, 2016.

Pryor, M. “Urban Rooftop Farming” In Seminar on Urban Agriculture in Hong Kong and Belgium, HKU and Liege U., 2016.


City Farm Tsuen Wan
1 City Farm Tsuen Wan
Awards


1 Afternoon in the rooftop farm at HKU

1 Rooftop farm at Quarry Bay
Demonstration
Rooftop Farming Project

HKU Rooftop Farm, Run Run Shaw Building HKU and Rooftop Farming Community, https://www.facebook.com/groups/203082323180442/ https://rooftopfarmhku.wordpress.com/

Media Coverage

Elements of the study have been featured in the following media outlets:

• Apple Daily Book Review (3 Jan 2016)
• Mask9 China Book Review (23 Jan 2016)
• The Standard News Book Corner (29 Jan 2016)
• The Rail Monthly (2016-1/2)
• HKET newspaper (3 Mar 2016)
• HK01-weekly (11 Mar 2016)
• HKU Bulletin Review (May 2016)
• CNN - Going Green (July 2016)
• BBC website - An inside view of Hong Kong’s hidden rooftop farms (17 May 2017)
• GALILEO science magazine Pro7 broadcasting station, German TV (2019)
Bibliography


1 Rooftop farm at Ebenezer School for the Blind
Australian International Schools Edible Roof Club
GOING GREEN

Monthly Community Day (July 2010)
Rooftop farming in Hong Kong

Fai Hui is an urban organic farmer in Hong Kong, who says there's more to rooftop farming than growing fresh food. Source: CNN

1. HKU Rooftop Farm featured by CNN Going Green
2. HKU Rooftop Farm
3. Image from the HKU Rooftop Farm community website
## COMPREHENSIVE GROWING CHART

### 作物

<table>
<thead>
<tr>
<th>Category</th>
<th>白菜 Cabbage</th>
<th>菠菜 Spinach</th>
<th>大黄 Mustard</th>
<th>芹菜 Celery</th>
<th>卷心菜 Cabbage</th>
<th>西兰花 Broccoli</th>
<th>萝卜 Radish</th>
<th>草莓 Strawberry</th>
<th>藜麦 Quinoa</th>
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<td>3月 Mar</td>
<td>4月 Apr</td>
<td>5月 May</td>
<td>6月 Jun</td>
<td>7月 Jul</td>
<td>8月 Aug</td>
<td>9月 Sep</td>
<td>10月 Oct</td>
<td>11月 Nov</td>
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<th>根类 Roots</th>
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<th>红薯 Sweet Potato</th>
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<td>4月 Apr</td>
<td>5月 May</td>
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<tr>
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## 其他

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<tr>
<th>土壤 Soils</th>
<th>有机质 Organic Matter</th>
<th>酸碱度 pH</th>
<th>水分 Moisture</th>
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Inside jack cover of The Edible Roof
The Department of Architecture educates students in an active culture of service, scholarship and invention. Uniquely situated at the crossroads of China and global influence, the Department takes the approach that design is best explored from a sophisticated understanding of both. With a multidisciplinary curriculum emphasizing technology, history and culture, students gain broad knowledge and skills in the management of the environmental, social, and aesthetic challenges of contemporary architectural practice. With opportunities for design workshops, international exchanges, and study travel, graduates of the Department of Architecture are well prepared for contribution to both international and local communities of architects and designers.