Joint Training School on Urban Food Production

COST actions TU1201 and TD1106

21-24 October 2014

Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia

COST Actions Urban Allotment Gardens TU1201 and Urban Agriculture Europe TD1106

Documentation of Joint Training School on Urban Food Production

Ljubljana, 21-24 October 2014

Partners of Joint Training School on Urban Food Production:

COST Action TU 1201 chaired by **Runrid Fox-Kaemper,** Dipl.-Ing. Architect, Head of Research Group „Built Environment", **ILS Research Institute for Regional and Urban Development gGmbH,** Office Aachen, Germany – Grant holder of the JTS.

COST Action TD 1106 Urban Agriculture Europe, chaired by Prof. Dr.-Ing. **Frank Lohrberg**, RWTH Aachen University, Aachen, Germany

Urban Planning Institute of the Republic of Slovenia represented by **Ina Šuklje Erjavec**, M.Sc of landscape architecture as Local organizer of the Joint Traning School.

Report prepared by

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Report on Joint Training School on Urban Food Production

Ljubljana Joint Training School on Urban Food Production was organized by Urban Planning Institute of the Republic of Slovenia together with the COST Actions TU1201 (Urban Allotment Gardens) and TD1106 (Urban Agriculture Europe). It was arranged for Students (at master or PhD level) and early stage researchers (who are in the early phase of their career with at least PhD degree and not more than 8 year work experience after graduation). The joint training school has linked knowledge, work and experience gathered from two COST Actions considering urban food production.

All participants actively participated in 9 workshops on different research areas (planning and policy, sociology, ecology, urban design): Walk Through Urban Gardens, Understanding Ecological Food Growing, Understanding the Site, Environmental Aspects of Urban Food Production, Social Aspects of Urban Food Production, Economic Aspects of Urban Food Production, Comprehensive Development of Urban Food Production, Designing Urban Food Production?, Designing Planning Processes for Urban Food Production, Different Levels of Governance Regimes and Policies.

Index of Report

Tutors and participants of Joint Training School on Urban Food Production

a. Tutors and speakers

1. **Mag. Ina Šuklje Erjavec**
   Landscape architect, Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia; *as tutor, speaker and organizer of JTS in Ljubljana*
   Workshop 7: DESIGNING URBAN FOOD PRODUCTION?

2. **Dr. Andrew Adam-Bradford**
   Geographer, Horn of Africa Unit - Human Relief Foundation, United Kingdom; *as tutor and speaker - Workshop 9: DIFFERENT LEVELS OF GOVERNANCE REGIMES AND POLICIES*

3. **Dr. Luke Beesly**
   The Hutton Institute, United Kingdom; *as tutor and speaker - Workshop 3: ENVIRONMENTAL ASPECTS OF URBAN FOOD PRODUCTION (soil survey and evaluation)*

4. **Dr. Paulo Brito da Luz**
   National Institute of Agrarian and Veterinary Research, Lisbon, Portugal; *as tutor and speaker* - *Workshop 3: ENVIRONMENTAL ASPECTS OF URBAN FOOD PRODUCTION (irrigation, agro-environmental indicators)*

5. **Nataša Bučar Draksler**
   Landscape architect, private allotment gardens organizer, NGO/associations supporting urban gardening in Slovenia MULE http://www.srce-me-povezuje.si/drustvo-mule and PRIDELAJ.SI http://pridelaj.si/, Slovenia; *as tutor and speaker - Workshop 2: UNDERSTANDING ECOLOGICAL FOOD GROWING*

6. **Dr. Majda Černič Istenič**
   Professor of rural sociology at Biotechnical faculty, University of Ljubljana, Slovenia*; as speaker - Workshop 4: SOCIAL ASPECTS OF URBAN FOOD PRODUCTION*

7. **Andrej Erjavec**
   Institute of quality of life, Ljubljana, Slovenia; *as tutor and speaker -*
   Workshop 7: DESIGNING URBAN FOOD PRODUCTION?

8. **Dr. Darja Fišer**
   Organizer of the national crops2swap movement and gardening festival Chelsea Fringe Ljubljana, Slovenia; *as tutor and speaker - Workshop 1: WALK THROUGH URBAN GARDENS*

9. **Dr. Matjaž Glavan**
   Assistant Professor for GIS systems in agriculture at the Biotechnical Faculty, University of Ljubljana, Slovenia***;*** *as speaker - Workshop 5: ECONOMIC ASPECTS OF URBAN FOOD PRODUCTION*

10. **Dr. Maria Partalidou**
    Lecturer in Rural Sociology, Aristotle University of Thessaloniki, School of Agriculture, Department of Agricultural Economics, Thessaloniki, Greece; *as tutor and speaker - Workshop 4: SOCIAL ASPECTS OF URBAN FOOD PRODUCTION*

11. **Dr. Marina Pintar**
    Professor of agricultural land use planning at the Biotechnical Faculty, University of Ljubljana, Slovenia***;*** *as speaker - Workshop 5: ECONOMIC ASPECTS OF URBAN FOOD PRODUCTION*

12. **Mag. Maja Simoneti**
    Landscape architect, urban planning policies, Institute for Spatial Policies/Ljubljana Urban Planning Institute, Ljubljana, Slovenia; *as tutor and speaker - Workshop 1: WALK THROUGH URBAN GARDENS*

13. **Martin Sondermann**
    Geographer, Leibniz University Hannover, Institute of Environmental Planning, Germany; *as tutor and speaker - Workshop 8: DESIGNING PLANNING PROCESSES FOR URBAN FOOD PRODUCTION*

Dr. Rozalija Cvejić
Research Assistant in environmental planning, Department of agronomy, Biotechnical faculty, University of Ljubljana, Slovenia; *as participant and tutor* - Workshop 6: COMPREHENSIVE DEVELOPMENT OF URBAN FOOD PRODUCTION

Mojca Nastran
Research Assistant at the Forestry Department of the Biotechnical Faculty, University of Ljubljana, Slovenia; *as participant and tutor - Workshop 6: COMPREHENSIVE DEVELOPMENT OF URBAN FOOD PRODUCTION*

b. Participants

1. **Ivana Blagojević**, Serbia
   Faculty of Agriculture, Department for Fruit sciences, Viticulture, Horticulture and Landscape Architecture, University in Novi Sad

2. **Rozalija Cvejić**, Slovenia
   Department of agronomy, Biotechnical faculty, University of Ljubljana; *also as tutor*

3. **Lea Egloff**, Switzerland /Germany
   Zurich University of Applied Sciences in Wädenswil

4. **Sonja Fahr**, Germany
   RWTH Aachen University

5. **Vasiliki Giatsidou**, Greece
   School of Agriculture, Aristotle University of Thessaloniki

6. **Carsten Alexander Heinrich**, Germany
   Department of History of Architecture and Conservation at RWTH Aachen University

7. **Amparo Herrera-Dueñas**, Spain
   Vertebrate Biology and Conservation, Complutense University of Madrid

8. **Zoe Heuschkel**, Germany
   University of Applied Science in Osnabrück

9. **Snežana Jovičić**, Serbia
   Faculty of Sciences, Department of Biology and Ecology, University of Novi Sad

10. **Sarah Liebing**, Germany
    Research Institute for Regional and Urban Development in Aachen; ILS in UAG

11. **Petra Matijevič**, UK/Slovenia
    Department of Anthropology and Sociology SOAS, University of London

12. **Zorica Međo**, Serbia/Germany
    Technical University of Berlin

13. **Mojca Nastran,** Slovenia
    Forestry Department of the Biotechnical Faculty, University of Ljubljana; *also as tutor*

14. **Andreea Oarga**, Romania
    Slovene Human Resources Development and Scholarship Fund

15. **Valentina Palermo**, Italy
    Department of Civil Engineering & Architecture, University of Catania

16. **Kristina Piškur**, Slovenia
    Faculty of Social Sciences, University of Ljubljana

17. **Xavier Recasens**, Spain
    Universitat Politècnica de Catalunya, Barcelona; Agronomist in Badalona City Council

18. **Veronika Reven**, Slovenia
    Municipality of Ljubljana, Urban Planning Department, Office for development and renovation of public spaces, Ljubljana

19. **Zala Schmautz**, Switzerland/Slovenia
    Sanitary Engineering, Faculty of Health Sciences, University of Ljubljana

20. **Sean Shanagher**, Ireland
    Ballyfermot College of Further Education

21. **Mari Shioya**, Slovakia
    Institute of Forestry Ecology, Slovak Academy of Sciences & Institute of Management, Slovak University of Technology

22. **Giorgia Silvestri**, Italy
    Science in Environmental Science at Pisa University

23. **Jenny Sjöblom**, Sweden
    Swedish University of Agricultural Sciences, Alnarp

24. **Lucie Sovová**, Czech Republic
    Faculty of Social Studies – Environmental Studies, Masaryk University in Brno

25. **Andrew Speak**,UK/Poland
    Adam Mickiewicz University, Poznan; University of Manchester

26. **Rebecca St. Clair**, UK
    University of Salford

27. **Basak Tanulku**, Turkey
    Camlica Cad. Muhurdar Cikmazi Beylerbeyi Istanbul

28. **Dimitra Theochari**, Greece/Germany
    National Technical University of Athens

29. **Attila Tóth**, Slovakia
    Department of Garden and Landscape Architecture, FHLE, SUA Nitra

30. **Pedro António de Matos Parente Vasconcelos**, Portugal
    City Hall of Vila Pouca de Aguiar, Portugal

31. **Zala Velkavrh**, Slovenia,
    ProstoRož

32. **Krista Maria Willman**, Finland
    School of Management, University of Tampere, Finland

33. **Žana Mehić**, Slovenia/Germany

34. **Nils Kreynhop**, Germany

c. Additional – invited participants

1. Jana Kozamernik, Landscape architect, external coworker at UIRS, Ljubljana, Slovenia
2. Jurij Kobe, department for Environmental Protection, Municipality of Ljubljana, Slovenia
3. Katja Rakovec, Zavod BOB, Slovenia; *as stakeholder*
4. Anja Manja Segulin, Zavod BOB, Ljubljana, Slovenia; *as stakeholder*
5. Nežka Agnes Vodeb, Zavod BOB, Ljubljana, Slovenia; *as stakeholder*
6. Janja Merkač, Zavod BOB, Ljubljana, Slovenia; *as stakeholder*
7. Jan Hočevar, Zavod BOB, Ljubljana, Slovenia; *as stakeholder*
8. Borut Melik, Zavod BOB, Ljubljana, Slovenia; *as stakeholder*

Joint Training School on Urban Food Production

COST actions TU1201 and TD1106

21-24 October 2014, Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia

Program

October 21th, Tuesday

Morning session		
09:00 – 09:15	**Registration and coffee** *Library lecture room of UIRS (ground floor – entrance from the passage)*	
09:15 – 10:15	• **Introduction** • **Short presentation of the Municipality of Ljubljana** • **Introduction to WORKSHOP 1** with an overview of different urban garden types and initiatives in Ljubljana (Mag. Maja Simoneti and Dr. Darja Fišer)	
10:15 – 12:30	**WORKSHOP 1** **WALK THROUGH URBAN GARDENS** Site visit workshop with comprehensive on-site assessment and discussion of 3 different types of Urban food production in the vicinity of UIRS: traditional Gardens of Krakovo, an urban farm of Andrej Peršin and guerrilla gardens near Gradaščica.	**Tutors:** **Mag. Maja Simoneti**, landscape architect, urban planning policies, IPoP/LUZ, Ljubljana, Slovenia **Dr. Darja Fišer**, organizer of the national crops2swap movement and gardening festival Chelsea Fringe Ljubljana, Slovenia
12:30 – 13:30	***Lunch break*** *restaurant Spirit of Ljubljana, Grudnovo nabrežje (pre-paid by participants)*	
Afternoon session		
13:30 – 16:30	**Site visit by bus to Savlje area** **URBAN FOOD PRODUCTION IN LJUBLJANA** *Bus starts after lunch from Grudnovo nabrežje.*	
16:30 – 18:30 (19:00)	**WORKSHOP 2** *seminar room UIRS (2nd floor)* **UNDERSTANDING ECOLOGICAL FOOD GROWING** Group work on 5 scenarios of ecological gardening according to the “Garden Cards” Methodology.	**Tutor:** **Nataša Bučar Draksler**, landscape architect, private allotment gardens organizer, NGO/associations supporting urban gardening in Slovenia: MULE http://www.srce-me-povezuje.si/drustvo-mule and PRIDELAJ.SI http://pridelaj.si/

October 22th, Wednesday

	Morning session	
09:00 – 10:30	**Introductory presentations of the workshops and field work** *Library lecture room of UIRS (ground floor – entrance from passage)* • Dr. Rozalija Cvejić and Mojca Nastran: Livada case study area • Dr. Paulo Brito da Luz • Dr. Luke Beesley • Dr. Maria Partalidou • Stakeholders – for new Community gardens; Zavod BOB (NGO specializing in project learning of young adults) http://www.zavod-bob.si/aboutus.php	*coffee available in between presentations*
10:30 – 12:30	**JOINT WORKSHOP** *Transfer by taxi vans to Livada area* **UNDERSTANDNG THE SITE – Livada case area** **Field work with tutors of days 2 and 3** Site analyses will be performed in 5 groups, taking into account aspects, such as location, soil, water and users. Discussion with stakeholders "Zavod BOB". *In case of bad weather we will go to Gostilna Livada earlier to continue with work there.*	
12:30 – 13:30	***Lunch break*** *Gostilna Livada (pre-paid by participants)*	
	Afternoon session	
13:30 – 16:00	**WORKSHOP 3** **ENVIRONMENTAL ASPECTS OF URBAN FOOD PRODUCTION** *Gostilna Livada seminar room* Workshop on optimizing the water situation, making use of local soils and waste resources and adding value to urban food plots (carbon storage, waste water treatments etc.). Planning for inclusion of soils, waters and waste conservation into new urban food-producing plots.	**Tutors:** **Dr. Paulo Brito da Luz**, National Institute of Agrarian and Veterinary Research, Lisbon, Portugal *Irrigation (design and management), Agro-environmental Indicators* **Dr. Luke Beesly**, The Hutton Institute, United Kingdom *Soil survey and evaluation*
16:00 – 18:30 (19:00)	**WORKSHOP 4** **SOCIAL ASPECTS OF URBAN FOOD PRODUCTION** *Gostilna Livada seminar room* Workshop on defining needs, values and motivations for urban food production. *additional participants: zavod BOB* *Presentation* Dr. Majda Čerič Istenič: **SOCIAL VIEWS ON FOOD PRODUCTION AND URBAN GARDENER PROFILE** (results from FOODMETERS project)	**Tutors:** **Dr. Maria Partalidou**, Lecturer in Rural Sociology, Aristotle University of Thessaloniki, School of Agriculture, Dep. Of Agricultural Economics, Thessaloniki, Greece **Dr. Majda Čerič Istenič**, Professor of rural sociology at Biotechnical faculty, University of Ljubljana

October 23th, Thursday

Morning session		
09:00 – 11:00	**WORKSHOP 5** **ECONOMIC ASPECTS OF URBAN FOOD PRODUCTION** *seminar room UIRS (2nd floor)* What and where are the reasons that the majority of mainstream food production is organised in the way as we know it today? Why do we need Urban Food Production and where is the line between urban and rural? What are the economic advantages or disadvantages of urban food production? What are the examples (winter wheat, milk, salad, strawberries) of how food prices are calculated from production to consumer? What are the economic views of vegetable gardens in Slovenia and Ljubljana? **LEARNING FROM FOODMETERS PROJECT** **Dr. Marina Pintar**, Professor of agricultural land use planning at the Biotechnical Faculty, University of Ljubljana **ECONOMIC BACKGROUNDS OF FOOD PRODUCTION** **Dr. Matjaž Glavan**, Assistant Professor for GIS systems in agriculture at the Biotechnical Faculty, University of Ljubljana	*coffee available in between*
11:00 – 13:30	**WORKSHOP 6** *seminar room UIRS (2nd floor) and UIRS meeting room (1st floor)* **COMPREHENSIVE DEVELOPMENT OF URBAN FOOD PRODUCTION** **LEARNING FROM GREENSURGE PROJECT** Group work on 5 scenarios of urban food production development for 2 case studies: a new community garden at Livada (3) and an urban agriculture area in Savlje (2)	**Tutors:** **Dr. Rozalija Cvejić**, Research Assistant in environmental planning, Department of agronomy, Biotechnical faculty, University of Ljubljana, Slovenia **Mojca Nastran**, Research Assistant at the Forestry Department of the Biotechnical Faculty, University of Ljubljana, Slovenia
13:30 – 14:30	***Lunch break*** *(lunch in a restaurant of your choice near UIRS)*	
Afternoon session		
14:30 – 18:00	**WORKSHOP 7** **DESIGNING URBAN FOOD PRODUCTION?** *seminar room UIRS (2nd floor) and UIRS meeting room (1st floor)* Group work on 5 proposals of spatial organization and design interventions for the scenarios developed in the previous workshop: the new community garden at Livada (3) and the urban agriculture area in Savlje (2)	**Tutors:** **Andrej Erjavec**, architect, Institute of quality of life (In.Ka.Bi.), Ljubljana, Slovenia, together with **Mag. Ina Šuklje Erjavec**, UIRS, Slovenia, and other tutors
19:30 –	***Common evening in Club Daktari***	

October 24th, Friday

	Morning session	
09:00 – 10:00	**Presentations from representatives from the City of Ljubljana** Open questions of planning, design and governance of urban food production in Ljubljana *seminar room UIRS (2nd floor)*	*coffee available in between*
10:00 – 12:30	**WORKSHOP 8** **DESIGNING PLANNING PROCESSES FOR URBAN FOOD PRODUCTION** *seminar room UIRS (2nd floor)* The central aim of the workshop is the design of the "ideal" planning processes encompassing four stages: *spatial analysis, zoning, site design* and *implementation*.	**Tutor:** **Martin Sondermann**, geographer, Leibniz University Hannover, Institute of Environmental Planning, Germany
12:30 – 13:30	***Lunch break*** *(lunch in a restaurant of your choice near UIRS)*	
	Afternoon session	
13:30 – 16:00	**WORKSHOP 9** **DIFFERENT LEVELS OF GOVERNANCE REGIMES AND POLICIES** *seminar room UIRS (2nd floor)* Understanding urban agriculture governance and different policy models and regimes with step by step learning about the RUAF policy formation tool: Multi-stakeholder Policy Formulation and Action Planning for Sustainable Urban Agriculture Development.	**Tutor:** **Dr. Andrew Adam-Bradford**, geographer, Horn of Africa Unit - Human Relief Foundation - governance and policies, United Kingdom
16:00 – 16:30	***Coffee break***	
16:30 – 18:00	**Wrap up and presentations of the results** *seminar room UIRS (2nd floor)*	

Documentation of Joint Training School on Urban Food Production

October 21th, Tuesday

1. Introduction

Welcome speech by organizer of JTS in LJubljana, Mag. Ina Šuklje Erjavec (general information, about Joint training school, COST projects, schedule and all tutors of Joint training school, distributions of participants in groups for workshops and information about planned fieldtrips).

Short presentation of the Municipality of Ljubljana – LOCAL AGRICULTURAL SELF SUPPLY IN THE MUNICIPALITY OF LJUBLJANA (urban structure of the city, self-supply, agriculture and allotment gardens in Ljubljana)
Speaker: Jurij Kobe (Department for Environmental Protection)

Ljubljana JTS Urban Food Production 2014, Day 1: morning presentations at UIRS

Annex 1: ***Presentation: Local Agricultural Self Supply in the Municipality of Ljubljana*** *(Jurij Kobe, MOL)*

2. WORKSHOP 1

a. **Introduction:** overview of different urban garden types and initiatives in Ljubljana
Speakers: Mag. Maja Simoneti and Dr. Darja Fišer

b. **Walk throuhg urban gardens - Site visit**
Tutors: Mag. Maja Simoneti, Dr. Darja Fišer
Photo: Maja Simoneti, Jana Kozamernik

Ljubljana JTS Urban Food Production 2014, Day 1 Workshop: WALK THROUGH THE GARDENS

Site visit was made by foot to the different, bottom up gardening areas in the vicinity of UIRS, exploring their characteristics and discussion with tutors about . Participants had also the possibility to speak with the gardeners on site, as in the picture above where Irena Woelle a designer of visual communications and an urban food production and many other important points of life and nature activist and coordinator of many community gardening sites. She explained very interesting aspect of the Community garden “Velika čolnarska” – it is a temporary garden on a private site that is not in use at the moment (waiting for new developers) in the middle of the city, between the private houses. The idea was born within the group of participants of the workshop on permaculture workshop. The garden site itself as well as gardening and harvesting is not divided among members into plots and individual activities but they do everything together

Ljubljana JTS Urban Food Production 2014, Day 1: Walk through the gardens - More traditional allotment gardens near along Gradaščica river

Annex 2:

- ***Presentation: Urban Gardening*** *(Mag. Maja Simoneti, Dr. Darja Fišer)*
- ***Presentation: Typology of Urban Gardens in Ljubljana*** *(Dr. Darja Fišer)*

3. Urban food production in Ljubjana - site visit to Savlje area

(North part of Ljubljana city)

Tutors: Dr. Marina Pintar , Nataša Bučar Draksler, Andrej Erjavec, Rozalija Cvejič and Mojca Nastran

Annex 3: Basic information about Savlje area (location, soil, land use and irrigation)
(Dr. Marina Pintar)

The site visit of urban food production area Savlje in Ljubljana was organized by tutors as well as by local organizers UIRS, providing the bus and other support for the visit.
The site visit was supported by documents and information presented on the way there and enabled participants of the JTS to experience and discusses the contrast between both of the urban agriculture areas and urban garden sites of different origins and ways of management.
The Savlje site visit was also an introduction to the Workshops 6 and 7 dealing with comprehensive development, planning and design of urban food production and case study visit for the case studies 2 groups of participants were working latter within those workshops.

Ljubljana JTS Urban Food Production 2014, Day 1: aerophoto of the Savlje area within nothernen part of the City of Ljubljana

The participants visited 2 different types of professional farms, both located within the city municipality of Ljubljana and supplying its local markets as well as providing sales of their harvest and products on site. The first one was more vegetable production oriented, using also greenhouses for growing and the other a cattle ecological farm with diary production. Both farms are part of the village, captured into the city quite long ago already, now closely linked to the city with the urban public transport as well as big densely populated urban neighborhoods nearby .
The situation is very interesting not only from spatial but also from sociological points of view because people living very nearby, are perceiving themselves very differently as urban inhabitants and as villagers.

Participants had the opportunity to see both farms and discuss with farmers about their experiences, attitudes and needs for better development;

Ljubljana JTS Urban Food Production 2014, Day 1: site visit of Ljubljana urban agriculture area Savlje; Case study area for urban agriculture. Discussion with the farmer on the farming area.

Ljubljana JTS Urban Food Production 2014, Day 1: site visit of Ljubljana urban agriculture area Savlje; Case study area for urban agriculture. Visit of vegetable farm: green hous and private store on site.

Ljubljana JTS Urban Food Production 2014, Day 1: site visit of Ljubljana urban agriculture area Savlje; Case study area for urban agriculture. Visit of one of the farmers in the area (eco - farm, small private store).

Besides farms, participants visited also some allotment gardening sites , one owned and managed by Municipality of Ljubljana within an abandoned area of military waste across the neighborhood as well as private ecological urban gardens for rent (Pridelaj.si), developed and managed by private investor Nataša Bučar Draksler who was also the JTS tutor and explained in detail development and management issues of her allotment gardens.

Ljubljana JTS Urban Food Production 2014, Day 1: site visit of Ljubljana urban agriculture area Savlje; Allotment gardens Pridelaj.si , Savlje near high-density area – discussion with Nataša.

4. WORKSHOP 2 – Understanding ecological food growing

Tutor: Nataša Bučar Draksler

Ljubljana JTS Urban Food Production 2014, Day 1: Workshop 2 – Ecological gardening with use of "Garden Cards" Methodology.

Annex 4:

- ***Presentation: Understanding Ecological Food Growing with Garden Cards*** *(Nataša Bučar Draksler)*
- ***Instructions for Garden Cards*** *(Nataša Bučar Draksler)*

October 22th, Wednesday

1. **Introductory presentations of the workshops and field work**

   Speakers: Dr. Luke Beesley, Dr. Paulo Brito da Luz, Dr. Maria Partalidou, Dr. Rozalija Cvejić and Mojca Nastran: Livada case study area

Ljubljana JTS Urban Food Production 2014, Day 2: Introductionary presentations of the Workshops and fieldwork.

Annex 5:

- ***Presentation: Urban Food Production: Environmental Challenges – introduction*** *(Dr. Paulo Brito da Luz)*
- ***Presentation: Farming urban soils*** *(Dr. Luke Beesley)*
- ***Presentation: Social aspects of Urban Food Production*** *(Dr. Maria Partalidou)*
- ***Presentation: Livada case study*** *(Dr. Rozalija Cvejić and Mojca Nastran)*

2. Joint workshop Understanding the site – Livada case area

Field work, site analysis – location, soil, water, users

Additional participants: stakeholders Zavod BOB, Ljubljana

Ljubljana JTS Urban Food Production 2014, Day 2: Joint workshop: UNDERSTANDING THE SITE; Soil analysis on case study area for community garden, Ljubljana.

Ljubljana JTS Urban Food Production 2014, Day 2: Joint workshop: Understanding the site; Presenting of group of stakeholders – future users of allotment garden site – Zavod BOB.

3. Workshop 4 – Social aspects of urban food production

Tutor: Dr. Maria Partalidou

Social views on food production and urban gardener profile

Speaker: Dr. Majda Čerič Istenič

Ljubljana JTS Urban Food Production 2014, Day 2: Workshop 4: SOCIAL ASPECTS OF URBAN FOOD PRODUCTION.

***From Workshop report** (Dr. Maria Partalidou):*

Agriculture and the city have been going hand- in- hand for centuries. Nowadays, Urban Food Production is of great importance in contemporary societies; as urbanization is growing, food prices are still going up and food travels from all over the world in order to reach urban dwellers. Amidst the current economic crisis, with alarming phenomena of neo-poverty and malnutrition, UA takes yet another crucial role in supporting vulnerable groups in cities and creating new jobs for unemployed. The module focused on two main points: how did we get to that chaos in food provisioning, the motives and other socioeconomic characteristics of urban farmers (either for hobby, or professionals) and the strengths, weaknesses and difficulties of these initiatives concerning both social and economic aspects.

The workshop was divided into three parts. The goal of the first part was to test an image – based methodology for the Social construction of the rural and the urban. Students were asked to identify the leading images of the rural and the urban within a set of 50 different given photos. During the second part of the workshop students were introduced to another binary "local or global" food systems. The aim of this task was to identify the actors in the food system, what are the emerging issues, how do we feed the city, what small farmers, in the peri-urban can do etc. The third part of the workshop was devoted to urban garden allotments. The students got familiar to emerging food provisioning practices such as urban agriculture and how it contributes to social inclusion.

Annex 6:

- ***Workshop report** (Dr. Maria Partalidou)*
- ***Presentation: Who are the gardeners and what motivate them to grow their own food? Results from FOODMETRES** (Dr. Majda Čerič Istenič)*

4. Workshop 3 – Environmental aspects of urban food production

Irrigation and Agro-environmental indicators

Tutor: Dr. Paulo Brito da Luz

Soil survey and evaluation - Farming urban soils

Tutor: Dr. Luke Beesly

Annex 7:

- ***Presentation: Urban Food Production: Environmental Challenges – Field Work*** *(Dr. Paulo Brito da Luz)*
- ***Presentation: Urban Food Production: Environmental Challenges – Workshop 3*** *(Dr. Paulo Brito da Luz)*
- ***Presentation: Urban Food Production: Environmental Challenges – Annexes*** *(Dr. Paulo Brito da Luz)*
- ***Workshop Exercises: Pressurized Irrigation – Sprinkler*** *(Dr. Paulo Brito da Luz)*
- ***Presentation: Farming urban soils*** *(Dr. Luke Beesly)*
- ***Article: Harmony Park - A Decision Case on Gardening on a Brownfield Site*** *(Dr. Luke Beesly)*

October 23th, Thursday

Aditional participants: Stakeholders Zavod BOB, Ljubljana

1. Workshop 5 – Economic aspects of urban food production

Learning from Foodmeters project

Speaker: Dr. Marina Pintar

Economic backgrounds of food production

Speaker: Dr. Matjaž Glavan

Annex 8:

- **Presentation: Learning from Foodmeters project** (Dr. Marina Pintar)
- **Presentation: Economic backgrounds of food production** (Dr. Matjaž Glavan)

2. **Workshop 6 (parallel workshop):**
   Comprehensive development of urban food production – learning from Greensurge project
   Livada case area – allotment garden and youth place
   Tutors: Dr. Rozalija Cvejić, Mojca Nastran, Mag. Ina Šuklje Erjavec
   Aditional active participants: Stakeholders Zavod BOB, Ljubljana

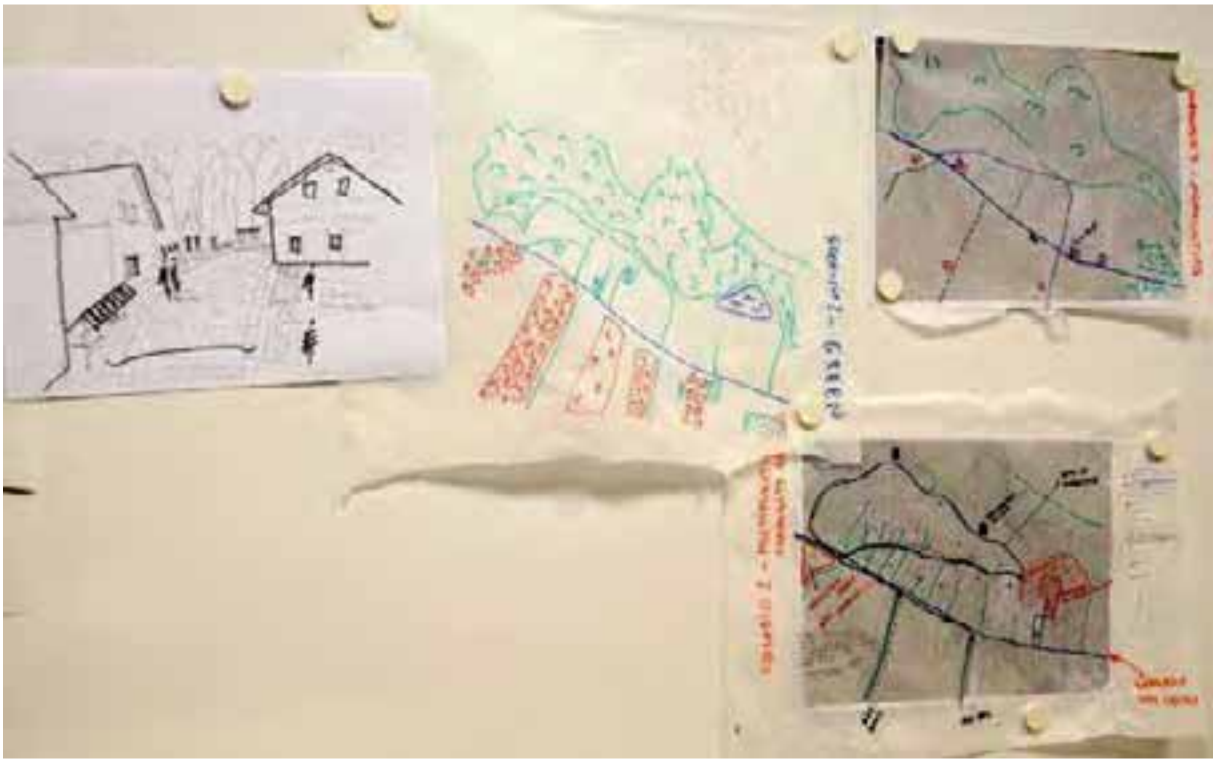
Ljubljana JTS Urban Food Production 2014, Day 3: Workshop 6: Comprehensive development of urban food production (Livada case area) – work in groups and presentation of results

3. Workshop 7 (parallel workshop): Designing of urban food production?

Savlje village development – urban agriculture area

Tutors: Andrej Erjavec, Mag. Ina Šuklje Erjavec

Annnex 12: Presentation: designing urban Food Production?



Ljubljana JTS Urban Food Production 2014, Day 3: Workshop 7: Designing urban food production? – working in groups, presenting results

October 24th, Friday

Aditional participants: Stakeholders Zavod BOB, Ljubljana

1. Presentation of representatives from City of Ljubljana

Speakers from Municipality of Ljubljana: Jurij Kobe, Veronika Reven

Annex 9:

- ***Presentation: Rural development in Ljubljana municipality*** *(Jurij Kobe, Municipality of Ljubljana)*
- ***Presentation: Allotment gardens in the Municipality of Ljubljana*** *(Veronika Reven and Mateja Doležal, Municipality of Ljubljana)*
-

2. Workshop 8 – Designing planning process for urban food production

Tutor: Martin Sondermann

Ljubljana JTS Urban Food Production 2014, Day 4: Workshop 8: Designing planning process for urban food production

Annex 10: ***Presentation: Designing planning process for urban food production***
(Martin Sondermann)

3. Workshop 9 – Different levels of governance regimes and policies

Tutor: Dr. Andrew Adam-Bradford

Ljubljana JTS Urban Food Production 2014, Day 4: Workshop 9: Different levels of governance regimes and policies

Annex 11: ***Presentation: Different Levels of Governance Regimes and Policies***
(Dr. Andrew Adam-Bradford)

4. Conclusion of JTS

Ljubljana JTS Urban Food Production 2014, Day 4: Conclusions with representatives from both COST Actions and Zavod BOB.

Ljubljana JTS Urban Food Production 2014: a gift from Municipality of Ljubljana: T –Shirts for all

Participants and tutors (almost all) of Ljubljana JTS Urban Food Production 2014

Presentations, reports and other material (Annexes 1 - 11)

Annex 1: ***Presentation: Local Agricultural Self Supply in the Municipality of Ljubljana*** *(Jurij Kobe, MOL)*

Annex 2: ***Presentation: Urban Gardening*** *(Mag. Maja Simoneti, Dr. Darja Fišer)*
Presentation: Typology of Urban Gardens in Ljubljana *(Dr. Darja Fišer)*

Annex 3: ***Basic information about Savlje area (location, soil, land use and irrigation)*** *(Dr. Marina Pintar)*

Annex 4: ***Presentation: Understanding Ecological Food Growing with Garden Cards*** *(Nataša Bučar Draksler)*
Instructions for Garden Cards *(Nataša Bučar Draksler)*

Annex 5: ***Presentation: Urban Food Production: Environmental Challenges – introduction*** *(Dr. Paulo Brito da Luz)*
Presentation: Farming urban soils *(Dr. Luke Beesley)*
Presentation: Social aspects of Urban Food Production *(Dr. Maria Partalidou)*
Presentation: Livada case study *(Dr. Rozalija Cvejić and Mojca Nastran)*

Annex 6: ***Workshop report*** *(Dr. Maria Partalidou)*
Presentation: Who are the gardeners and what motivate them to grow their own food? Results from FOODMETRES *(Dr. Majda Čerič Istenič)*

Annex 7: ***Presentation: Urban Food Production: Environmental Challenges – Field Work*** *(Dr. Paulo Brito da Luz)*
Presentation: Urban Food Production: Environmental Challenges – Workshop 3 *(Dr. Paulo Brito da Luz)*
Presentation: Urban Food Production: Environmental Challenges – Annexes *(Dr. Paulo Brito da Luz)*
Workshop Exercises: Pressurized Irrigation – Sprinkler *(Dr. Paulo Brito da Luz)*
Presentation: Farming urban soils *(Dr. Luke Beesly)*
Article: Harmony Park - A Decision Case on Gardening on a Brownfield Site

Annex 8: **Presentation: Learning from Foodmeters project** (Dr. Marina Pintar)
Presentation: Economic backgrounds of food production (Dr. Matjaž Glavan)

Annex 9:	***Presentation: Rural development in Ljubljana municipality*** *(Jurij Kobe, Municipality of Ljubljana)* ***Presentation: Allotment gardens in the Municipality of Ljubljana*** *(Veronika Reven and Mateja Doležal, Municipality of Ljubljana)*
Annex 10:	***Presentation: Designing planning process for urban food production*** *(Martin Sondermann)*
Annex 11:	***Presentation: Different Levels of Governance Regimes and Policies*** *(Dr. Andrew Adam-Bradford)*
Annex 12	***Presentation: designing urban Food Production*** *(Andrej Erjavec and mag. Ina Šuklje Erjavec)*

Reports of working groups (Annexes 12 - 16)

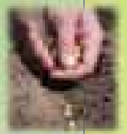
LOCAL AGRICULTURAL SELF SUPPLY IN THE MUNICIPALITY OF LJUBLJANA

Ljubljana, 21. 10. 2014

Jurij KOBE (Department for Environmental Protection)

Mateja Doležal, Veronika Reven (Department for Urban planning)

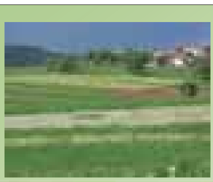
Why sustainable local food system?



Food soverignty & self sufficiency

Environmental protection - Short Food chains

Food security



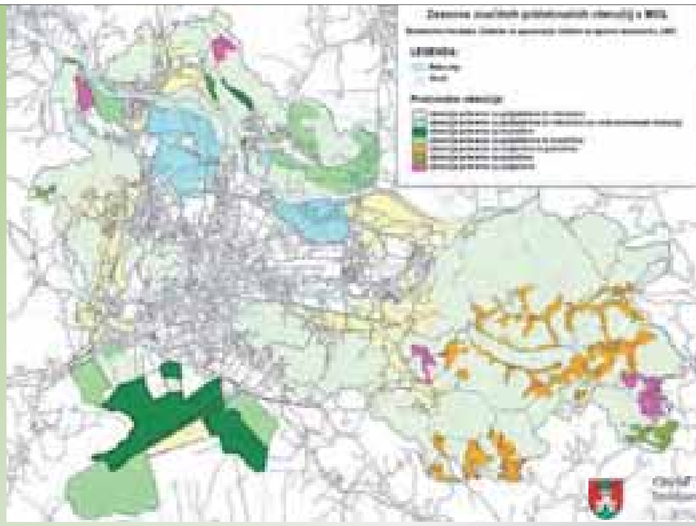
More than 2/3 of entire municipality consists of agricultural & forest lands

Total area = 275 km^{2}*

Forest = 108 km^{2}

Agricultural land = 107 km^{2}

*Data from Real estate cadastre



Strategy for rural development 2014 -2020(draft)

Strategic objective 1

High quality products for self supply (agriculture & forestry) through optimal use of local resources

Number of farms
Average area of active lands per farm

1991	2001	2010
1343 farms	925 farms	815 farms
4,3 ha active lands/farm	6,3 ha active lands/farm	7 ha active lands/ farm

5678 ha active lands:

- **2066 ha Arable lands & meadows**
  - 175 ha vegetables
  - 88 ha potatoes
  - 637 ha cereals
  - 1085 ha fodder plants
- **3504 ha pastures**

Total agricultural area

Land cadastre

2001	2010	decrease (%)
11.142 ha	10.667 ha	4,3%

Statistical data

2001	2010	decrease(%)
5.914 ha	5.678 ha	4,0%

Optimizing sales channels of agricultural products

- local markets
- home delivery
- local events
- seasonal market stall sale
- direct sale on the farm

Challenges

- Direct sale to public institutions
- Adding value to agricultural & forest products : fruit & vegetable processing, development of complementary activities
- Promotional activities

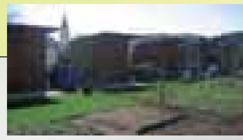
- Spatial regulations - the spatial placement of farm buildings and facilities for the needs of gardening
- Encouraging of gardning at the allotment areas

Allotment gardens in the City of Ljubljana

- Vir: Jamnik, Smrekar, Vrščaj: Vrtičkarstvo v Ljubljani, 2009

1984	1995	2008	2010
289 areas	378 areas	218 areas	23 areas (spatial plan)
200 ha	267 ha	130 ha	45 ha

- Note:
  Data for the years 1984 - 2008 represents the actual situation (appropriate and inappropriate areas, authorized and unauthorized areas), the figure for 2010 represents an appropriate area for the planned plots (land use)



Allotment gardens in the City of Ljubljana

- Planned areas for allotment gardens in Municipal spatial plan (2010)
- Planned and designed allotment areas owned by the Municipality
- Agricultural land – private owners

Allotment gardens in the City of Ljubljana – planned areas for allotment gardens Municipal spatial plan (2010)

Designed allotment gardens areas

Štepanja vas

•14 allotment plots

- equipped with sheds, children's playground, parking places, water supply connector to the distribution network, composters, mobile toilets and waste containers

Dravlje

• 51 allotment plots

• the same equipped as at Štepanja vas, but without connection to the water distribution network

Savlje – former military dumpsite

- 50 allotment plots

Agricultural land – private owners

- **initiatives at agricultural areas - Municipality also has an intermediary role between the owners of agricultural land and gardens seekers (1,5 ha)**

Thank you for your attention

Urban gardening

Mag. **Maja Simoneti**, Institute for Spatial Policies
and
Dr. **Darja Fišer**, crops2swap (or Zelemenjava in Slovene)
working together in urban gardening group within Network: Mreža za prostor

Joint Trainig School on Urban Food Production
COST actions TU1201 and TD1106

21-24 October 2014, Ljubljana, Slovenia
Urban Planning Institute of the Republic of Slovenia

Why urban gardening?

- it is a geuine and rewarding activity

- growing food – knowing food
- enjoying results of your work
- socialising
- contact with nature
- freedome of outdoors
- relaxation
- community building

- new urban practices and economies: urban revitalisation, crop swapping, outdoor education, cooking, tourism, …)

Urban gardening in Ljubljana

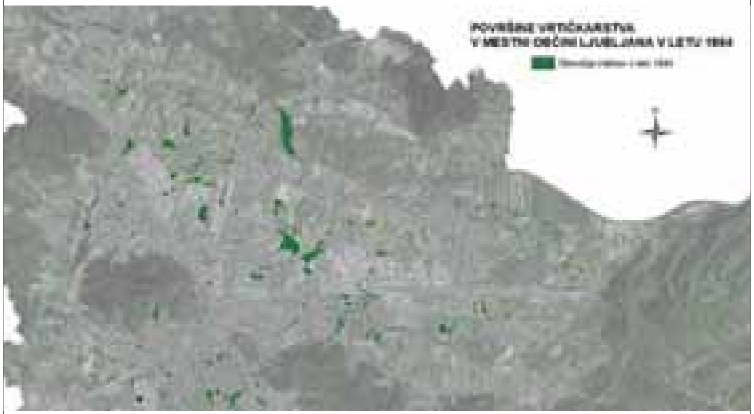
- food garden as a cultural phenomenon – the majority of house & garden owners in Slovenia keeps a kitchen garden in their backyard
- planned and self organised
- urban gardening – gardening on borrowed or occupied land, either with or without the owner's permission and rent

- gardening is for everyone
- gardens are everywhere
- gardening is both traditional and trendy

Recent history of urban gardening in Ljubljana

- 1955: gardens for the new citizens are organised in the growing industrial town and national captial
- 1985: the new master plan tends to move gardening to the outskirts
- 1995: guerilla gardening has expanded along with lost land use and control, the municipality starts comprehensive research activity
- 2007: removal of illegal gardens in front of the central cemetery
- 2010: a new master plan defines gardening as permanent land use, new gardening rules are set, the first new sample allotments are organised
- 2014: interest for gardening is growing, guerilla gardening is expanding again

Urban gardening, 1984



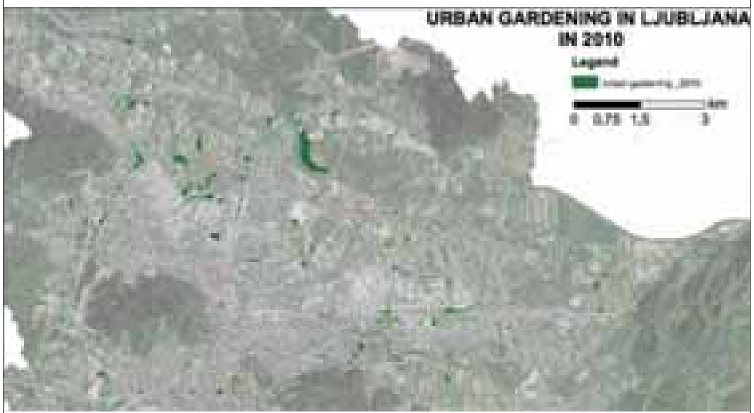
Gardening in Ljubljana, 1996

New urban gardening policy, 2007

- special / important location was chosen
- gardens were radically erased
- to stop illegal gardening
- to demonstrate the political will for change
- new public space - a park as a substitute

for the former exclusive land use

Urban gardening, 2010



New master plan, 2010

- a new master plan - gardening as permanent land use as well as allowed on specific areas
- new gardening rules and ordinance

- follows research findings and environmental acceptability
- pushes gardening out of the city centre
- aims to organise and control gardening practices in the city

Urban gardening ordinance

What happens?

- new area preplanned for gardening is much smaller than the area of ther existing gardening practice
- on the outskirts of the city while people garden and wish to garden in the city centre as well
- the proposed design for the demonstration gardens proved to be too expensive

- the size, the location and budget are underestimated

- diverse range of practice
- organised by the municipality and private actors
- selforganised
- great majority of urban gradening is illegal

2013, Jane‘s Walk

Jane‘s Walk, 2013

Krakovo gardens, cultural heritage, private ownership
Trnovo, guerilla gardening, public ownership
Kolezija, guerilla gardening, private ownership
Kolezija, gardening for the elderly, public ownership
Trnovo, windowsill gardening

Findings

- garden proximity is crucial /young & old, on foot & by bike, on a daily basis/
- the temporary nature of gardening is not an issue /when made clear/
- silent agreement can result in a very stable arrangement /a decade or more/
- official consent of the owner and the municipality would be highly welcome /illicit gardens are stigmatised/

Ljubljana, 2014

- big public interest in gardening – near your home, also in the centre

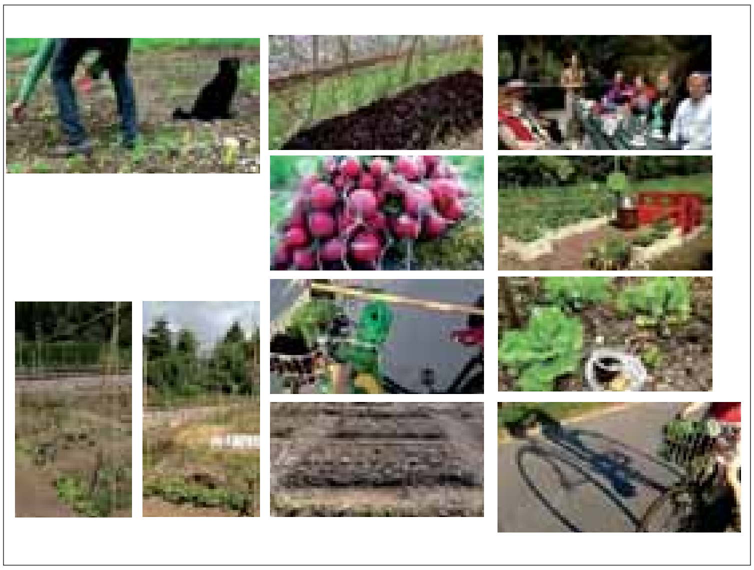
- new contexts of gardening are emerging: revitalisation of degraded areas, green space maintenance, temporary land use, cultural program, education

- offer of legal gardening areas is very limited
- expansion of guerilla gardening is on the rise again

otroci iz
in onkraj gradbišča
vas vabimo na
blagovno menjavo sadik
Se vidimo!

AKCIJA – ZASADITE SVOJ VRT!

Jutra na vrtu
28. teden: Kar je dano, je v zemljo zakopano



Lessons learned

- plot gardening is a part of a contemporary city
- gardeners are very persistent – they easily migrate

- people wish to garden close to their homes
- temporary gardens are more desirable than dislocated permanent solutions
- equipment (shed, fence, playground, benches, litterboxes…) is not of key importance

- people tend to respect the measures taken by the municipality: they comply with the regulations and bans
- BUT much less so when the proposed planned are not put into effect

JOINT TRAINING SCHOOL ON URBAN FOOD PRODUCTION

TYPOLOGY OF URBAN GARDENS IN LJUBLJANA

DARJA FIŠER

JOINT TRAINING SCHOOL ON URBAN FOOD PRODUCTION

TOWARDS A TYPOLOGY

1. ALLOTMENT COLONIES

   example: Litostroj Allotments

2. **GARDENS WITH TRADITION**

   example: Krakovo Gardens

3. TEMPORARY USE

   example: Beyond a Construction Site

4. MAINTENANCE

   example: On the railway embankment

5. NEIGHBOURHOOD GARDENS

   example: Allotments at Rimska cesta

6. BORROWED GARDENS

   example: Allotments in Murgle

7. **GUERILLA GARDENS**

   example: Allotments at Gradaščica

8. CONTAINER GARDENS

   example: Savsko naselje

ALLOTMENT COLONY LITOSTROJ

Initiative: Litostroj Gardening Society

Duration: 1955 – on-going

Location: behind the Litostroj factory complex

No. of allotments: about 50

Land owners: farmers, state institutions, private companies

Relationship between allotment holders and land owners: different arrangements (paying for rent and water, just for water or nothing at all)

Characteristics: a stable allotment colony dating to the construction of the neighbourhood

KRAKOVO GARDENS

Initiative: individuals

Duration: Middle Ages – on-going

Location: between Eipprova and Krakovska Street

No. of allotments: about 30

Land owners: private owners

Relationship between allotment holders and land owners: different arrangements (renting, borrowing, sharing)

Characteristics: transition from commercial food growing to hobby gardening

ONKRAJ GRADBIŠČA

Initiative: cultural and art society Obrat

Duration: 2010 – on-going

Location: Disused construction site between Resljeva and Kotnikova Street

No. of allotments: 40

Land owners: City of Ljubljana

Relationship between allotment holders and land owners: contract for free temporary use

Characteristics: temporary use of a disused construction site that started during a cultural festival and evolved into a community garden


ALLOTMENTS ON THE RAILWAY EMBANKMENT

Initiative: Botanic Gardens & national TV

Duration: 2013 – on-going

Location: railway embankment between Botanic Gardens and Dolenjska Street

No. of allotments: 7

Land owners: city of Ljubljana and Slovene Railways

Relationship between allotment holders and land owners: agreement for free temporary use

Characteristics: temporary use and maintenance of an infrastructure corridor




ALLOTMENTS AT RIMSKA CESTA

Initiative: individuals

Duration: 2060 – on-going

Location: between Rimska and Aškerčeva Street

No. of allotments: about 5

Land owners: private owner

Relationship between allotment holders and land owners: agreement for free use in exchange for maintenance of the hedge

Characteristics: very old neighbourhood allotments in the very centre of the city

ALLOTMENTS IN MURGLE

Initiative: individuals

Duration: 2010 – on-going

Location: Murgle

No. of allotments: 13

Land owners: private owner

Relationship between allotment holders and land owners: agreement for free use in exchange of mowing

Characteristics: beginner- and family-friendly community garden in a suburb

ALLOTMENTS AT GRADAŠČICA

Initiative: individuals

Duration: 2050 – on-going

Location: next to the bridge across Gradaščica river at Barjanska Street

No. of allotments: about 20

Land owners: City Museum of Ljubljana

Relationship between allotment holders and land owners: guerilla gardening

Characteristics: guerilla gardens with a long tradition, lots of recent expansion

VRTIČEK V SAVSKEM NASELJU

Initiative: Saprabolt Society

Duration: 2013 – on-going

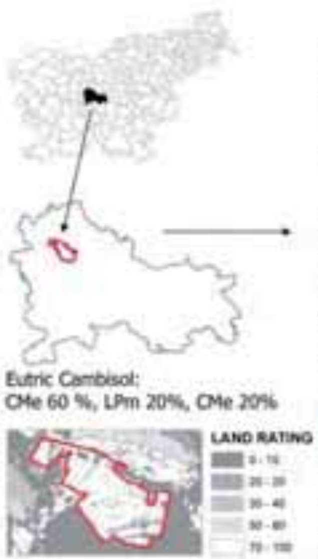
Location: in a neighbourhood park at Savsko naselje

No. of allotments: gardens in raised beds and builders bags

Land owners: City of Ljubljana

Relationship between allotment holders and land owners: contract for temporary use

Characteristics: a social experiment in community gardening in a traditional neighbourhood



Soil sample analysis (* C: organic matter / 1,724)

sample	pH	P_2O_5 [mg/100g]	K_2O [mg/100g]	Org. matter [%]	C
Savlje	7.0	23.2-30.1	45.0-51.2	4.3-4.7	2.5-2.7

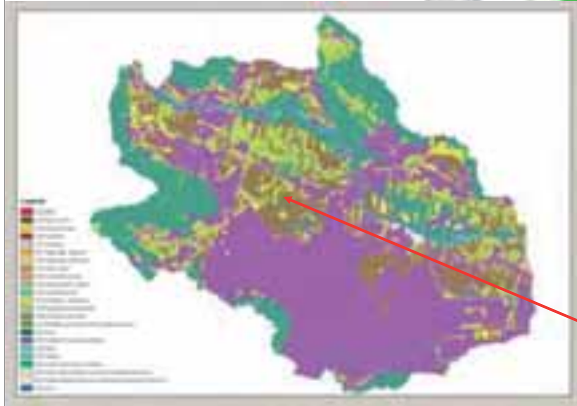
Excessive load with of P_2O_5, extreme load of K_2O

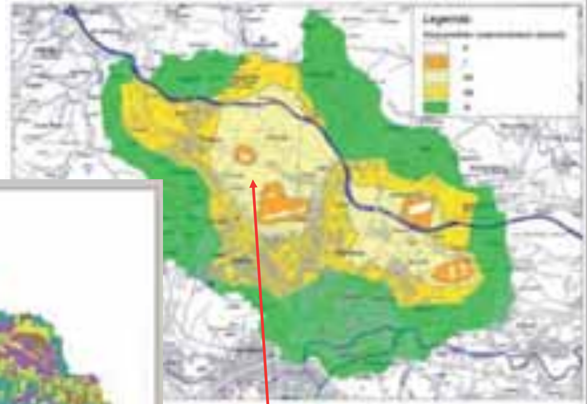
Site visit to Savlje area
JTS Urban food production
Ljubljana, 21-24 Oct 2014

1= professional food production; 2 = non-professional food production

Agrucultural land use and water protection zones on Ljubljana Field intersect

Land use





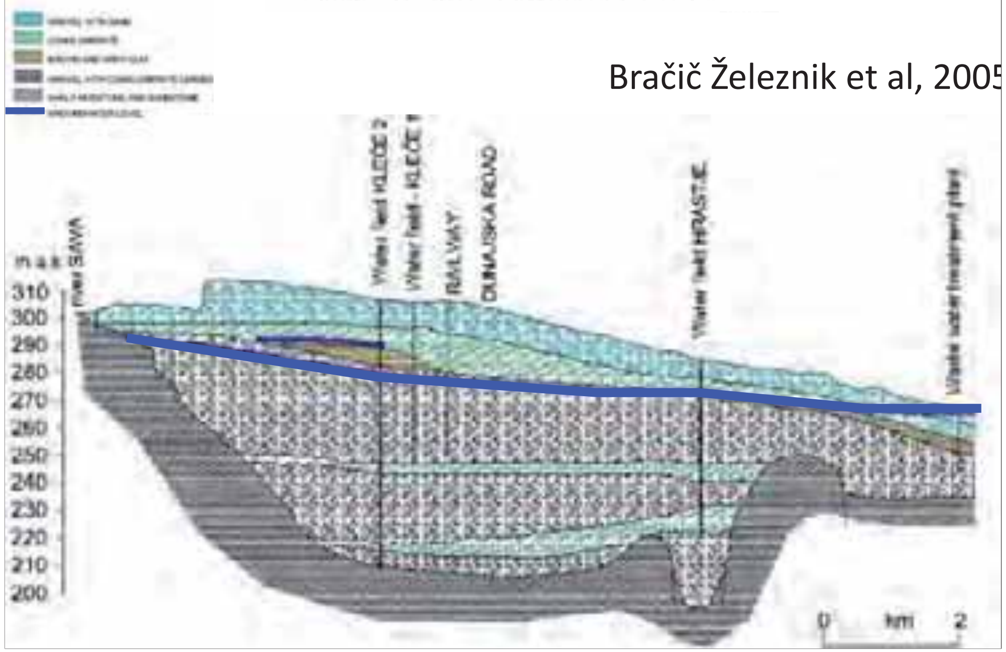
Water protection areas
(Ministry of Environment, 2005)

arable land

meadows

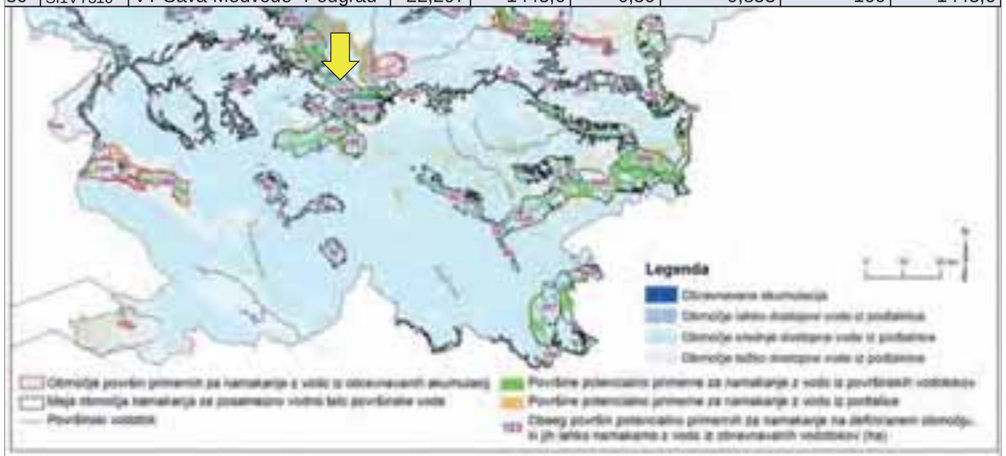
Lithology of the Ljubljana aquifer

Bračič Železnik et al, 2005



irrigation areas (ha); available water from surface water bodies

	Vodni vir			Območje 3 km od vodotoka in 100 m nadmorske višine nad vodotokom				
	Code of water body	Area /name of the watershed area	Water for use (e.g. irrigation) (m^3/s)	Appropriate area for irrigation (ha)	Hydromodul (l/s/ha) 18 hour irrigation daily	Water requested for irrigation of the entire area (m^3/s)	Share of potentially irrigated area (%)	Potentially irrigated area (ha)
39	SI1VT310	VT Sava Medvode -Podgrad	22,297	1445,6	0,59	0,853	100	1445,6



pridelaj si
...in mi ti bomo pomagali

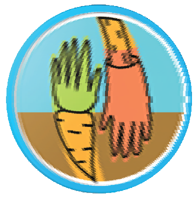
UNDERSTANDING ECOLOGICAL FOOD GROWING with Garden Cards®

Nataša Bučar Draksler,
landscape architect

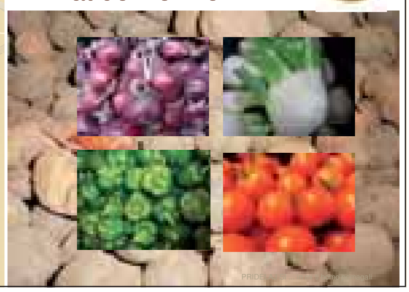
Planning is easier With Garden Cards

1. Why Garden cards
2. How to draw a plan for organic gardening
3. Sorting vegetables according to nutrient availability
4. Crop rotation
5. Distribution at the patch
6. Timeline
7. Plant density, pH, sun

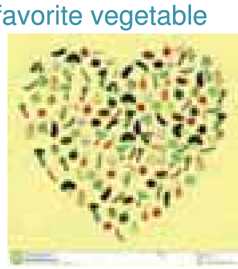
2. HOW ?



What do we like?



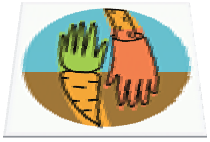
Choose your favorite vegetable



ORAC	DRUŽINA	IME RASTLINE	opomba k ORAC
27426	zelišče	timijan	
27297	zelišče	majaron	
9465	zelišče	šetraj	
5708	čebulnice	česen	
4805	zelišče	bazilika	
3083	križnice	brokoli	
2380	solatnice	radič in cikorija	
2252	ostalo	špargiji	
2249	metuljnice	fižol visok	kuhano zrnje
1904	križnice	rukola	
1767	lobodovke	rdeča pesa	
1736	križnice	redkvica	
1680	razhudniki	krompir	pečen v olupku
1513	lobodovke	špinača	
1397	zelišče	origano	
1301	kobulnice	peteršilj	μ mol TE/100g
1017	solatnice	solata	
935	razhudniki	paprika	
932	razhudniki	jajčevec	
913	čebulnice	čebula	
870	križnice	cvetača	
847	metuljnice	čičerika	
728	ostalo	koruza sladka	
697	kobulnice	korenje	
592	križnice	zelje	
552	kobulnice	zelena gomoljna	
546	razhudniki	paradižnik	
490	čebulnice	por	
396	bučnice	buče plezalke zimske	
307	kobulnice	sladki komarček	
232	bučnice	kumare	
180	bučnice	bučke grmaste poletne	

ORAC
Oxygen
Radical
Antioxidant
Capacity

2. GROUP VEGETABLES BY FAMILY



Cabbage family is the biggest family

VRTNE KARTE®

- **combine cards in small heap by colour.**

- The same colour means plants in the same family.
- Exception are RED cards. Those are other plants, among which only sunflower and Jeruzalem artichoke are family.

Beet family – spinach beet ...

Cabbage family

Carrot family

Cucumber family

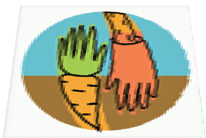
Lettuce family

Onion family

Pea and bean family

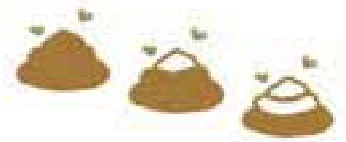
Potato family

3. DIVISION BY GARDEN BEDS



How much food plants need??

The pile at the back side of VRTNE KARTE® tells us how much manure or compost plant needs.



CROP ROTATION

An agricultural technique in which, season after season, each field is sown with crop plants in a regular rotation, each crop being repeated at intervals of several years.

What is one area?

It is a group of garden beds equally treated with nutrients

There are 3 areas at least:

- Intensive manured **1**. area
- Middle manured **2**. area
- Withouth manure **3**. area

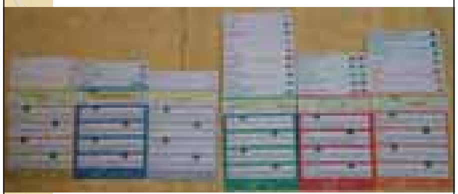
VRTNE KARTE®

Arrange VRTNE KARTE® according to piles

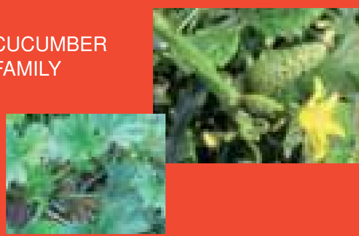
1. area

At the 1st area
We grow plants, which need
The highest amount of nutrients

Division regarding to nutrient needs



CUCUMBER FAMILY

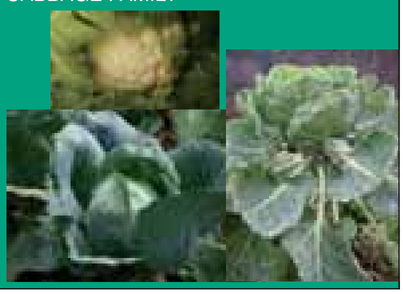


POTATO FAMILY

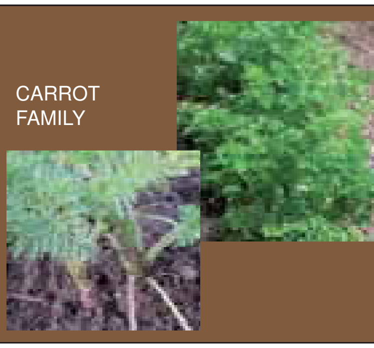
2. area

There we grow plants,
which need average overall fertility
and do not tolerate fresh manure.

CABBAGE FAMILY



CARROT FAMILY




CABBAGE
FAMILY

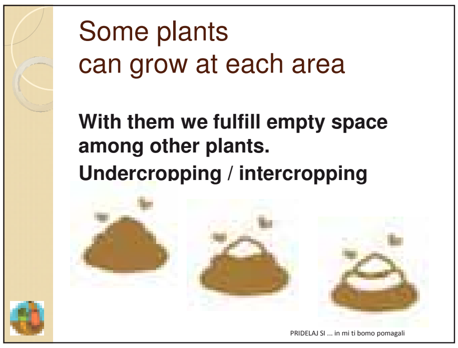

3. area
There we grow plants,
which almost don't need fertilisers
Or they can produce neutrogen from the air by themselves.
PRIDELAJ SI ... in mi ti bomo pomagali


BEET FAMILY

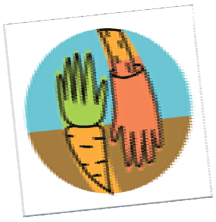

ONION
FAMILY

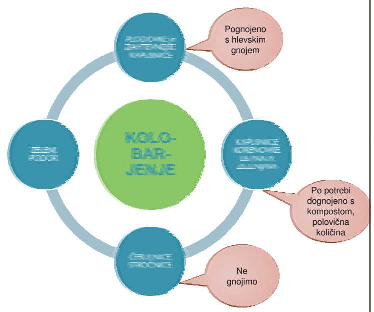

PEA AND
BEAN FAMILY

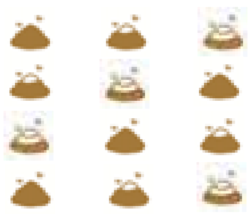

LETUCCE
FAMILY


Some plants
can grow at each area
With them we fulfill empty space among other plants.
Undercropping / intercropping
PRIDELAJ SI ... in mi ti bomo pomagali

4. CROP ROTATION







to change = to rest

- If crops from the same family are grown in the same place year after year, related pests and diseases may become established. Plants from the same family have equal nutrient requirements. They are not good neigbours and must not grow at the same place year after year.

5. DISTRIBUTE VEGETABLE AT THE PATCH

Possible disposition

- A - Distribute Garden cards® at the patch in drills. Take care not toput the same colour (same family) side by side.
But they may make a line longways.

- B - Distribute Garden cards® at the patch with equidistant spacing

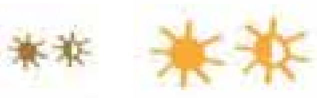
- Be aware of the effect of plant density

6. DESIGN THE SCHEME

Time schedule – green for sowing seeds

Don’t forget, some vegetables could be sown more often, to prolong the season (lettuce, radish, sweet corn, chicory …)

Take note of sun or shadow



Take note of planting distance

Take note of

acidity / alkalinity of soil

pH=5,5-7 pH=5,5-7

- **DRAW A PLAN.**

One month later

Distribute and plant

INSTRUCTIONS FOR GARDEN CARDS®

1. CHOOSING WHAT TO GROW ☺ ☹

What do you like to eat? Divide Garden cards® in two parts. Stack the cards onto two piles. On the first shall be plants, which you like to eat ☺. Add some new to learn something new. On the second just leave plants you will not grow ☹. Put them back into the box.

2. GROUP VEGETABLES BY FAMILY 9 colours

Group Garden cards® from the first pile according to colour. Garden cards® with the same colour represent vegetable from the same botanical family. Red cards are exception and they represent the rest of the crops. Among them only sunflower and Jerusalem arthichoke are relatives. If crops from the same family are grown in the same place year after year, related pests and diseases may become established. Plants from the same family have equal nutrient requirements. They are not good neigbours and must not grow at the same place year after year.

3. SORTING VEGETABLES ACCORDING TO NUTRIENT REQUIREMENTS

Different crops have different nutrient requirements, so moving them around the growing area helps to prevent soil. There are drawings of manure at the back side up right of the cards. They symbolise the manure and remind us how much nutrients they need.

Collect Garden cards with on the first pile – 1. area.

Collect Garden cards with on the second pile – 2. area.

Collect Garden cards with on the third pile – 3. area.

Area is a surface with the same amount of nutrients, treated the same way. Najbolj pognojene so gredice v prvi poljini in naj-manj v tretji.
Grow crops with similar requirements together so you can apply the appropriate soil treatments for them.

4. DRAW A PLAN OF YOUR VEGETABLE GARDEN

Draw your garden and sign areas with numbers (1 or 2 or 3).

Garden cards® with the symbol put on the patch, that will be manured reach. This will be area no.1.

Garden cards® with the symbol put on the patch, which was strong manured last year. This will be area no.2.

Garden cards® with the symbol put on the patch, which was not manured last two years This will be area no.3.

5. DISTRIBUTE THE VEGETABLES AT EACH PATCH

A - Distribute Garden cards® at the patch in drills. Take care not toput the same colour (same family) side by side. But they may make a line longways.

B - Distribute Garden cards® at the patch with equidistant spacing - cikcak.

When you are satisfied with distribution, draw it onto a plan. Be aware of the effect of plant density. Distance is written at the bottom of the back side at each Garden card®. Crops, which need a lot of space grow slowly . Intercropping is the sowing of fast-growing or small vegetable on unused ground between slower-growing main crops. Undercropping is the sowing of low plants under the taller.

6. PLANING THE PRODUCE YEAR

Distribute Garden cards® according to time of sowing or planting. Timeline is at the top of the back side of each card. Card on the front shall cover one at their back just that much that you can read the timeline.
Multi-sowing means sowing several seeds in the same place at around twice the normal spacing.
Double cropping is the sowing on spare ground between the clearance of one main crop and the planting of another.

7. MANAGING SOIL

Soil treatment in a rotation.

1. area – compost or manure use for heavy feeders such as potatoes, cabbage family, tomato.
2. area – manure was added a year before or in the autumn before planting.
3. area – was manured two years ago. There bean and pea family will be growing.

8. SOWING VEGETABLES

Be ready to make compromises. Divide garden into equak-sized sections according to how many years rotation is to last.
If possible set aside an area of perennial vegetables and herbs.

Latin names will help at shopping abroad or at purchasing at web.

URBAN FOOD PRODUCTION: ENVIRONMENTAL CHALLENGES

Introduction

Paulo Brito da Luz – Senior Researcher

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Joint Training School
21-24 October 2014
Ljubljana, Slovenia

Integrated Resources Management

MAIN SCIENTIFIC FIELDS

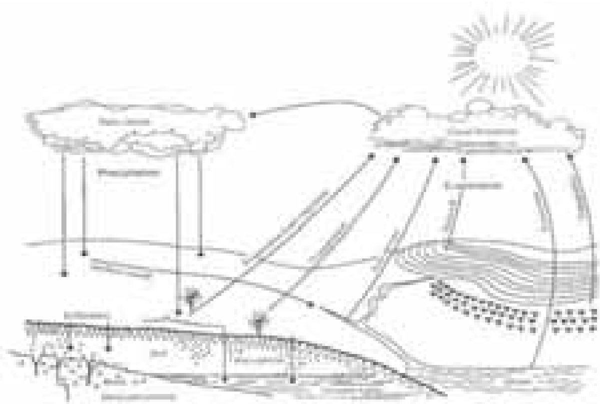
WATER APPLICATION
SOIL-PLANT-ATMOSPHERE SYSTEM
AGRI-ENVIRONMENTAL SUSTAINABILITY
CLIMATOLOGY
AGRICULTURAL PRODUCTION SYSTEMS
AGRICULTURAL ECONOMICS
TERRITORY MANAGEMENT

Overview

Sustainability of natural resources concerning urban food production. Agro-environmental requirements and limitations.

1) In Europe climate change is expected to decrease precipitation and increase temperatures in the summer season. We face specific challenges in urban allotment gardens related to extreme events and water supply.
2) Considering drought periods, gardens will need irrigation solutions to assure crop water requirements. Precipitation extreme events and excessive irrigation tend to cause runoff and flooding damages. Inadequate irrigation design and management will lead to severe problems in water, soil and energy conservation.
3) Those negative impacts lead to the requirement for more sustainable and efficient land use practices, taking into account the interactions between water quantity, quality of soil and water and selected crops.
4) Site-specific studies involving the water balance, regarding a soil-plant-atmosphere system, are a key strategy guideline to ensure a reliable land use management.

Hydrologic Cycle



Water in the Soil-Plant-Atmosphere System

Basic information to approach a water balance (with respect to water application or precipitation):

•Soil texture classes
•Field capacity and water storage
•Soil cover, slope and micro-relief
•Rooting depth
•Infiltration capacity
•Crop coefficient : Kc (curve and factors)
•Weather factors

•Surface runoff
•Drainage-Percolation
•Evapotranspiration : Eto and Etc

•Water quality parameters

Farming urban soils:

1) First steps to identifying risks; the evidence trail

Luke Beesley

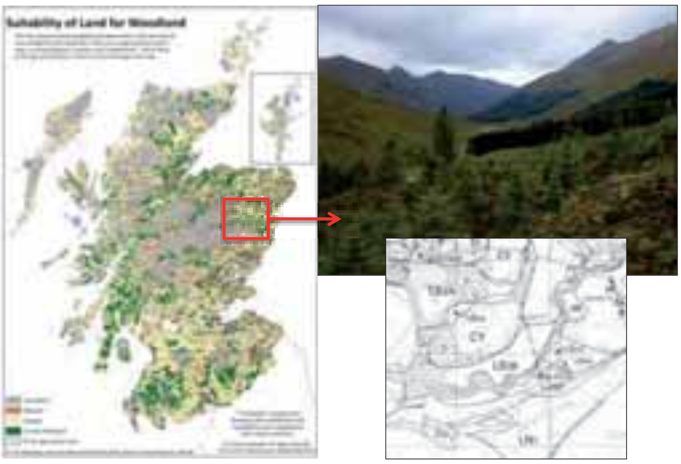
The James Hutton Institute

What are soils?

"Mineral and/or organic materials forming the substrate supporting biological life…"

"Storage areas for carbon and vital nutrients"

"Buffers for toxic contaminants"



"Soils which are disturbed, influenced or added to by the action of humans…"

"and containing the presence of anthropogenic artefacts…"

"visible and invisible"

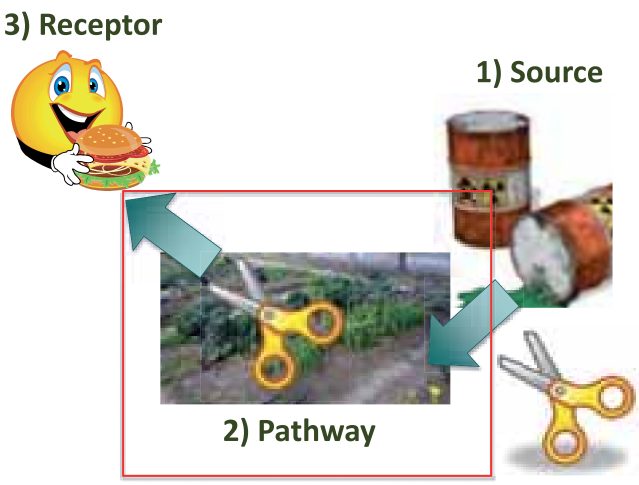
Source: European Commission

"soil sealing and the loss of productive land"

"concentrated and contaminated runoff waters"

"forced to use contaminated and poor quality soils"

Visible	Invisible
 →	Heavy metals, Cd, Ni, etc
 →	Organic contaminants from inks etc
 →	Organic and metal contaminants from paints, preservatives



Key questions in the field:

Sources of risk:
-Point or diffuse
-Historic or contemporary
-Can you identify the visible and invisible ones?
-What simple indicators can you use to help you?

Pathways:
-Direct contact with source, soil etc
-Through eating food grown in risk areas

Receptor:
-Age/demographic
-Exposure/consumption

Joint Training School of COST Actions TU1201 and TD1106

Workshop 4: Social aspects of Urban Food Production

needs - values – perceptions - motivations

Dr. Maria Partalidou Rural Sociologist
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http://rural-lab.agro.auth.gr/staff3.htm

- The first images of the city that come to our minds are buildings, roads, cars, lights, supermarkets open all day, with colorfully packaged food
- In a city that keeps growing bigger and hungrier

We have No idea where our food comes from!

Future Challenges

- Population increases globally
- **Until 2025 over 60% will be living in cities**
- Changes in dietary choices (too much meat=too much energy)
- Unemployment in cities
- Food prices are still going up
- Food miles

Something is really wrong with our food- system

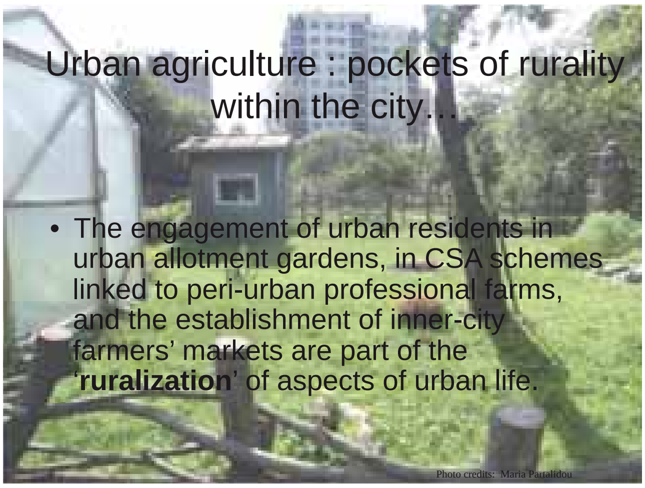
Chaos in food provisioning

We have not been able to cover the needs of a great part of the world

whereas in other parts (mainly in cities) people actually die due to food choices and their attitudes connected to contemporary life in the city

the future of FOOD

is the future of HUMANITY



Urban agriculture : pockets of rurality within the city…

- The engagement of urban residents in urban allotment gardens, in CSA schemes linked to peri-urban professional farms, and the establishment of inner-city farmers' markets are part of the '**ruralization**' of aspects of urban life.

Photo credits: Maria Partalidou

How the workshop will work [16.30-18.30]

1. What is the current situation in your city: **food provisioning** in your homeland. Is it a food desert- food miles? (task for vegetables and fruits) [20' min]

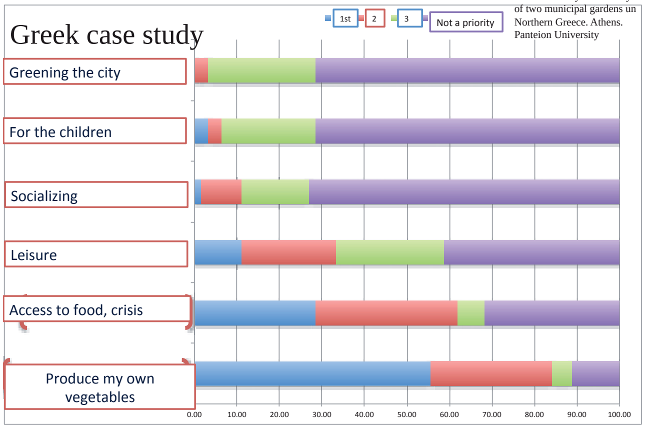
2. Social construction of the rural and the urban : based on photos "sense of urban" and "sense of the rural" [20'min]

Photo credits: Maria Partalidou

The rural is not a unified, discrete and unambiguous space

Motivations for UA

Anthopoulou, T. (dir) (2012) Urban Agriculture. Social Inclusion and sustainable city. Case study of two municipal gardens un Northern Greece. Athens. Panteion University



How the workshop will work [16.30-18.30]

3. Place making of UA They are constructed and imagined as lived places (images of urban agriculture and UGAs based on pictures from homeland) [20 min]

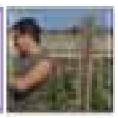
Photo credits: Maria Partalidou

Urbanite with Rural bonds, in their mid 47 years old, **self production motivation**, harmed by crisis, less educated

Urban dwellers, higher educational level, younger, no rural bonds, **greening the city**

Urban background, experienced, **leisure motivation**, free time, higher age (pensioners), all educational levels

Without rural background, harmed by crisis, **self production motivations for food security** . Younger, with lower education no experience in agriculture



Anthopoulou, T. (dir) (2012) Urban Agriculture. Social Inclusion and sustainable city. Case study of two municipal gardens un Northern Greece. Athens. Panteion University

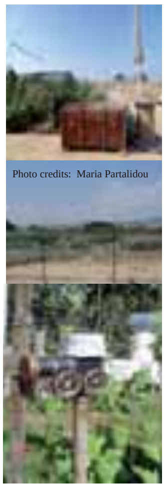
Notes from the field

- **Take photos** of “space configuration”- boundaries “place making” and “personalization of plots”
- **Take notes** (talk to people!!)

“What need/s does the garden cover for you”?

“What was your motive?”

* Write down as much as you can about their personal characteristics (male, female, age, educational level, bonds to the rural, job etc)



How the workshop will work [16.30-18.30]

4. Results from the **matrix of needs** - notes from the ground [30 min]

Short report : how you would answer to the different needs (matrix) by proposing what activities? [30 min]

Introductory presentations: Livada case study

Mojca Nastran, Rozalija Cvejić
Biotechnical Faculty, University of Ljubljana

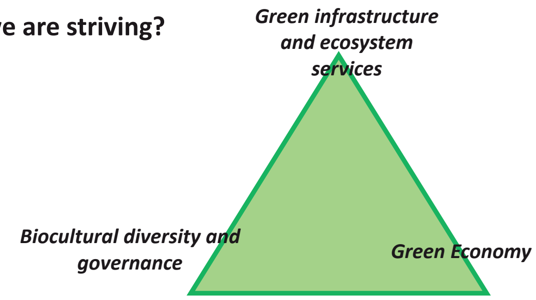
To what we are striving?

Urban Green Infrastructure can be used as a tool for integrated spatial planning and governance to deal with urban challenges, from climate change adaptation and biodiversity loss to enhancing human health and wellbeing, social cohesion and economic sustainability

The most important principles for UGI planning and governance:
Multi-functionality, **connectivity**, **multi-level**, **social inclusiveness** and **adoption of a communicative approach**

strong relationship between UGI and objectives of social cohesion (as well as BD)

To what we are striving?



ecosystem values and functions

- The concept of GI has gained prominence during recent years as a strategic approach to develop “an interconnected network of green space that conserves natural ecosystem values and functions, and that provides associated benefits to human populations”

community participation

- local governments do not always need to act as initiators, implementers and managers, but can instead act as facilitators of initiatives to enhance UGI which are led by other actors. Such diversity in steering methods can boost local efforts to protect and enhance UGI’s, broaden financial sustainability and enrich community particiaption

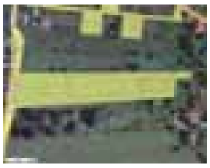
green economy

- UNEP (2011) defines a green economy as one that results in “improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities”. In its simplest expression, a green economy is low-carbon, resource efficient, and socially inclusive. In a green economy, growth in income and employment are driven by public and private investments that reduce carbon emissions and pollution, enhance energy and resource efficiency, and prevent the loss of BD and ESS.

Livada case study

Ljubljana

Livada, Ljubljanica, PRC, road ring



Livada case study

… we did some work at Livada on Monday ☺

From field visit of Livada to Task of the workshop 6:

- Zone new urban green space implementing requirements of both GS and needs of Zavod Bob
- Our task is NOT to end up with a list of wishes and measures, but more!
- Our task is **to create balanced set of measures, equally considering their direct and indirect impacts, that will sucesfully lead towards our goals.**

workshop 6: incomprehensive development of urban food production

Rozalija Cvejić, Mojca Nastran,
Biotechnical facutly, University of Ljubljana

Task of workshop 6:

- Zone new urban green space implementing requirements of both GS and needs of Zavod Bob
- Our task is NOT to end up with a list of wishes and measures, but more!
- Our task is **to create balanced set of measures, equally considering their direct and indirect impacts, that will sucesfully lead towards our goals.**

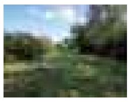
	Aspect	Ecosystem services		Bio-cultural		Green economy	
	Impact						
		heat wave reduction	air quality improvement	collective social action	plant cultivation	social entrepreneurship development	green jobs development
Measure							

Social complexity: operational definition (Radej, 2014)

Approach	simple	complicated	systemic	chaotic	complex
Features					
• triadic conceptualism	P	P + T	P + T	P + T + P +T	P + T + C
• horizontal intermediation	absent	punctual	relational	relational	complete
• evaluation domain *primary*	A, B, C	A, B, C	A, B, C	A, B, C	A, B, C
secondary	none	none	none	a_1,a_2,a_3, ...	ac, ab, cb
• constitution	pillars	intersections	triangle	Sierpinski triangle	Venn diagram
• overlaps	none	point	vertex	vertex	area

To refresh: sites visited ----→ we will form groups

3 groups 2 groups

LIVADA

- 6000 m²
- Intended for community gardens by Municipality
- River Ljubljanica
- Path of Remembrance and Comradeship
- Slight waterlogging
- Outside strict center
- Vicinity of dwellings

SAVLJE


Social learning mechanisms of multi-party collaboration to deliver social learning (van Herk, 2011):

- communities of practice
- learning and action alliance
- socially embedded institutions
- learning platforms or arenas
- learning networks for sustainable development
- learning organisation and networked organisations

- **LEARNING ALLIANCE**

"a group of individuals or organisations with a shared interest in innovation and the scaling-up of innovation, in a topic of mutual interest"

We will help ourselves: Learning alliance with Zavod Bob

- Institute Bob is NGO specialized in project learning of young adults

- the whole is more than the sum of the parts
- don't do everything at once
- programme „under construction"
- temporary use of space
- live space
- creative interaction with neighborhood
- mobility

Desiderata:

- motivation: public interest & window of opportunity
- needs: complex & multidisciplinary, all aspects of development must be met (environmental, social, economic)
- motto: the whole is more than the sum of the parts
- limitations: low installation and maintenance costs
- content
- potential: tangible results in policy-making, design&planning, implementation
- do not forget: how to step out? afterlife?

references

- van Herk, S., Zevenbergen, C., Ashley, R., Rijke, J. (2011). ***Learning and Action Alliances for the integration of flood risk management into urban planning: a new framework from empirical evidence from The Netherlands***. Environmental Science & Policy, 14 (5), 543–554.

Workshop 4: Social aspects of Urban Food Production

needs - values – perceptions - motivations

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Agriculture and the city have been going hand- in- hand for centuries. Nowadays, Urban Food Production is of great importance in contemporary societies; as urbanization is growing, food prices are still going up and food travels from all over the world in order to reach urban dwellers. Amidst the current economic crisis, with alarming phenomena of neo-poverty and malnutrition, UA takes yet another crucial role in supporting vulnerable groups in cities and creating new jobs for unemployed. The module focused on two main points: how did we get to that chaos in food provisioning, the motives and other socioeconomic characteristics of urban farmers (either for hobby, or professionals) and the strengths, weaknesses and difficulties of these initiatives concerning both social and economic aspects.

The workshop was divided into three parts.

The goal of the **first part** was to test an image – based methodology (see Schmid and Patzel, 2010) for the Social construction of the rural and the urban. Students were asked to identify the leading images of the rural and the urban within a set of 50 different given photos.

Onwards students discussed and reflected upon the symbolic and guiding images and how these are constructed by the media or by everyday interaction; elaborating also on their own photos (that they were asked to bring prior to the school as task). Some overall points were that the distinction between 'urban' and 'rural', between the city and the country, is one of the oldest and most pervasive binaries (Woods, 2011) but students believe that today such kind of dichotomic relationships does not exist. Within cities one can find pockets of rurality (ruralisation of aspects of urban life) and vice versa. The point was that we have to see this relationship through the lens of a symbiosis: What the city can do for the rural and what the rural can do and how to take care of the city for the benefits of the society.

At this point students were also asked to identify "what is urban in urban agriculture". And some of their points are raised here.

1. the opportunity to organize meetings/ workshops/ events with different people from different backgrounds/ education. Urban Agriculture is really important for socialization into the city, to build social ties in the neighbourhood, for social integration of foreigners, to improve quality of deprived neighbourhoods. Urban Agriculture supports learning processes especially due to the practical activities (learning by doing) and the high sharing of ideas opinions in the garden. Urban Agriculture supports the improvement of civic duty, participation and action by the citizens. Through the "rural" practices, participants can improve the "urban" quality of life and wellbeing of their city.
2. "Urban" in Urban Agriculture is sense of place
3. Social : doing together
4. Its location within the urban area
5. Quantitative (% grey VS green)
6. Spontaneous and experimental gardening, not professional
7. if the garden is surrounded by contemporary buildings, it creates ambience of urban. In the opposite, if it is surrounded by houses in agricultural fields it is rural.
8. Its link and the ability access with/ to urban population
9. The limitations, demands and needs coming from "urbanity" of life and place
10. Purely spatial definition (land use) Agriculture= growing food & Urban= complex land use (Built up, Residence, Entertainment, Transport infrastructure, Industry)
11. More/ different infrastructure, facilities and opportunities through the proximity to the city and many people at one place (city).
12. Reduce food miles, could be agricultural activity between the concrete buildings.
13. The connection between farm activities with the city/ citizens. Farmers change their business model to connect with the costumers (direct sales, educational and leisure activities).
14. Urban people visiting the farm.
15. the actors, the air, immediate proximity of farm to central services and population centre, people and setting, the closest place portraits free
16. As landscape architect, I consider Urban Agriculture as a must and I believe Urban Agriculture is about multifunctionality and bringing together uses that do not naturally come together. For example, a park that is productive in a very dense urban area, centrally in the city. The park provides value for a farmer to live from; it is maintained only from the farmer and is a place for citizens to be in agriculture areas.
17. Urban is a "fancy" label nothing more, related (functionally or spatially) to or included in the urban area.
18. why does it matter???

During the **second part** of the workshop students were introduced to another binary "local or global" food systems. The aim of this task was to identify the actors in the food system, what are the emerging issues, how do we feed the city, what small farmers, in the peri-urban can do etc. Using the tables provided by the students (asked to develop prior to the school) students articulated the current situation in their city: food provisioning in their homeland and food miles (Lang, 2005)? Finally they discussed on what do they consider as «local» (Committe of the Regions, 2011) Some of the issues raised was that people, especially in cities, do not really know where food comes from, as they are detached from the rural and the actual food production and this distance between the production and consumption is not only a geographical or economical one but it is also a social and political distance. People are disconnected from the political, environmental, economic and social impacts of their food choices.

The **third part** of the workshop was devoted to urban garden allotments. The students got familiar to emerging food provisioning practices such as urban agriculture and how it contributes to social inclusion. They were introduced to the results of FOODMETRES project (The 7th Framework Programme funded by European Commission) by Majda Černič Istenič with special focus on the identification of social groups to which gardeners belong, their motivations to grow their own food and their perception of ecological and social benefits of growing own food. They were divided into groups and one representative of the Zavod BOB network was appointed to them in order to elaborate on the needs and motivations of the group. Students were asked to make a list of needs and motives for the Zavod BOB case and propose tailored made actions for the urban garden. Each group gave an oral short presentation of the proposal.

References:

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Woods, M. (2011). Key Ideas in Geography, Rural Series eds: Sarah Holloway, and Gill Valentine, Routledge.

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Who are the gardeners and what motivate them to grow their own food?
Results from FOODMETRES

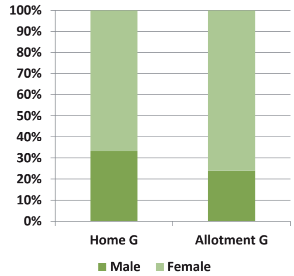
Majda Černič Istenič
University Ljubljana
Biotechnical Faculty

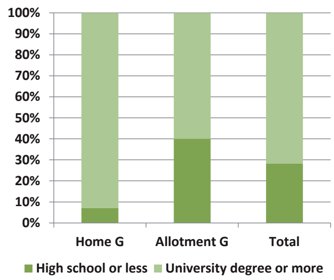
Sample of the survey

- Internet survey carried out during May – July 2014
- Sample:

	N	%
Home gardeners	36	53,7
Public and private allotment gardeners	31	46,3
Total	67	100,0

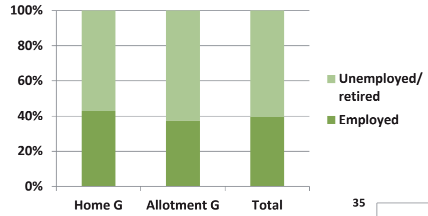
Gender, age and education

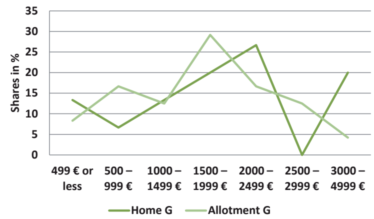




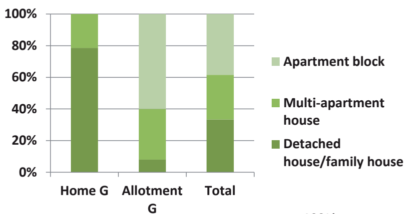
Mean age: 56,8, no statistical significant differences among groups

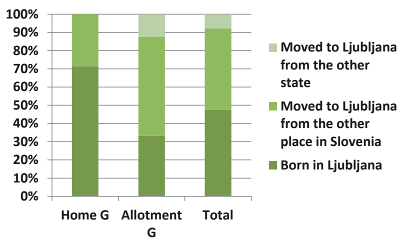
Working status and income class



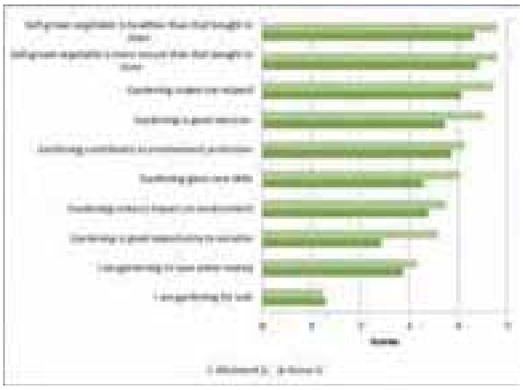


Type of housing and origin of residence



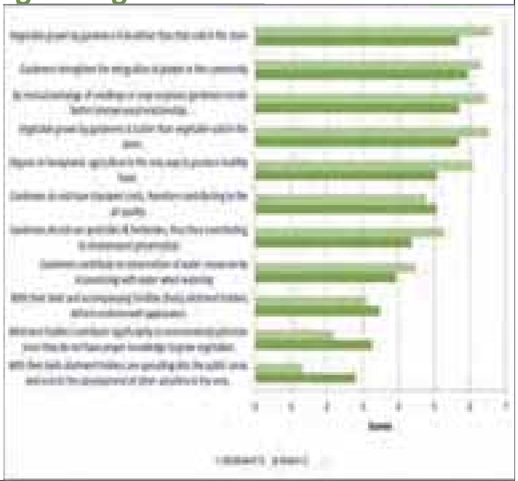


Motivations for growing own food



- In both groups grow your own is more related to own personal benefits (healthy and safe food, relaxation and exercise) than to environmental benefits, but significantly less to save money

Perception of ecological and social benefits of growing own food



- Organic food production is more valued by Allotment holders than Home gardeners
- Home gardeners are critical towards ecological impacts of Allotment holders' practices
- The awareness of the impact of urban gardening on ''Zero carbon footprint'' is not very high in both groups

What are your observations?

URBAN FOOD PRODUCTION: ENVIRONMENTAL CHALLENGE

Field Work

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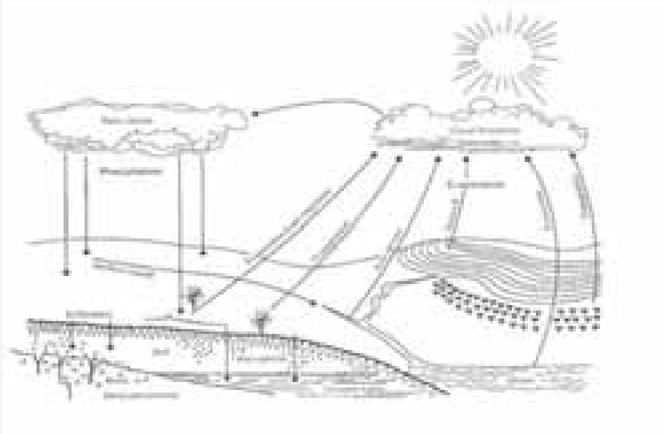
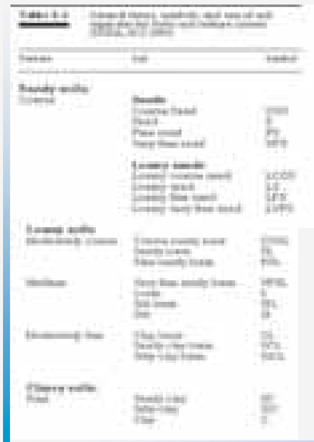
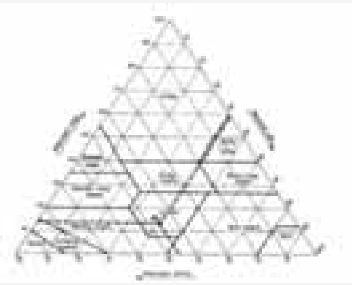
Hydrologic Cycle

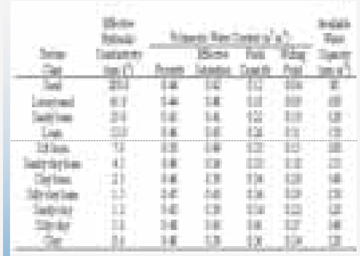


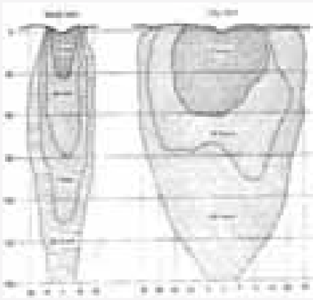
Soil. Texture Classes





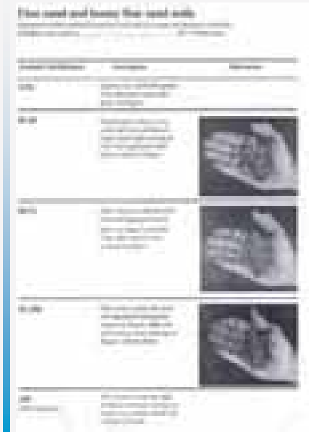
Soil-Water





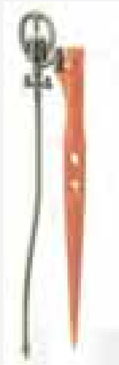
Soil-Water

Soil-Water

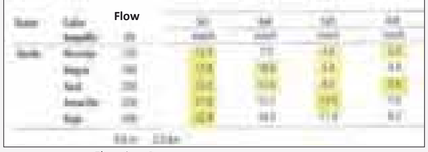


Soil-Water

Irrigation (Microsprinkler catalogue)



Microsprinkler spacing and application rate



Application Rate (mm/h) = Flow (L/h) / Area (m²)
Water application = Application rate x time

<u>Evaluation of an irrigation period of 3 hours</u>:

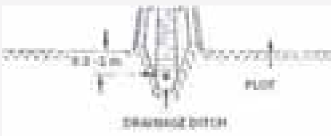
Possibilities of surface runoff and percolation:

a) Application rate – Infiltration capacity
b) Water application – Available water capacity

considering sandy loam and clay loam soils (0.5 m depth):

(1 mm = 1 L/m²) (irrigation without water losses)

Drainage



URBAN FOOD PRODUCTION: ENVIRONMENTAL CHALLENGES

Workshop (3)

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Introduction

1) The improvement of water governance must take into account the resources conservation (soil, water and energy) as well as the competitiveness of the agro-forestry management. Climate factors uncertainty determine the need for more suitable technologies on farm irrigation projects, adequate to each specific soil-plant-atmosphere system.

2) Design and management solutions in the irrigation sector shall solve conflicts concerning technical, environmental and economic issues.

3) The implementation of political strategies promoting irrigation evaluation frameworks, to assure an integrated and appropriate water management since consistent criteria and indicators are selected (and generated by advanced research), may be an effective way to avoid practices with negative impact.

Agro-Environmental Indicators

a) WATER USE
- Water use intensity (water amounts)
- Water stress (crop susceptibility to water deficit, evapotranspiration)
- Water use efficiency-uniformity (runoff, percolation)

b) WATER QUALITY
- Water contamination (pollution, nutrients and pesticides)
- Salinity and Alcalinity

c) SOIL QUALITY – LAND CONSERVATION
- Physical properties and conditions (depth, texture, structure, compaction, crust sealing)
- Hydro-dynamic parameters (Ks, water holding capacity)
- Soil erosion (erodibility)
- Fertility (organic matter)
- Salinity and Alcalinity (SAR)
- Topography (slope, relief)

d) OTHER ECOLOGICAL ISSUES
- Groundwater (level)
- Energy conservation(pumping efficiency)
- Crops (rotation and adaptation)

Irrigation Selection

Crop	Soil	Water	Climate
Crops grown & rotation	AWC	Quality	Wind
Water requirement	Infiltration rate	salts, toxic elements	Rainfall
Height	Depth	sediment	Frost conditions
Cultural practices	to water table	organic materials	Humidity
Pests	to impervious layer	fish, aquatic creatures	Temperature extremes
Tolerance to spray	Drainage	Quantity	Rainfall frequency
Toxicity limitations	surface	Reliability	Evaporation from
Allowable MAD level	subsurface	Source	plant leaves and stems
Climate Control	Condition	stream	soil surface
Frost protection	Uniformity	reservoir	Solar radiation
cooling	Stoniness	well	
Diseases & Control	Slope (s)	delivery ground	
Crop quality	Surface texture	Delivery schedule	
Planned yield	Profile texture	frequency	
	Structure	duration	
	Fertility	rate	
	Temporal properties		

Source: USDA. 1997. National Engineering Handbook. Irrigation guide

Water in the Soil-Plant-Atmosphere System

Basic information to approach a water balance (with respect to water application or precipitation):

- Soil texture classes
- Field capacity and water storage
- Soil cover, slope and micro-relief
- Rooting depth
- Infiltration capacity
- Crop coefficient : Kc (curve and factors)
- Weather factors

- Surface runoff
- Drainage-Percolation
- Evapotranspiration : Eto and Etc

- Water quality parameters

Soil-Water

SOIL WATER RELATIONSHIP
(FAO, 2001 "Handbook on Pressurized Irrigation Techniques")

TABLE 6.1 - Soil physical properties (average values)

Type of soil	Light (coarse) texture	Medium texture	Heavy (fine) texture
Saturation capacity (SC) % weight	25–35%	35–45%	55–65%
Field capacity (FC) % weight	8–10%	18–26%	32–42%
Wilting point (WP) % weight	4–5%	10–14%	20–24%
SC/FC	2/1	2/1	2/1
FC/WP	2/1	1.85/1	1.75/1
Bulk density/volume weight	1.4–1.6 g/cm³	1.2–1.4 g/cm³	1.0–1.2 g/cm³
Soil available water (moisture) by volume (FC-WP x bulk density)	6%	12%	16–20%
Available moisture (Sa) in mm per metre soil depth (FC-WP x bulk density x 10)	85 mm	120 mm	160–200 mm
Soil water tension in bars:			
• at field capacity	0.1	0.2	0.3
• at wilting point	15.0	15.0	15.0
Time required from saturation to field capacity	18–24 h	24–36 h	36–48 h
Infiltration rate	25–75 mm/h	8–16 mm/h	2–6 mm/h

Soil-Water

Texture Class	Effective Hydraulic Conductivity (mm h^{-1})	Volumetric Water Content (m^3 m^{-3}): Porosity	Effective Saturation	Field Capacity	Wilting Point	Available Water Capacity (mm m^{-1})
Sand	200.0	0.44	0.42	0.12	0.04	80
Loamy sand	61.0	0.44	0.40	0.18	0.08	100
Sandy loam	25.0	0.45	0.41	0.22	0.10	120
Loam	13.0	0.46	0.43	0.26	0.11	150
Silt loam	7.0	0.50	0.49	0.33	0.15	180
Sandy clay loam	4.5	0.40	0.36	0.33	0.18	155
Clay loam	2.5	0.46	0.39	0.34	0.20	140
Silty clay loam	1.5	0.47	0.43	0.34	0.19	150
Sandy clay	1.2	0.43	0.39	0.34	0.22	120
Silty clay	1.0	0.48	0.43	0.41	0.27	140
Clay	0.6	0.48	0.39	0.36	0.24	120

Crop Water Requirements

Reference crop evapotranspiration (ETo)	The rate of evapotranspiration from an extensive surface of 8-15 cm tall green grass cover, actively growing, completely shading the ground and not short of water. Alternative approaches for estimating ETo are the radiation, the Penman and the Pan Evaporation (presented in FAO bulletin Irrigation and Drainage No 24). In all methods is expressed in millimeter per day mean value over 10 or 30 days period. ETo data are normally available in all countries. They can also be computed from climatic data.
Crop coefficient (K_c)	A factor used to modify potential evapotranspiration. (1) Ratio between crop evapotranspiration (ET_c) and the reference crop (ET_o) when crop is grown in large fields under optimum growing conditions, or $ET_c = K_c$ times ET_o. (2) The ratio of the actual crop evapotranspiration to its potential evapotranspiration.
Crop evapotranspiration (ET_c)	The amount of water used by the crop in transpiration and building of plant tissue, and that evaporated from adjacent soil or intercepted by plant foliage. It is expressed as depth in inches or as volume in acre inches per acre. It can be daily, peak, design, monthly, or seasonal. Sometimes referred to as consumptive use (CU).

Crop-Soil-Water

Design Components - Layout

The design process for a suitable pressurized irrigation system leads to a set of technical specifications comprising:

1) System capacity (flow)
2) Selection of emitters (flow, distance, discharge rates and pressures) and irrigation layout (pipelines and plots)
3) Water pumping (according to pressure and flow calculations)

In all piped systems the main component parts (Figure 3.1) are:

- the control station (head control unit);
- the mains and submains (pipelines);
- the hydrants;
- the manifolds (feeder pipelines);
- the laterals (irrigating pipelines) with the emitters.

FIGURE 3.1 - Scheme of a network layout

Irrigation (Sprinkler catalogue)

Irrigation (Microsprinkler catalogue)

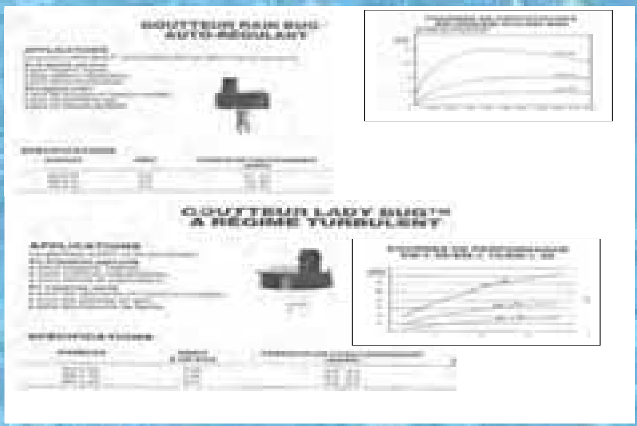
MODÈLES DISPONIBLES

TABLEAU DE PERFORMANCES ET SPÉCIFICATIONS

CARACTÉRISTIQUES

AVANTAGES

Irrigation (Drip catalogue)



Irrigation (Drip)

In drip irrigation, water is applied to each plant separately in small, frequent, precise quantities through dripper emitters. It is the most advanced irrigation method with the highest application efficiency. The water is delivered continuously in drops at the same point and moves into the soil and wets the root zone vertically by gravity and laterally by capillary action. The planted area is only partially wetted.

In medium heavy soils of good structure, the lateral movement of the water beneath the surface is greater than in sandy soils (Table 14.1). Moreover, when the discharge rate of the dripper exceeds the soil intake rate and hydraulic conductivity, the water ponds on the surface. This results in the moisture being distributed more laterally rather than vertically. The following water lateral spread values are indicative:

TABLE 14.1 - Type of soil and average radius of water spread laterally with drippers

Type of soil	Average radius of water spread
Light texture	[illegible]
Medium texture	[illegible]
Fine texture	[illegible]

Water Quality

WATER QUALITY-RELATED PROBLEMS IN IRRIGATED AGRICULTURE

SALINITY

Salts in soil or water reduce water availability to the crop to such an extent that yield is affected.

WATER INFILTRATION RATE

Relatively high sodium or low calcium content of soil or water reduces the rate at which irrigation water enters soil to such an extent that sufficient water cannot be infiltrated to supply the crop adequately from one irrigation to the next.

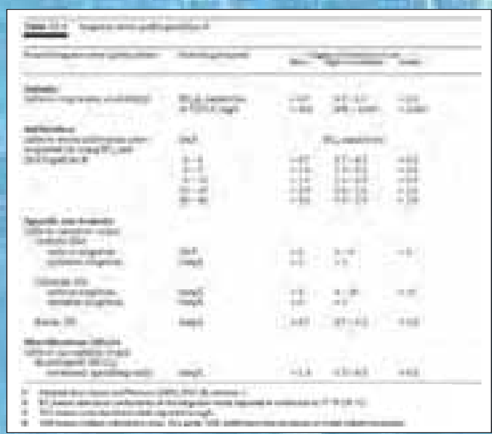
SPECIFIC ION TOXICITY

Certain ions (sodium, chloride, or boron) from soil or water accumulate in a sensitive crop to concentrations high enough to cause crop damage and reduce yields.

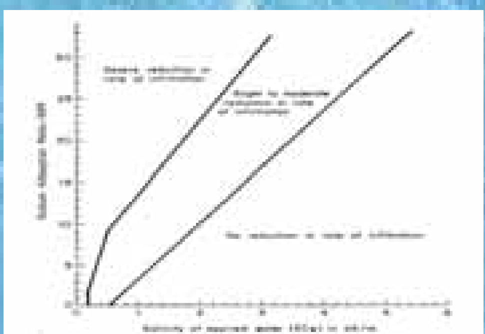
MISCELLANEOUS

Excessive nutrients reduce yield or quality; unsightly deposits on fruit or foliage reduce marketability; excessive corrosion of equipment increases maintenance and repairs.

Water Quality



Water Quality



Main References (online)

FAO. 2007. Handbook on pressurized irrigation techniques. FAO Water Development and Management Unit and International Programme for technology and research in irrigation and drainage (IPTRID). Rome. (282 p.)

USDA. 1997. National engineering handbook: Irrigation guide. NRCS. Washington, DC. (754 p.)

URBAN FOOD PRODUCTION: ENVIRONMENTAL CHALLENGES

Annexes

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Soil profile	The whole arrangement of different layers (horizons) from top to bottom, from soil surface to mother rock. The top layer, called "A" horizon, is normally cultivated for crops. The layer below is called horizon "B" usually with higher clay content and further below is horizon "C". Horizons "A" and "B" can be defined as the soil. Soils formed under different conditions have different profiles. Young soils formed by alluvial materials have moderate or no profile development and sometimes show a significant variation in texture within the depth of the root zone. An average depth of 75 cm and even less is suitable nearly for all kind of crops. Under modern irrigation and nutrient supply methods (fertigation) soil depths of 45 cm are sufficient for most vegetables and shallow root trees.

Bulk density	Mass of dry soil per unit volume, determined by drying to constant weight at 105 °C, usually expressed as gm/cc or lb/ft³. Rock fragments 2 mm or larger are usually excluded or corrected for after measurement.

Soil moisture [illegible]	[illegible]

Soil available moisture (Sa)	Available moisture or water is the percentage content of water in the soil in the range between Field Capacity and Wilting Point. It is the principal source of water for plants and is usually called as capillary water. Available Water Sa % = FC% – WP% [illegible]

Available water capacity (AWC):
The portion of water in a soil that can be readily absorbed by plant roots of most crops, expressed in inches per inch, inches per foot, or total inches for a specific soil depth. It is the amount of water stored in the soil between field capacity (FC) and permanent wilting point (WP). It is typically adjusted for salinity (electrical conductivity) and rock fragment content. Also called available water holding capacity (AWHC). (= Sa)

Readily available moisture (RAM)	The state of moisture in the soil, which amounts 40 to 75 percent of the total available moisture (Sa) easily absorbed by the plants. It is the product of the Sa multiplied by P (fraction) maximum permissible moisture deficit or depletion of the Sa in percentage form. Readily available moisture = Sa x P
Management allowed depletion (MAD) (= P)	The planned soil moisture deficit at the time of irrigation. It can be expressed as the percentage of available soil water capacity or as the depth of water that has been depleted from the root zone. Sometimes called allowable soil depletion.

RAM = Sa x P

or

RAM = AWC x MAD

Infiltration, infiltration rate
The downward flow of water into the soil at the air-soil interface. Water enters the soil through pores, cracks, wormholes, decayed-root holes, and cavities introduced by tillage. The rate at which water enters soil is called intake rate or infiltration rate.

Soil permeability	It is the readiness with which the soil conducts or transmits water. It is quantitatively defined as Hydraulic Conductivity (K) and greatly depends on the soil texture and the quality of the irrigation water.

Hydraulic conductivity
The ability of a soil to transmit water flow through it by a unit hydraulic gradient. It is the coefficient k in Darcy's Law. Darcy's Law is used to express flux density (volume of water flowing through a unit cross-sectional area per unit of time). It is usually expressed in length per time (velocity) units, i.e., [illegible] Sometimes called permeability.

Soil moisture deficit	The amount of water that must be applied to the soil to cause through drainage.
Percolation rate	The maximum rate at which water will flow into the subsoil from the topsoil under specific conditions, expressed in millimeters per hour or day.

Electrical conductivity (EC)
A measure of the ability of the soil water to transfer an electrical charge. Used as an indicator for the estimation of salt concentration, measured in mmhos/cm (dS/m), at 77 °F (25 °C).

EC_e = Electrical conductivity of soil water extract.
EC_i = Electrical conductivity of irrigation water.
EC_{aw} = Electrical conductivity of applied water.

Sodium adsorption ratio (SAR)	[illegible]

Main References (online)

FAO. 2007. Handbook on pressurized irrigation techniques. FAO Water Development and Management Unit and International Programme for technology and research in irrigation and drainage (IPTRID). Rome. (282 p.)

USDA. 1997. National engineering handbook: Irrigation guide. NRCS. Washington, DC. (754 p.)

PRESSURIZED IRRIGATION – SPRINKLER

SAMPLE CALCULATION (Excluding: System capacity, Total pressure, Pumping power and Layout with pipes and subunits/plots):

GIVEN:

Urban Allotment garden area (A): 0.5 ha

Crop Water Requirements:

Crop selection: Beans

Reference Crop Evapotranspiration - ETo (meteorological broadcast/historical series) – 5 mm/day

Crop Coefficient – Kc: 1.1

Crop Evapotranspiration – Etc = ET0 x Kc: 5.5 mm/day

Soil:

Soil Texture: Sandy loam

Water Application - Sprinkler System:

Spacing (sp x sp) – 12 x 12 m; Pressure – 2 Bar (Catalogue F33); Application Efficiency (AE) – 80%; Irrigation duration (T) - 3 hours

Calculation:

Available Water Capacity – AWC=Sa (table) --------------------------------

Management Allowable Depletion – MAD (table 3.3) ---------------------

Rooting Depth – Rd (table 3.4): ---

Water - Maximum Net Depth (mm) (AWC x MAD x Rd): ------------------

Sprinkler Irrigated Area (a = sp x sp): ---------------------------------------

Layout - Number of sprinklers (A/a): ---------------------------------------

Sprinkler Discharge - Dc (catalogue): --

Application Rate - AR (precipitation) - (Dc/a): ----------------------------

Net Irrigation Depth - D – (AR x T x AE): -----------------------------------

Irrigation Interval (D/ETc): --

Evaluation of irrigation scheduling:
Soil texture
Irrigation duration 6 hours
Same D but Irrigation interval of 4 days

PRESSURIZED IRRIGATION – SPRINKLER

SAMPLE CALCULATION (Excluding: System capacity, Total pressure, Pumping power and Layout with pipes and subunits/plots):

GIVEN:

Urban Allotment garden area (A): 0.5 ha

Crop Water Requirements:

Crop selection: Beans

Reference Crop Evapotranspiration - ETo (meteorological broadcast/historical series) – 5 mm/day

Crop Coefficient – Kc: 1.1

Crop Evapotranspiration – Etc = ET0 x Kc: 5.5 mm/day

Soil:

Soil Texture: Sandy loam

Water Application - Sprinkler System:

Spacing (sp x sp) – 12 x 12 m; Pressure – 2 Bar (Catalogue F33); Application Efficiency (AE) – 80%; Irrigation duration (T) - 3 hours

Calculation:

Available Water Capacity – AWC=Sa (table) -------------------------------- 120 mm/m

Management Allowable Depletion – MAD (table 3.3) --------------------- 40%

Rooting Depth – Rd (table 3.4): --- 0.6 m

Water - Maximum Net Depth (mm) (AWC x MAD x Rd): ------------------ 29 mm

Irrigated Area (a = sp x sp): -- 144 m^2

Layout - Number of sprinklers (A/a): --------------------------------------- 35

Sprinkler Discharge - Dc (catalogue): -- 1020 L/h

Application Rate - AR (precipitation) - (Dc/a): ---------------------------- 7.1 mm/h

Net Irrigation Depth - D – (AR x T x AE): ----------------------------------- 17.1 mm

Irrigation Interval (D/ETc): -- 3 days

Evaluation of irrigation scheduling.
Soil texture. Sandy Loam. Ks = 25 mm/h. Clay loam soil: Ks = 2.5 mm/h < 7.1 mm/h. Thus, runoff/ponding problems (but first hour infiltration is above 2.5...)depending also on surface storage: slope (>5%) and residues (table "3")
Irrigation duration 6 hours: 6 x 5.7 = 34.2 mm > 29. Thus, percolation problems
Same D but Irrigation interval of 4 days: 5.5 x 4 = 22 mm of Etc > 17.1 mm. Thus, water deficits (Potential problems. Example: no soil water storage to compensate)

Obs: with drip irrigation systems, wetted or shade areas may influence application rates calculation and ETc

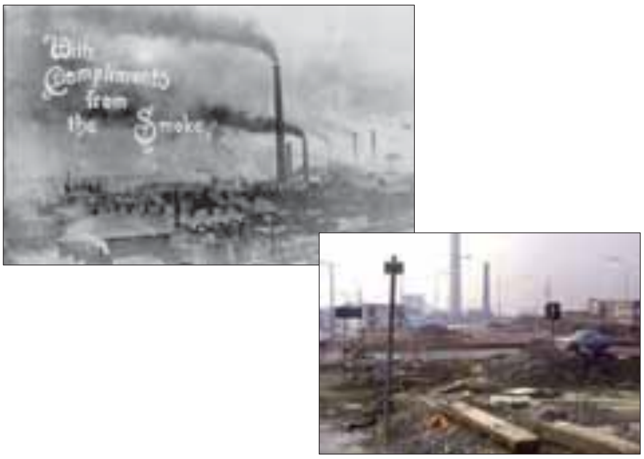
Farming urban soils:

2) Exploring and mitigating hazards

Luke Beesley

The James Hutton Institute

Where's the risk?



A)..?
B)..?
C)..?
D)..?
G/H)..?

What do we measure?

The total amount of contaminant in the soil (%, or mg/kg). By X-ray scanning or acid digesting soils.

The soluble concentration of contaminant extracted from the water in soil pore spaces (mg/l). By vacuum extraction of soil pore water.

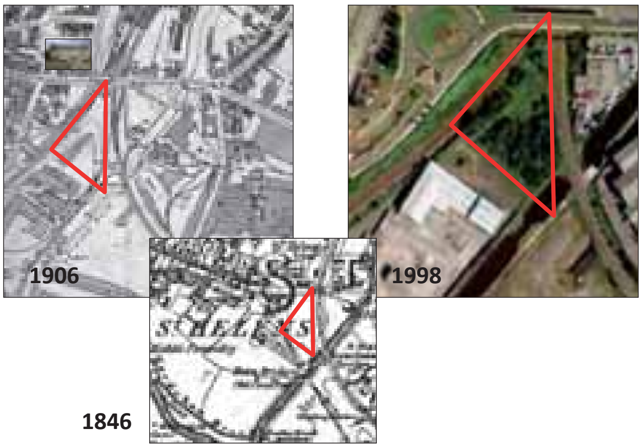
Tells us about the contaminants that can leach to waters or be taken up by plant roots

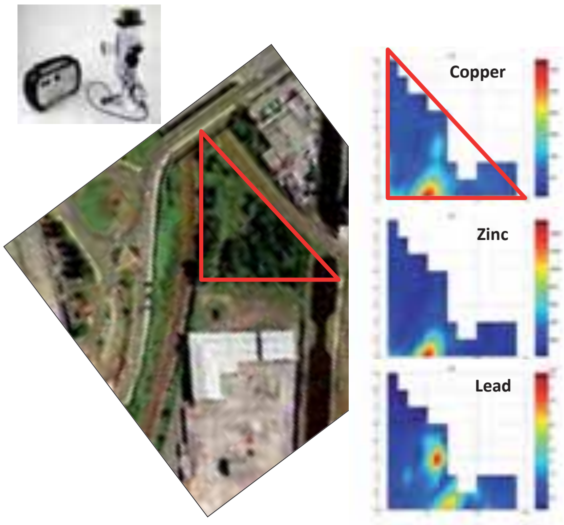
Case study; UK community garden

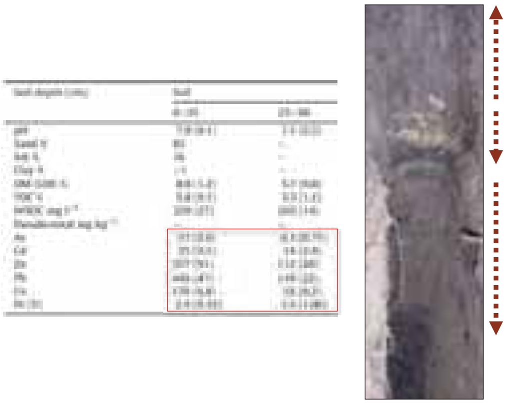
-Rapid local industrialisation 1850-1950

-Not disturbed soils, but aerial pollution

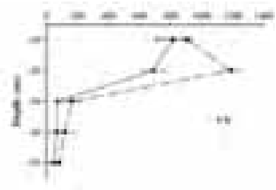
-Previous investigations into contaminated lettuces etc







Source: Clemente et al, 2008



-Previous industrial activity reflected in soil composition

-Measuring the 'total' and the 'plant available' concentrations

-Measuring the concentration in plant matter

UK Soil guide values

mg kg^{-1}	As	Cd
Residential 'direct contact with soil'	32	10
Allotments 'eating produce grown in soil'	43	1.8
Industrial	630	230

Which land use?

Case study; central Madrid gardens

F. El Retiro

-City central park

-Local authority site, planned, managed, wastes and soils controlled

-Education centre on site

D. Esta Es Una Plaza

-Derelict land, previously industrial?

-Use of local soils in beds and terraces

-Community led projects

1. Collect soils & crops

2. Prepare samples in lab

3. Scan & analyse samples

Soils

Site	Initial findings	Sources
D. Esta Es Una Plaza	Medium/high level Ag, Hg, Pb	Old metal plating industry
F. Retiro	Low level Pb	Traffic emissions

Crops

Site	Initial findings	Impacts
D. Esta Es Una Plaza	Tobacco with Ag, Cu, Hg, Pb	Direct intake of metals
F. Retiro	Low level Pb	Minimal intake of metals

What are your next steps…

-More samples, more analysis?

-Survey people on their intake of crops?

-Restrict children playing in the soil?

-Close the site down and remediate soils?

Discuss the options…

Farming urban soils:

3) Adding environmental value

Luke Beesley

The James Hutton Institute

‘Improving’ soils?

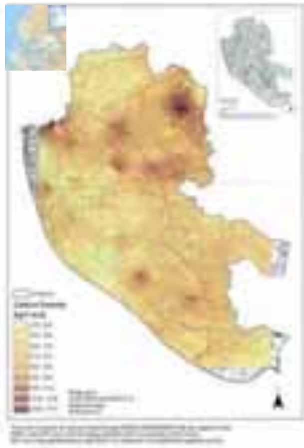
-Tillage & ground preparation

-Adding organic fertilisers…

…composts, manures, ash waste etc

…can add C, N and other nutrients

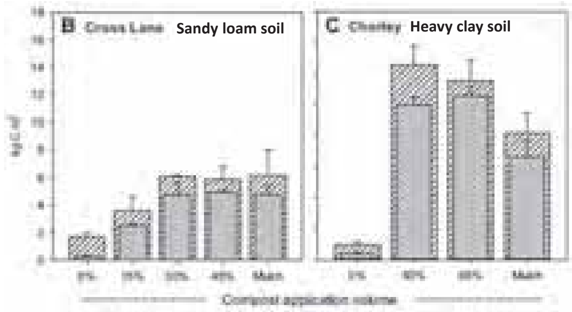
…and can increase pH in acid soils

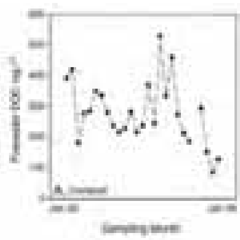


-Urban green-spaces can store C…

-especially when compost is applied

-urban soils can be manufactured to store C

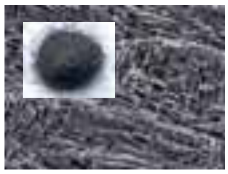




-Adding compost changes soil chemistry

-Carbon dissolved in water acts as a ‘carrier’ for contaminants

-Thus, adding compost can cause contaminants to be more ‘mobile’ within the environment



-Adding biochar adds lots of carbon, but negligible nitrogen

-Large surface area can ‘adsorb’ contaminants

-Plants may avoid it

-Some urban wastes may contain contaminants

-Painted and preservative treated wood contains As, Cr, Cu and other metals

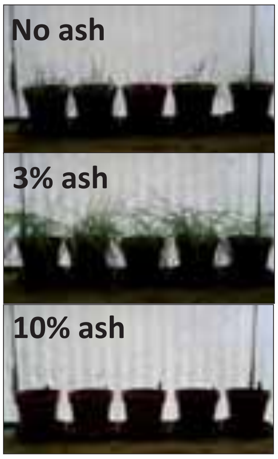
-When burned the following ash is a concentrated source of metals

Wood ash experiment; farm example

-Wood ash from local biomass energy boiler

-Mixed sources of wood, some 'virgin' other painted etc

-Added ash to soils at 3 and 10% volumes and grew Ryegrass

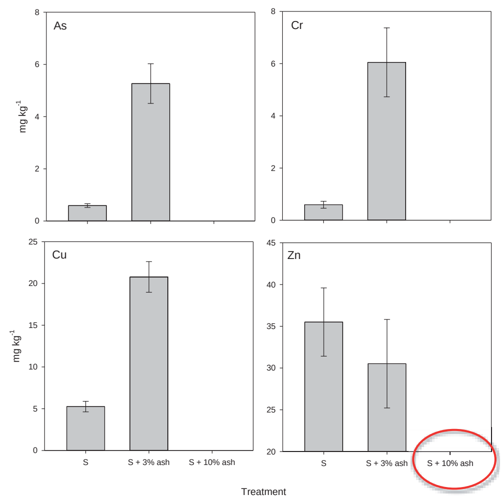


-Soil pH increased from 5 to 7.5

-Low amounts of ash increased Ryegrass biomass

-High amounts of ash; no plant growth

-Contaminants in plants?



Results

-Low amounts of ash increase pH, adds some useful nutrients and produce more biomass

-Increases in contaminants found in Ryegrass; impacts for grazing animals, crop plants etc

-Too much ash completely toxic; no plants will grow

Options

-Be careful to burn non contaminated woods?

-Add only small amounts of ash…how much?

-What can you recommend?

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Harmony Park: A Decision Case on Gardening on a Brownfield Site

Ashley Marie Raes Harms, DeAnn Ricks Presley,* Ganga M. Hettiarachchi, Chammi Attanayake, Sabine Martin, and Steven J. Thien

ABSTRACT In March of 2009, Mr. John Holloway and his neighbors in the Harmony Park district of Kansas City, MO, were excited to begin gardening on a vacant city lot in their neighborhood. The neighborhood, like many in urban areas, had once been residential interspersed with small establishments including restaurants, shops, and businesses such as auto body shops and gas stations. The under-utilized lot had once had multiple abandoned houses on it that had been torn down about two decades earlier, but since then the lot had been empty, overgrown with weeds, and a neighborhood eyesore. Mr. Holloway, a leader in his community, hoped that a community garden would not only improve the aesthetics of his neighborhood, but also provide a local, inexpensive source of fresh fruits and vegetables for his neighborhood, which is located in a food desert. When concerns arose about soil contaminants on the site, Mr. Holloway grew panicked that a community garden on a brownfield site would do more harm than good in his neighborhood. This case focuses on Mr. Holloway's decision of whether to continue gardening on the brownfield site in Harmony Park. The decision requires that students evaluate environmental, agronomic, human health, social, and economic issues related to the problem Mr. Holloway faces. Objectives of this case are for students to analyze and discuss data and concepts related to gardening on brownfield sites, urban soil contamination, urban food deserts, and human health.

In 2010, 83.7% of the United States population was living in urban areas, and that percentage is projected to increase in the future (U.S. Census Bureau, 2011); however, this population growth is not uniform throughout the various neighborhoods in cities. Many urban neighborhoods with higher poverty rates (30% or greater) have experienced a rapid decline in population since the 1980s. Nearly 15% of urban land in U.S. cities, or approximately 1,800 hectares per city, is vacant or abandoned (Pagano and Bowman, 2000). As urban populations transitioned to suburbs, inner-city businesses, houses, and parking lots were abandoned or razed, leaving open, vacant lots. Publicly and privately owned vacant lands and brownfields in many U.S. cities are quickly being converted to urban gardens and farms by individuals, families, neighborhoods, schools, nonprofit organizations, and many other groups or organizations. According to the Small Business Liability Relief and Brownfields Revitalization Act (U.S. Government Printing Office, 2002), *brownfields* are defined as "real property of which the expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."

The United States has an estimated 450,000 to 1 million brownfields, many of which are often considered potential gardening sites due to their proximity to residential areas. This problem case is based on an actual situation faced by a neighborhood group that established a community garden on a brownfield site. Recommendation for best management practices (BMP) based on soil analyses for both agronomic and environmental parameters must be made to reduce any potential risk from gardening in the contaminated soil.

20 February 2008

John Holloway grew up in Harmony Park, and he built his life and career in this area of Kansas City. He saw first-hand that more and more of the neighborhood's houses were left empty, unkempt, and eventually boarded up or razed. Mr. Holloway knew that he had to do something to remedy this and improve his neighborhood, his lifelong home. He was concerned that if nothing was done, his neighborhood would become nothing but endless vacant, unused lots and unsafe structures. Mr. Holloway envisioned a more prosperous and vibrant future for his neighborhood and fellow neighbors.

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Abbreviations: BMP, best management practice; DDE, dichlorodiphenyldichloroethane; DDT, dichlorodiphenyltrichloroethane; FDA, Food and Drug Administration; GPS, global positioning system; ICP-OES, inductively coupled plasma optical emission spectrometer; USDA-NRCS, United States Department of Agriculture Natural Resources Conservation Service; USEPA, United States Environmental Protection Agency; XRF, x-ray fluorescence spectrophotometer.

Neighborhood History

A great deal of Kansas City's African-American history took place in the area of the city that included Harmony Park, and many of the city's notable African-American leaders once resided here. In the last 50 years, the neighborhood experienced a population decline from 11,700 to 2,500. In 2008, nearly 38 hectares or approximately 25% of the land area in the Harmony Park neighborhood was vacant lots. After the decline in population, many historic buildings and residences fell into disrepair, and vacant lots turned into weedy sites or were used for illegal trash dumping. The sights of boarded-up homes and businesses and the demolition of condemned structures were not uncommon. A decline in the number of businesses throughout the Harmony Park neighborhood also forces current residents to travel farther from home for basic needs such as groceries, fresh produce, medicines, and clothing.

Fig. 1. Michigan Avenue vacant lot prior to garden establishment.

A Neighborhood in a Food Desert

Low-income, minority neighborhoods in many cities throughout the United States are often disproportionately located in food deserts (Chung and Myers, 1999; Powell et al., 2007; Zenk et al., 2005). A *food desert*, as defined by Cummins and Macintyre (2002) is a "poor urban area, where residents cannot buy affordable, healthy foods." The lack of access to healthy, fresh, affordable foods threatens the well-being of millions of Americans who live within food deserts, including the residents of Harmony Park.

Low-income urban residents face many obstacles to eating a healthy diet; one is a shortage of places to shop. Poorer neighborhoods throughout the United States have nearly 30% fewer supermarkets than the highest-income neighborhoods, so access to food is more often limited to smaller convenience stores (Chung and Myers, 1999; Giang et al., 2008; Morland et al., 2002a; Weinberg, 1995). Poor minority neighborhoods are even less likely to have access to a supermarket than poor white neighborhoods (Morland et al., 2002b; Powell et al., 2007; Zenk et al., 2005). The smaller convenience stores in these food deserts often offer a lower selection of higher priced, lower quality food items (Chung and Myers, 1999; Hendrickson et al., 2006; Zenk et al., 2005). Access to food is further limited for many low-income residents due to a lack of reliable transportation and the greater distance from home to store (Walker et al., 2010). The Harmony Park neighborhood does not have a local grocery store or supermarket, and gas station convenience stores are the only locations in the neighborhood where residents can purchase food items. Jackson County, MO, where Harmony Park is located, saw a 10 to 24.9% decrease in grocery stores from 2007 to 2008 (USDA-ERS, 2011).

The lack of affordable, healthy, and fresh foods decreases the ability of Harmony Park residents to maintain a healthy diet. Research has found that low-income populations, especially minorities, consume fewer fruits and vegetables than currently recommended by the Food and Drug Administration (FDA) (Kratt et al., 2000; Resnicow et al., 2001). A healthful, balanced diet contributes to a healthy body and decreased instance of diet-related health issues (Ness and Powles, 1997; Van Duyn and Pivonka, 2000). Food desert neighborhoods are disproportionately affected by adverse diet-related health problems such as type 2 diabetes, cancer, obesity, heart disease, and premature death (Deaton and Lubotsky, 2003; Hendrickson et al., 2006).

Mr. Holloway and other community members were aware of these economic, social, and health problems in their neighborhood and set out to make changes for themselves, their friends, and neighbors. Efforts began in 2008 to revitalize this historic neighborhood. The Harmony Park Neighborhood Improvement Association formed and worked in conjunction with the University of Missouri-Kansas City and governmental groups to implement historic preservation plans for many buildings in the neighborhood and to transform many vacant lots into usable green spaces. The Harmony Park Neighborhood Improvement Association wrote an action plan, and its first recommendation was to "enhance self-sufficiency and economic growth through the development of urban agriculture on vacant lots."

THE CASE

In early 2009, Mr. Holloway and his neighbors gathered to discuss what should be done with a vacant lot on Michigan Avenue. Mr. Holloway, president of the Harmony Park Neighborhood Improvement Association for 15 years and resident of the neighborhood, led the neighborhood gathering. As a prominent figure and friend to those in the neighborhood, Mr. Holloway is passionate about uplifting Harmony Park and reintroducing the neighborhood to the rest of the Kansas City metropolitan area as the historically and culturally rich community that it once was. His efforts already can be seen on many of the residential streets in Harmony Park. Houses that once were boarded up and abandoned are now hopeful reminders of the resilience of this neighborhood, standing strong with fresh paint and new windows, roofs, and residents. Although abundant strides have been made to revitalize the community, several vacant lots on each residential block are empty, weedy dumping grounds and remain eyesores. Mr. Holloway wanted to do something about the 38 hectares of unused, vacant lots throughout Harmony Park.

The Michigan Avenue Vacant Lot

An example is one of three vacant lots located on Michigan Avenue (Fig. 1). The 42 m by 37 m lot was situated within a residential area of the Harmony Park

Fig. 2. Michigan Avenue vacant lot and two boarded-up homes to the north and south of the lot.

neighborhood. To the north and south edges of the lot were two uninhabited, boarded-up houses (Fig. 2). The lot had a westerly ascending slope of 2 to 9% to an elementary school yard that was once the site of an auto body shop. The east edge was bordered by Michigan Avenue, across which was a row of inhabited houses. Four houses once stood on the site, but they fell into disrepair and were razed and cleared away in the 1990s. Remnants of these former houses, such as broken glass, bricks, paint chips, wood, and cement remained in the soil. The site's soils were subjected to many anthropogenic impacts and were mapped by the U.S. Department of Agriculture–Natural Resource Conservation Service (USDA-NRCS) as an Urban land-Harvester complex, a soil formed in less than 40 inches of disturbed material over a truncated loess (Soil Survey Staff, 2001).

Mr. Holloway and neighbors wanted to craft something on the lot to improve the neighborhood. The group discussed many potential uses for the lot, including a park, a playground, a flower garden, and an orchard. In March 2009, Mr. Holloway and his fellow neighbors finally settled on the decision to establish a community garden. They envisioned a community gardening space with numerous plots to grow vegetables, fruits, herbs, and flowers. Each 28 square-meter plot was to be assigned to an individual or family in the neighborhood, and gardeners could keep what they grew and give away extra to neighbors. The garden would provide a local source of fresh produce for Harmony Park community residents that they wouldn't have to venture far from home to get and that would improve the diets of these low-income individuals and families. Mr. Holloway thought a garden would be aesthetically pleasing as well, and a relaxing place for recreation and socializing.

By April 2009, the vacant lot on Michigan Avenue was cleared of weeds and loose debris and the soil was tilled in preparation for establishing a garden that spring and summer (Fig. 3). Even before the plots were delineated, all available plot spaces were claimed by Harmony Park residents. Elderly women, young men, and families with children were all excited to enjoy the recreation of gardening and to eat the fresh produce from their plots. The neighborhood was eager to move forward with plans for the community garden, and many gardeners began to plant early spring crops such as Swiss chard, lettuces, and spinach in anticipation of their first growing season on their new garden plots.

The Problem

One morning as Mr. Holloway was reading the paper and drinking his morning cup of coffee, he came across a newspaper article on President Obama's new garden (Burros, 2009). The article read, "When the Obamas decided to turn some of the South Lawn at the White House into a kitchen garden, they did what many smart urban gardeners do: they had the soil tested for its nutrients and potential contaminants, like lead." Mr. Holloway felt alarmed; he had not thought to have the soils tested for potential contaminants. He wondered what types of contaminants could possibly be in a soil in his neighborhood. "Surely we have nothing to worry about," he thought. Mr. Holloway visited the garden that evening to pick his newest batch of ripe tomatoes and okra and saw the grandchildren of his elderly neighbor, Norma, playing in the soil of her garden plot as she weeded and watered her crops. He began to worry, thinking, "If our soil is contaminated, then are Norma's grandchildren at risk from playing in the soil?" And what about the tomatoes and okra he had planned to bring home to family for dinner—could they be contaminated, too? Although a garden was a beautiful addition to their neighborhood, Mr. Holloway did not want to put any of his friends or family at risk. He decided to add his new harvest of fresh veggies to the compost pile instead of taking them home for dinner. He needed more information before he could feel safe eating anything grown on the site.

Fig. 3. Community garden site cleared of all debris, weeds, and woody vegetation.

The next day, Mr. Holloway called the extension service at the nearby land-grant university to request help with his problem. Mr. Holloway knew he needed to determine whether it was safe to garden on and eat food from the community garden lot; he especially wanted help figuring out how to better manage the urban soils to keep everyone healthy. What good is a beautiful community garden in a food desert if it could be hurting everyone he loves? The garden was supposed to improve his neighborhood's health and vitality, not threaten it.

Fig. 4. Field-portable x-ray fluorescence spectrophotometer sampling for preliminary total soil trace element concentrations.

Soil and Plant Tissue Sampling and Testing

Soil scientists from a nearby university came to help Mr. Holloway assess the soil quality, potential presence of contaminants, and any potential human health risks of the Michigan Avenue community garden site. Screening of the site for trace elements (specifically lead [Pb], cadmium [Cd], and arsenic [As]) was done using a field portable x-ray fluorescence spectrophotometer (XRF) analyzer (Thermo Scientific, Billerica, MA) (Fig. 4 and 5). Measurements were taken every 3 m across the site in a rough grid pattern. The XRF measurements were georeferenced using a global positioning systems (GPS) unit. Total soil lead concentration maps were created using this spatial data to determine areas of high or low total soil lead concentrations (Fig. 6). Eight soil samples were collected from the site for confirmation analysis of the total soil lead concentration by laboratory digestion using method 3051A (USEPA, 2007) followed by analysis using an inductively coupled plasma optical emission spectrometer (ICP-OES) (Table 1). Soil samples were collected from areas where compost had been added to garden plots where compost had not been added. Soils were digested as described before and the total soil lead concentration was also measured for these samples using the same ICP-OES method (Table 2).

The soil scientists told Mr. Holloway that the common sources of trace elements in urban environments included

Table 1. Total soil lead concentrations of the Michigan Avenue vacant lot in the spring of 2009.

Soil sample	Total lead
	mg/kg
1	288
2	254
3	335
4	173
5	252
6	141
7	183
8	185
Average	226

Fig. 5. Conducting preliminary soil tests for total soil trace element concentrations on the Michigan Avenue vacant lot using the field-portable x-ray fluorescence (XRF) spectrophotometer. A handheld GPS was used to record the position of the XRF measurement, and a field notebook was used to record the GPS waypoint and the XRF sampling point number. The data is downloaded from both devices and merged in a spreadsheet.

the past use of leaded paint and gasoline, historical pesticide use, and industrial and commercial activities. The potential sources of contamination of urban areas like the Michigan Avenue lot are shown in Table 3. Additional soil samples were collected to analyze for chlordane (C1–C3, Fig. 6), dichlorodiphenyltrichloroethane (DDT), and dichlorodiphenyldichloroethylene (DDE) (C4–C9, Fig. 6). Chlordane, a pesticide and common persistent urban organic contaminant, was used to treat house foundations for termites and is commonly found in soils around house foundations or where previous structures stood. Because houses border the lot and rubble from formerly razed houses was found on the site, the soil scientists told Mr. Holloway that additional soil tests would need to be conducted to determine if chlordane was present in the soil. The soil scientist also explained that DDT was a commonly used insecticide before it was banned in the United States

Table 2. Average total soil lead concentrations of the Michigan vacant lot before and after the addition of compost in the spring of 2009.

Before or after adding compost	Average total soil lead
	mg/kg
Before adding compost	245 ± 21
After adding compost	145 ± 20

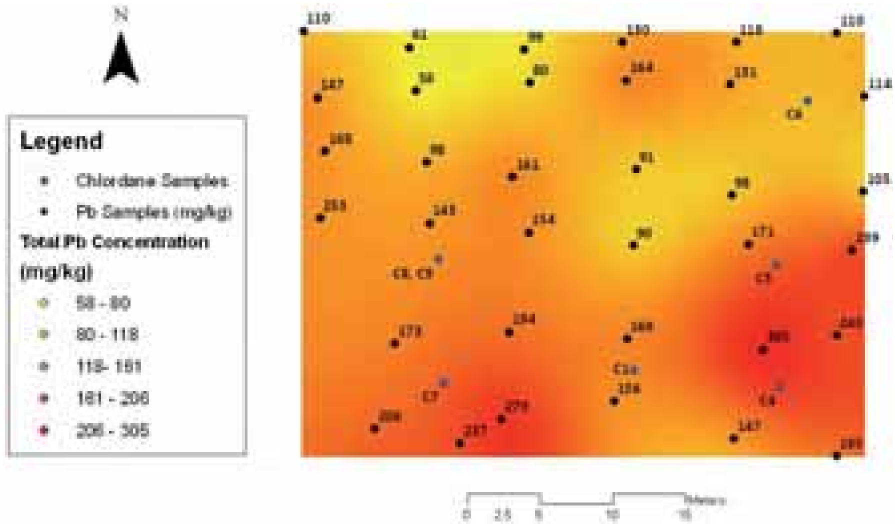

Fig. 6. Chlordane sample locations and field portable x-ray fluorescence sampling locations with preliminary total surface soil lead concentrations across the Michigan Avenue community garden site. The color gradient reflects an interpolation of the lead values, and was created by using the inverse-distance weighting method in a geographic information systems software package.

in 1972, and it is found in soils where pesticide spray was common, so tests would be done to determine its presence. DDE is an intermediate product of DDT degradation in the soils and can be found in the soils where DDT was applied. Chlordane, DDT, and DDE in the soil samples were extracted using the EPA 3540C, the Soxhlet extraction method, and were analyzed using gas chromatography following EPA 8081A method. The concentration of chlordane was below the minimum detection limits of the laboratory method (i.e., 0.05 mg/kg). Concentrations of DDT and DDE were low: the range of DDT concentration was 0.04 to 1.3 mg/kg, and maximum DDE concentration found was 0.04 mg/kg. Testing concluded that these pesticides were not a great concern at this site.

Background on Brownfields and Urban Soils

Natural and urban-derived soils vary considerably. Urban soils are often highly disturbed and/or contaminated due to human activities (Bullock and Gregory, 1991; Craul, 1999; Reimann and De Caritat, 2000). Urban soils are often more physically, chemically, and biologically heterogeneous than naturally derived soils, posing unique management issues. Previous land use and human activities on and around an urban site (e.g., industries, automobile emissions, leaded paint, mining, and use of man-made products) can lead to increased accumulation of trace elements and organic compounds or soil contamination (Boyd et al., 1999; Mielke et al., 1999; Mielke and Reagan, 1998; Nriagu, 1979, 1996). Lead, cadmium, and arsenic are the

Table 3. Common urban soil contaminants and their sources (modified from Angima and Sullivan, 2008; USEPA, 2012, 2013).

General source	Examples of previous site uses	Specific contaminants
Paint (before 1978)	old residential buildings; mining; leather tanning; landfill operations; aircraft component manufacturing	lead
High-traffic areas or near roadways	next to trafficked roadways or highways; near roadways built before leaded fuel was phased out	lead, zinc, polycyclic aromatic hydrocarbons (PAHs)
Treated lumber	lumber treatment facilities; structures built with treated lumber	arsenic, chromium, copper, creosote
Burning wastes	landfill operations	PAHs, dioxins
Contaminated manure	copper, zinc salts added to animal feed	copper, zinc
Coal ash	coal-fired power plants; landfills; homes with coal furnaces	arsenic, selenium, cadmium, sulfur
Biosolids	wastewater treatment plants; agriculture	cadmium, copper, zinc, lead, persistent bioaccumulative toxins (PBTs)
Petroleum spills	gas stations; residential/commercial/industrial uses (anywhere an aboveground or underground storage tank is or has been located)	PAHs, benzene, toluene, xylene, ethyl benzene
Pesticides	widespread pesticide use, such as in orchards; pesticide formulation, packaging, and shipping	lead, arsenic, mercury, dichlorodiphenyltrichloroethane (DDT), chlordane, and other chlorinated pesticides
Commercial or industrial site use		PAHs, petroleum products, solvents, lead, and other heavy metals (such as cadmium, arsenic, chromium, lead, mercury, and zinc)
Dry cleaners		stoddard solvent and tetrachloroethene
Metal finishing operations		metals and cyanides

Table 4. Recommended gardening practices based on results of soil test for lead, modified from Angima and Sullivan, 2008. The modification is the addition of the 250 to 400 category, which was added because of concerns specific to root crops (Ganga Hettiarachchi, personal communication, 25 Oct. 2013).

Amount of lead	Gardening practice
Less than 50 mg kg^{-1}	Little or no lead contamination in soil. No special precautions needed.
50 to 250 mg kg^{-1}	Some lead present from human activities. Grow any vegetable crops. Choose gardening practices that limit dust or soil consumption by children.
250 to 400 mg kg^{-1}	Do not grow root crops. Choose gardening practices that limit dust or soil consumption by children.
400 to 1200 mg kg^{-1}	Do not grow root crops and low-growing (difficult to clean) leafy vegetables. Choose gardening practices that limit dust or soil consumption by children.
Greater than 1200 mg kg^{-1}	Not recommended for vegetable gardening. Mulch and plant perennial shrubs, groundcover, or grass. Use clean soil in raised beds or containers for vegetable gardening.

most common contaminants in urban environments. Trace elements occur in small quantities and are found naturally in many soils; however, urban soils often contain elevated concentrations of non-naturally occurring trace elements and compounds due to human activities (Finster et al., 2004). Soils are a sink for many trace element contaminants, and most of these urban soil contaminants are persistent, immobile, and non-biodegradable (Boyd et al., 1999; Finster et al., 2004; Mielke et al., 1999; Mielke and Reagan, 1998; Watt et al., 1993).

Contaminated urban soils require unique management techniques due to their heterogeneity and potential contamination to reduce exposure pathways and any human health risks. Past and forgotten sources of contamination, razing of aboveground materials, and mixing of urban soils can lead to sites with variably distributed contamination, making understanding and minimizing human health risks difficult.

Urban soils are an important pathway for human exposure to trace elements and organic contaminants (Boyd et al., 1999; Gallacher et al., 1984; Mielke et al., 1999; Mielke and Reagan, 1998; Watt et al., 1993). This is troublesome, because common urban soil contaminants (e.g., lead and arsenic) are toxic to humans, especially children (Boyd et al., 1999; Finster et al., 2004; Hettiarachchi and Pierzynski, 2004; Mielke et al., 1999; Mielke and Reagan, 1998). Gallacher et al. (1984) found that residents living in areas with highly lead-contaminated soils had higher blood lead levels than residents of areas with minimally contaminated or uncontaminated soils. Humans may be exposed to soil contaminants through three main pathways: ingestion, inhalation, and dermal exposure (Boyd et al., 1999; Mielke et al., 1999; Mielke and Reagan, 1998).

The two main exposure pathways affecting urban dwellers, especially gardeners and farmers, are ingestion of soil dust and ingestion of food grown in contaminated soil (Cambra et al., 1999; Hawley, 1985; Hettiarachchi and Pierzynski, 2004). Direct ingestion of soil dust may be from putting soil or dirty fingers in mouths, which is a typical occurrence for young children when playing outdoors, or from soil dust that adheres to produce, hands, and clothing. Root crops grown directly in the soil and crops that grow close to the soil, such as spinach, often have soil dust adhered to the tissue when harvested (Finster et al., 2004). Ingestion of food grown in contaminated soil also may pose a risk to human health if the bioavailability of the contaminant is high and if translocation of the contaminant from soil to the edible portion of the plant has occurred (Finster et al., 2004; Purves and Mackenzie, 1970). The bioavailability of an individual contaminant affects the plant uptake and translocation of the contaminant from soil into the roots, from the roots to shoots, and shoots to fruiting bodies. Hettiarachchi and Pierzynski (2004) defined bioavailability as the proportion of a soil contaminant that is available for absorption into an organism. Some researchers have attempted to develop rules of thumb for managing soils based on the measured contaminant concentration (Table 4). Individuals in direct contact with urban soil should be aware of these issues so they can minimize the environmental and human health risks associated with soil contamination.

THE DECISION FOR STUDENTS

Mr. Holloway is frightened to make a decision about promoting community gardening on the Michigan Avenue site. He wants to improve his neighborhood with this beautiful garden, to give his neighbors the opportunity for recreation and socializing while gardening, and to provide everyone with fresh, healthy, and local produce. But what if their health is at risk from lead contamination, if not other chemicals or metals? He is alarmed, but he doesn't want to also alarm his friends. "We've put so much effort into this garden, and it has already become a bright spot in Harmony Park. What should I do?"

Case Objectives

Upon completion of this case, students should be able to:

1. Discuss issues related to brownfields, food deserts, urban soil quality and contamination, and growing food on mildly contaminated soils.
2. Discuss the common urban soil quality and contamination issues related to historical and current human impacts on urban lands.
3. Discuss how food deserts affect urban dwellers' ability to access healthy, fresh foods.
4. Discuss the three pathways and the potential human health risks associated with exposure to contaminated soil.
5. Uncover relevant scientific information and evaluate its validity.
6. Analyze site-specific data on the contaminants tested and the potential risks associated with growing food crops on brownfields.
7. Formulate a BMP recommendation for gardening on a brownfield given that the gardeners have already begun growing on the site.

Additional Reading for Teachers and Students

- Cornell Waste Management Institute. 2009. Soil contaminants and best practices for healthy gardens. http://cwmi.css.cornell.edu/Soil_Contaminants.pdf (accessed 4 Feb. 2014).
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TEACHING NOTES

Case Uses

This case could be used effectively by high school or undergraduate students interested in urban soil quality, soil contamination, urban soil sampling, food deserts, and urban agriculture. The case could help students investigate the complex environmental, human health, social, and economic issues of urban agriculture on brownfields. Students with varied academic and personal backgrounds could make use of this case to practice the following skills: uncover and assess validity of scientific information; interpret research data; analyze social, economic, environmental, and human health issues associated with a complex real-world problem; and formulate a BMP protocol to mitigate human health risk for urban growers and consumers. Instructors should emphasize that additional information from scientific literature and reference guides will be necessary to make a sound decision.

Students could be given the case several class periods before the scheduled discussion in class, as well as additional reading materials, and should be encouraged to research case topics independently. Instructors should separate teaching resources before making the case and list of resources available to students. Students should arrive to the discussion period prepared to discuss the case problem and topics with their peers and instructor.

Questions to Stimulate Discussion and to Examine the Issues of the Case

Review the evidence of contamination on the site as well as the social, economic, human health, and environmental issues of this case and answer the following questions:

1. What is the dilemma that Mr. Holloway faces? Should he and his fellow neighbors continue to garden on and eat produce grown on the brownfield site? Is it a good idea to convert the vacant city lots in this neighborhood into community garden spaces to grow fresh foods for neighborhood consumption?

2. Does Mr. Holloway have a legitimate reason to worry about the health of his neighbors, friends, and family who are gardening on the site? Who will Mr. Holloway's decision affect?

3. Should Mr. Holloway tell the gardeners on the site about the contamination?

4. What are the benefits of locating the community garden on a brownfields site?

5. What are the disadvantages of locating the community garden on a brownfields site?

6. How are soils tested? Is it like the television show "CSI: Crime Scene Investigation," where you put a soil sample into an analytical machine and get a readout of all possible contaminants? Are there any university or private soil testing labs in your state? How much does it cost to test one soil for lead? Do the benefits of growing fresh produce for the neighborhood outweigh the disadvantages associated with the urban soils of the lot?

7. Based on the evidence, what BMPs would you recommend that Mr. Holloway and the other gardeners implement on the site? What, if anything, could be done on the site to ensure the health of growers and consumers?

Answers to Questions, and Ideas for Classroom Management

1. Mr. Holloway is a community leader.

2. The total soil lead concentrations are mildly elevated (Table 1, 2, and 4), indicating the past human impacts have raised lead concentration above the natural soil levels. Mr. Holloway and the other gardeners should be aware that the soils they are growing in contain elevated levels of lead; however, these concentrations should not provoke panic for these gardeners. The main risk from lead is through eating or inhaling soil. Lead is not a plant nutrient, so uptake into plant tissues is not a concern.

3. Mr. Holloway is a leader in the community, and many people are looking to him for guidance on whether or not they should continue to garden at the site. His family, neighbors, and any other consumers of produce from the site will be affected by his decision to continue or to stop gardening on the Michigan Avenue lot. If they continue gardening without taking the proper precautionary measures, then they may be endangering themselves; however, the soil total lead concentrations are not elevated enough to warrant the immediate termination of gardening on the site. Precautionary measures would include the following. First, collecting and submitting soil samples to a laboratory would help them to assess the overall risk of gardening on the site. Second, if the soil is only mildly contaminated and is thus still safe for gardening, then the gardeners should avoid inhaling dust while working. One solution is to cover walkways with fabric or mulch to keep the dust down. If they are doing an operation that is particularly dusty, such as tillage, they should consider wearing a dust mask. Gardeners should also avoid the transfer of soil into their mouths, for example, to wash their hands and produce with soap and water before eating. Consumers should be told to wash produce thoroughly, peel root crops, and discard the outer leaves of leafy crops.

4. Mr. Holloway, as a leader in his neighborhood, has a responsibility to his neighbors and to the consumers of the produce from the garden to notify all who are involved of the mildly elevated concentrations of lead in the soil. Ask the class: "How would your answer change if Mr. Holloway was the owner of this land?"

5. The Harmony Park neighborhood is located in a food desert in which access to affordable, fresh, healthy foods is limited. The residents of Harmony Park could benefit from a local, free supply of healthy fruits and vegetables. Improved diets may help improve the health of these community members. Also, residents benefit from socializing at this community gathering spot, enjoying a beautiful piece of nature and green space in the middle of the city, and recreation and exercise while engaging in gardening activities. This brownfield site was an underutilized and convenient location in the neighborhood.

6. The urban soils on the site are highly heterogeneous, making management of the site more difficult. The total soil lead concentrations are elevated, whereas the levels of both DDT and chlordane were below the detectable limits in the soils of this brownfield site. These issues can make management decisions complex and difficult for gardeners to make. Expensive soil tests and potentially expensive risk mitigation techniques may be too expensive for a community gardening group to shoulder. Outside technical assistance is often required to determine the safety of and the BMP of a specific brownfield site.

7. Students should contact and/or identify local soil testing laboratories and inquire about the availability, cost of testing, and turnaround time for total soil lead and for chlordane and DDT. (This question is posed so that students have an appreciation for the costs associated with testing for contaminants and why community gardens will likely not be able to afford extensive soil testing.) This question was designed to make students think about the potential positive and negative aspects of the proposed community garden. Many answers are possible. Students should identify that the addition of compost to soils on the site decreased the total soil lead concentration. How did it do this (dilution of the concentration and reduction of the bioavailability)? Gardeners could add compost to the entire site to reduce the total soil lead concentration in the surface soil. At the actual site, Mr. Holloway and the gardeners added compost to the entire Michigan Avenue community garden and incorporated it into the top 6 inches of soil. Mulch was also added to all walkways to reduce the amount of exposed soil and to minimize soil dust in the garden. Depending on the size of the community garden, the cost of bringing compost and/or mulch could be quite high. How would that be paid for? Raised beds created using imported topsoil would be another option, along with covered walkways. Gardeners should be advised to wear gloves while gardening or to wash hands after working in the soil. Children should be prohibited from putting soil in their mouths, and babies and toddlers must be closely monitored if they are going to be present in the garden. A fence would be a good measure to keep children and pets from passing through this mildly contaminated site. All produce should be thoroughly washed with soapy water to remove adhered soil particles prior to eating. Furthermore, urban soils are usually inherently poor and need to be improved by adding compost, testing for soil nutrients, and adding nutrients if needed. Adding compost will lead to increased productivity for food production. One important note is that commercial composting facilities are not permitted on contaminated sites. Therefore, the amount of contaminants present in the compost itself is usually very low. Composting garden materials upon the contaminated soils at the community garden should be avoided, as composting is often done directly on the soil surface, and this would lead to enrichment of the compost in lead. On-site composting should be confined to low-lead parts of the property, if possible.

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