COMMON GROUND
SCHOOL FOR URBAN FOOD SYSTEMS
Theme: AR3CP01 Complex Projects
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This booklet is a journalistic summary of my project, a school for urban food systems. I believe that rethinking food production and consumption is key in contributing to awareness into our state of overconsumption and environmental problems, as our current state of food consumption and production creates cities that fail to meet even the slightest standard of self reliance¹. Bringing education and work on urban food production to Chicago South will have a positive impulse on the current social, economic status of the area, while creating awareness for a common future in which environmental issues have to be dealt with. Greening the 21st century city will improve our health, stabilize our economy and bring us all closer together as we meet in the garden².

Studio methodology
Our studio Complex Projects has a distinct methodology which has provided a framework to examine different scales and actors involved in our assignment based in Chicago South-works, a former thriving Industrial area of steel production, and now, lies abandoned. This has resulted in a complex situation of environmental, social, spatial and economic conditions.

The methodology to gain an understanding of these conditions has been as follows:

Phase one: exploratory and descriptive
Firstly journalistic research has been conducted on three topics on sustainability, identity and shrinking of Chicago (and multiple other scales). To investigate the three topics, the group was divided into three sub-groups all with their own topic to investigate. These topics were, “eco-logic, identity, and shrinking.” I chose to be part of the group “eco-logic”, investigating the matter of sustainability in Chicago and multiple other scales. Although the three groups had their own field of expertise, every week group-presentations provided everyone with knowledge on all three topics. This method has been experimental and flexible, giving us more freedom in the topics to be researched. The main idea was to gain as much information on sustainability as possible on multiple levels and scales. As we were researching quantities (measurable variables) as well as qualitative topics (such as culture and identity) the research method was flexible, allowing us to be more free in our choices of topics. This exploratory research led to an abundance of information, which had to be categorized and evaluated.

At the same time, we conducted descriptive research, the topics became categorised, analysed and evaluated within the story we as a group wanted to tell. After sharpening, dropping and adding subjects and information, everything was converted into a coherent story presented and bundled in a journalistic book. All groups produced such a book which gave of us a basic understanding (but even more questions) on our design assignment.

This first research phase has been supported by previous research books, seminars and courses, essays, and a visit to Chicago including workshops and seminars.

Phase two: explanatory
After the journalistic research on three topics had been conducted, the groups where re-arranged again to take a position within the abundance of information found, the assignment was to form a manifest. The manifest was formed by fierce discussions as we tried to explore relevant links and relations, filtering the abundance of (often contradictive) information. The exploratory and descriptive research done in the first phase was summarized by explanatory research in the second phase. We as a group tried to explain and guide the contradicting information found towards a statement and position. A position describing the environmental, social, spatial and economic conditions, problems and opportunities found in Chicago and Chicago South-works.

Phase three: iterative design
The manifest gave us 7 main topics, which where articulated into a strategy of 7 layers with the aim tackle the environmental, social, spatial and economic problems on site. Instead of designing a masterplan, we created rules for different scales. On the scale of Chicago, Chicago South and Chicago South-works. A Multitude of design techniques were used to investigate and sharpen the spatial possibilities of the strategy: sketches, diagrams, 3d models, physical models, sections, plans, and impressions.
Phase four: problem statement
The first, second and third phase took place in the first half year of the graduation trajectory. The followed methodology had been pre-assigned and guided by the studio until this phase. The last step in this methodology was to formulate a research question for a building coherent on all scales, from 1:500 until the level of detailing. After reflecting on the previous phases, I was able to form a problem statement dealing with the social, economic, and environmental issues raised in the manifest and urban strategy. My problem statement had been formulated as follows: My thesis will research and attempt to understand the future role agricultural education has in the notion of common ground and sustainability within the United States of America. By learning from examples in the field of agricultural education, I will arrive at a model for a centre of advanced urban agriculture within a larger framework of agricultural education and research.

Phase until P2: Individual methodology, exploration of problem statement: trial and error
The individual design-phase commenced and I continued using the methodology similar to the first phases of the design methodology of the Complex Projects Studio. I adopted the exploratory and descriptive phases, researching agricultural education and its architecture, and at the same time the implementation of this knowledge into the context and spatial design. During the explanatory design phase, I was unable to successfully make the right conclusions with the standard architectural design techniques at my disposal to investigate in a clear and directed way spatial solutions for my problem. I was finding solutions, but not the solutions that gave a clear answer for a school combined with urban agriculture. This resulted in trial and error design, relying heavily on intuitive design, trying to find grip in a field which was unfamiliar for me: agricultural education and food production. That is why until P2, I
did mainly conduct exploratory and descriptive research. Only during the summer vacation after P2, I took the time to evaluate the work and consciously started explanatory research, which gave me a more clear direction to investigate the design question, test various options, refine these options, evaluate, and conceptualize (the iterative design process). This proved to be difficult as the base of the design had been formulated by trial and error.

Phase until P3: relational methodology, back to basics
Although the beginning of the iterative design process looked promising at the beginning, it did not create clarity in concept or spatial solutions. The design assignment had been stated as follows: Future food production and the city: Architecture, and the social implications of this idea.

This would require a building formed by interdisciplinary knowledge, requiring more research into actual and innovative food production by for instance, greenhouses or high-tech food producing towers. The school would function as a social engine, opening up partly to local inhabitants.

The vision
The programmatic answer for food production in the city of the future had been formulated as a superimposition of an agraric vocational school (with public functions and intricate relations with society) and high tech food producing solutions such as a vertical farm. I conducted scientific research on sustainable food production and innovative new concepts, as well as the social relation of education in society. This knowledge resulted in a vision on food production in the future and its social implications. Our current state of food consumption and production is very unstable and bringing part of food production back to the city is key for a future with more awareness and solutions for sustainability.

subsequently, the school had to be designed with focus on sustainability, which posed multiple design questions I was unable to answer by the precedents of agraric schools I had been researching, or by the tool-sets I had been using (mainly form, composition and programmatic blocks in physical models).
I wrote an essay on sustainability in Architecture, and an interesting passage by John Kristinsson revealed which tool-sets I had not been using. John Kristinsson describes that a certain amount of tool-sets are missing in contemporary Architecture. Missing tool-sets are vital to achieve a sustainable development. These tool-sets are certain parameters that for instance take into account the surrounding and site, soil, green, surface water, transport, construction and building materials, food production and consumption. I was analysing reference projects based on the tool-sets of contemporary design, rather than the tool-sets described by John Kristinson. The method and tool-sets I had been using in the phase until P3 did not seem fit for the problem I was trying to solve. A superimposition of school and food producing facilities, a highly innovative idea according to Dr. Dickson Despommier, an expert in innovative food systems in the city. He describes food production in inner-city buildings as a paradigm shift in Architecture. As this idea is still so new, only conceptual references exist, which meant I could not rely on a large amount of analogies of similar projects.

Back to basics: methodology of relations
As my pre-assumed method did not deliver, I fell back to the knowledge I mastered in the last 6 years of Architecture: designing with relations. As I was trying to design such an unfamiliar design I relied on the framework of principle reasoning. Research the question to its fundamentals (as I did not have knowledge of the tool-sets described by John Kristinson nor of the vertical farm). From there I reasoned up.

References
Working by analogies is usually a good method for an Architectural project, since you investigate and take successful elements from equivalent projects and problems. But when looking for new and innovative ideas for future problems it is useful to look at other references than purely Architecture as I found that the Architectural references I studied could not completely provide me with building blocks for the design.

Instead by reasoning by analogies which did not provide an answer to my design question I worked with 4 pillars, all related and with focus on food production and interdisciplinary knowledge:

The 4 pillars as methodology: interdisciplinary literature research as a base for relational design
Interdisciplinary literature research on topics I was unfamiliar with:
- Sustainability (in Architecture)
- State of the art in food production
- education and society

pillars
1. contextual relations (research on the fragment)
2. programmatic, social and economic relations (research on the American agrarian educational system and social programs), spatial conditions of vocational schools
3. environmental relations
Research on what the building does, not what it is. The research conducted has not been focussed on architecture, rather on typologies of food production and the building as closed bio-cycle
4. spatial relations
Applying all this knowledge into a spatial design and concept: the superimposition of the school and vertical farm.

The design tools I used have been as follows:

Contextual relations (diagrams, plans, model and facade) scales 1:5000, 1:1000, 1:500, 1:200
Programmatic relations: diagrams and plans
Spatial relations: sketches, impressions, sections and models on scale 1:200, 1:100, 1:50
environmental relations and food production: diagrams and sections 1:100 & 1:50, details 1:20 & 1:5 including structural, climate and detail design

Phase until P4: relational methodology, iterative design process, and re-evaluation

I continued with iterative design on all scales simultaneously, being more conscious of evaluating, and conceptualizing ideas and spatial solutions. Re-evaluating my research question led to a sharper definition: In response to our current state of (over)consumption, how can a building re-introduce food production into the city while addressing the environmental, social, spatial and economic values described in the strategy for common ground?

I found already in an early stage that the atrium had a binding role in the environmental, social, and economic questions raised by the strategy and our studio. During this phase, and with the help of tutoring I was able to investigate this space using multiple design options, this included the important role the placement of the productive tower had in the design

The spatial concept of the building is a repetition of food-producing open spaces. My vision, bringing food production back into the city has been articulated on multiple scales, from Chicago South to the detail. Logistics are of up-most importance in designing a food productive building and this has had a key role in the placement of functions within the building mass. I do believe that food producing buildings and agricultural productive towers can be a solution for our food problematics of dense cities and metropoles, and I tried to apply this vision in Architecture from city to detail.

**Reflection on process and improvements**

my process has not been entirely stable, mainly because of starting with a methodology with tool-sets not perfectly suitable for my design question. For me to notice this earlier in the process, this means I have to plan more conclusions and evaluation moments into the design process.

Using the 4 pillars as design methodology had an effect on the focus point of the design, but as this vision includes design and research on the large scale and interdisciplinary topics, it did have implications for the smaller scale of the project. Design solutions for the smaller scale have not been researched using a satisfactory number of design options. When using this methodology in future innovative projects, more focus must lie on designing on a smaller scale and, on this scale, designing multiple design options earlier in the process. All relations effected each other, all design solutions effected each other. The design that follows from this methodology is therefore very susceptible to change, time consuming, but in the end, does result in a design which is coherent on all scales.

The 4 pillars and vision of food production in the city

- Increased focus
  + problem definition and defining an innovative vision
  + relation education and society
  + the urban fragment
  + spatial research connecting the larger scale tot smaller scale (city - urban context - fragment - building mass - interior spaces), synthesis urban scale to detail
  + research and knowledge on programmatic relations architecture and food production
  + research on the atrium as public interior
  + knowledge on the spatial structure of the agraric vocational school
  + theoretical and practical integration sustainability and future urban food systems into the design
  + Integrated climate and structural design+ design alternatives school and productive tower
  + architecture of agriculture

- Decreased focus
  - design alternatives on the smaller scale (facade and detail).
  - knowledge on the architectural discipline of school design.
  - design alternatives for architectonic articulation of food producing methods
The four pillars
FUTURE HIGH SPEED RAIL
220 MPH
AIRPORT

CHICAGO
DETROIT
KANSAS CITY
CLEVELAND
TOLLEDO
ST. LOUIS
INDIANAPOLIS
CINCINNATI
COLUMBUS
PITTSBURGH
MILWAUKEE
MADISON
KANSAS CITY
ST. LOUIS
Chicago downtown
Chicago South Works
11.4 miles
18.24 km
According to our studio research, which has resulted in three Complex Projects research books, the United States of America are in a constant state of overconsumption. The United States consume almost twice the amount of their resources. The bio-capacity per capita of the U.S. is shrinking; sources are running out while consumption stays similar. To be able to continue our current life style, cities, regions, and countries will have to cooperate in dealing with these issues. Our dependency is a fact. We need to reconnect to reality, work together and create awareness of this fact. The city of Chicago is the pioneer of sustainable technology and its central location in the Mid-West are the perfect grounds to discuss sustainability and our current system of production and consumption of food, energy, waste and water.

The studio research has resulted in a position towards the complex conditions found. This position, formed by a group of 5, has been formulated in the manifest for common ground. A manifest that comprises of 7 main issues bound by the fact that environmental, social, spatial and economic sustainability is our ultimate goal as an individual and as a collective.

The proposition of sustainable consumption and production means a radical change in the relation between consumption and production within the built environment, changing the relation man and productive land. It calls for a shift in the way we built and develop neighbourhoods, cities and regions but also redefines the relationship of the individual within the collective. More important than the consequences for the built environment are the social consequences of this plan. It implies most of all the cooperation of people in their own food production and active involvement in waste, water, energy production and reduction, a certain collective awareness, or common ground.

INTRODUCTION
Chicago South-works, a former thriving Industrial area of steel production, lies abandoned. A proposition for the urban strategy is a sensitive issue in a neighbourhood like South Chicago, an area that's being isolated due to closings of schools and health clinics, poor transportation, high crime rates and low poverty levels, causing frustration that is largely expressed through violence.

Current inhabitants of South-works, a monotony of ethnics and income groups main concern is not sustainable awareness, while there are other problems that have priority. On the contrary, Chicago South offers a lively and strong community and culture and a strong history which an intervention will have to respect and to be able to connect to.

The task is to find a relevant intervention that deals with the complexity of the now, and the future to come. So what is needed for the now? On a local scale, the area is being isolated due to closings of schools and the lack of education and simultaneous job-opportunities. The lack of education and job-prospects in Chicago South is an important issue to tackle. For the future, the area needs new meaning, not only on neighbourhood scale, but on the scale of the city to break the negative circle of decreasing property value, school closings and the lack of jobs. Combining education and jobs for multiple income groups within the field of sustainable consumption and production of food will provide new meaning and opportunities for the area on multiple scales, for the existing community and new inhabitants of South-Works. As the development will attract new people, the intervention can become a place of interaction for a diverse group of people.
What is Common Ground?

Common ground is a strategy for urban development and consists of 7 layers with the aim to for environmental, social, spatial and economic sustainability. Although this plan cannot be self-sustainable, the main goal of the plan is to provide awareness for the current situation of Chicago South and its future.

Common ground is everything that binds us, sports, music, dance, food, work or language. In these, we recognize ourselves to become part of the collective consciousness. Within space we are constantly in search for recognition or alienation of a group to make us aware of the collective. That is what binds us as individuals to a group and vice versa.

7 SPATIAL LAYERS

- Ecological Independancy
- Connectivity
- Power of the Collective
- Density
- Diversity
- Change Collective Memory
- Flexibility
QUESTIONING THE CURRENT SITUATION OF CHICAGO SOUTH

- **UNSUSTAINABLE FUTURE**
- **A STATE OF ISOLATION**
- **FAILED SYSTEM**
- **VACANCY**
- **STRONG COMMUNITY**
- **COLLECTIVE MEMORY**
- **THERE IS NO FINAL DEVELOPMENT**
Possible scenario urban strategy for Chicago South-works
THE FRAGMENT
QUESTIONING OUR CURRENT SYSTEM OF FOOD
PRODUCTION AND CONSUMPTION IN THE CITY

“Everything we consume is produced far beyond city limits, creating cities that fail to even meet minimum standards of self-reliance ...”

Dickson Despommier, from the book The vertical Farm, feeding the world in the 21st century

The urban strategy shows a distinct relation between consumption and production of food. We state that all developments within the urban plan are responsible for production of part of their necessary food. The urban strategy implements agriculture on an urban level at large scale, touching multiple actors and their interests. Which means a new understanding and knowledge of this field is necessary. My project will attempt to address the issue of the role of Architecture and design within the field of sustainable consumption and production of food. With all the technological possibilities we see in current day society, it must be possible to change this untenable state described by Dickson Despommier and re-introduce food production into the city again, renewing the relationship food and the city while supplying fresh products for inner city dwellers, creating new and jobs and other opportunities on a local scale. To achieve this, we need test-sites, research and educational facilities, public and private initiatives and collaboration of city-dwellers. That is why I will design a school for urban food systems.

Relation land versus the built environment, from the strategy for Common Ground
DESIGN QUESTION

In response to our current state of (over)consumption, how can a building create awareness for food production into the city?
CONTENT

DESIGNING WITH RELATIONS
1. CONTEXTUAL RELATIONS
2. PROGRAMMATIC, SOCIAL AND ECONOMIC RELATIONS
3. ENVIRONMENTAL RELATIONS
4. STRUCTURAL DESIGN
HOW CAN ARCHITECTURE FACILITATE A SOLUTION FOR THE DESIGN QUESTION

In response to our current state of (over)consumption, how can a building re-introduce food production into the city while addressing the environmental, social, spatial and economic values described in the strategy for common ground?
DESIGNING WITH RELATIONS

“Relational Architecture is action form. Action is not necessary movement but is embodied in relationship, relative position and potential in organisations. Action is imminent in the disposition of the organisation. There is no prescription for Architecture, only a technique for performing it.”

“Architecture creates situations. Every relation needs a form of communication.”

Alex van der Beld, lecture The ethological city

The project will be formed by designing with the following relations

1. Contextual relations
2. Environmental relations
3. Programmatic relations
4. Spatial relations

1. CONTEXTUAL RELATIONS

THE FRAGMENT
STRATEGY FOR DEVELOPMENT
CONCLUSION
THE FRAGMENT
STRATEGY FOR DEVELOPMENT

1. infrastructure
2. catalyst buildings
3. zones of flexible development

rules for flexible development
1. dense built strip
THE CITY

built environment

dirt roads

83rd street
park road + tram

"the strip"
THE FRAGMENT AS INTERSECTION

wetlands, park and leisure

civic urban agriculture

83rd street

Research fields
CONCLUSION

THE FRAGMENT AS URBAN MOMENT WHERE PRODUCTIVE LAND, NATURE AND CITY COME TOGETHER, A PLACE OFFERING A VIEW INTO THE OPEN.

bringing nature and productive landscape into the city

creating a vista towards the open land

Architecture guiding the viewers direction
A square in front of the school creates an urban moment on 83rd street, the school is rotated for optimal orientation towards the South.

entrance and the public atrium
EVOLUTION BUILDING MASS

P2

EXPLORATORY PHASE
MORPHOLOGY FOUND: SUPERIMPOSITION OF THE PRODUCTIVE TOWER AND SCHOOL
research fields
- crop yield and data generation
- soil chemistry and fertility
- soil management
- crop production
- weed science
- entomology
- plant pathology

vocational fields
- teaching and practical education in the field of urban agriculture
- For students and local inhabitants

greenhouses
- used extensively for both research and teaching, the Research Greenhouses provide facilities and support for production of agronomic, horticultural, ornamental and forest plants.

wetlands and nature trail
- natural water treatment system providing leisure and a wide variety of wild plant life.

centre for advanced urban agriculture

centre for advanced urban agriculture

For students and local inhabitants

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centre for advanced urban agriculture
CONCLUSION

THE FRAGMENT AS FACILITATOR OF FLEXIBLE GROWTH, AN URBAN ENGINE
3. THE FRAGMENT AND ENVIRONMENTAL, SOCIAL, SPATIAL AND ECONOMIC RELATIONS

contextual relations

wetlands
contextual relations
wetlands
nature trail
urban farming
greenhouses
farms
vertical farming
basement agriculture
built environment

non-visible relations
network
knowledge
produce
sportscentre, markethall
collective initiative
Chicago South
private initiative
public initiative
new inhabitants
southworks
private initiative
corporations
farmers
non-visible relations

network
knowledge
and education
ATMOSPHERE
North Facade - Facade design (open versus closed) and placement of productive tower directs the visitor towards the atrium.
facade design principle
East facade - The school is lifted on a platform, raising it up from the landscape, and as a result the Atrium offers an unblocked view towards the open landscape.
West facade - the tower as a new landmark for Chicago South-works and the public atrium.
2. PROGRAMMATIC, SOCIAL AND ECONOMIC RELATIONS

THE SCHOOL, EDUCATION AND SOCIETY
PROGRAM DEFINITION
PROGRAM REQUIREMENTS
PROGRAMMATIC RELATIONS
CONCLUSIONS
IMPRESSIONS
Conclusions literature research: The assemblage of education

According to the assemblage theory by Manuel Delanda, education is formed by formal, informal, and non-formal learning. Formal education is taught in institutes, while informal and non-formal learning are not bound to a particular place, and happen without the interference of an educational system or organized structure. Informal and non-formal learning happen everywhere around the institute. To complete a learning environment that includes all three modes of learning.

A school has intricate relations with society, and therefore, should not be excluded or closed off from it. The power of education lies not only in a curriculum defined by a closed institute, but also in the ability to become part of the larger learning apparatus of the three modes of learning and connect to society itself. An institute that embraces multiple relations and connections with society. A spatial answer for this knowledge is to create a field, opening up to the public. Also, opening up a building for public use means public and non-public relations have to be carefully designed. What functions would house such a school?
Based on the Virginia tech minor ´´civic agriculture and food systems, which combines community engagement, education and research on urban agriculture.
1. CIVIC ENGAGEMENT AND PUBLIC FUNCTIONS

what is civic engagement?

“Learning together”
KEN METER, FOOD SYSTEM ANALYST

Providing a ground not only for students, but also to support the local community in urban agriculture.

2. PRACTICAL EDUCATION

what is educating urban agriculture

“Experiential based education”
SUSAN CLARK, NACTA (NORTH AMERICAN COLLEGE AND TEACHER OF AGRICULTURE

Educating students by theory and actively practicing urban agriculture.

3. RESEARCH

What is research on urban agriculture?

“13 topics”
The RUAF foundation

Research on and improvement of current day knowledge on urban agriculture.
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<thead>
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<th>1. CIVIC ENGAGEMENT AND PUBLIC FUNCTIONS</th>
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<td>1. CIVIC ENGAGEMENT PROGRAM</td>
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<tr>
<td>LEVEL: BRIDGE BETWEEN VOCATIONAL AND LAND GRANT COLLEGE</td>
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<tr>
<td>UNDERGRADUATE AND THE PUBLIC</td>
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<tr>
<td>Based on the Civic Agriculture and Food Systems (CAFS) minor of Virginia Tech.</td>
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<td>“developing an economically, environmentally and socially sustainable system of agriculture that relies on local and regional resources, markets and community connections” Clark, S. et al, (2013) Framing an Undergraduate Minor through the Civic Agriculture and Food Systems Curriculum 1 (p.60)</td>
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<th>2. PRACTICAL EDUCATION</th>
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<td>Based on the Civic Agriculture and Food Systems (CAFS) minor of Virginia Tech.</td>
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<tr>
<td>1. Introduction to Civic Agriculture</td>
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<td>2. Ecological Agriculture: Theory and Practice</td>
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<td>3. Concepts in Community Food Systems:</td>
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<td>4. Capstone: Civic Agriculture and Food Systems</td>
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<tr>
<td>Curriculum with the capacity to engage students in integrative and experiential learning, community problem solving and systems thinking ... all learning must be put into context of prior knowledge and experience, the key for an enhanced education was for students to “learn by doing.” Clark, S. et al, (2013) Framing an Undergraduate Minor through the Civic Agriculture and Food Systems Curriculum 1 (p.60)</td>
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<td>1. RESEARCH</td>
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<td>LEVEL: LAND GRANT COLLEGE</td>
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<td>Based on topics discussed by the RUAF foundation, (Resource centres on urban agriculture &amp; food security)</td>
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<tr>
<td>1. Urban food systems</td>
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<td>2. Planning, processes and tools</td>
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<td>3. Short food chains</td>
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<td>4. Reuse of waste in urban agriculture</td>
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<td>5. Urban agriculture and climate change</td>
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<td>6. Technology development and extension</td>
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<td>7. Urban horticulture</td>
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<td>8. Urban agro-forestry</td>
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<td>9. Urban food policies</td>
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<td>10. Food security and health</td>
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<td>11. Urban agriculture and emergencies</td>
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<td>12. Multifunctional land use</td>
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<td>13. Financing urban agriculture</td>
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PROGRAM

Civic engagement and public functions
1. The public atrium
   interior public square, meeting ground for local producers
   and consumers students, and visitors of the research
   institute and school.

2. restaurant
   Production meets consumption. Re-establish and rethinks
   the relationship between production of food in the city.
   Rethinking consumption means rethinking the places
   where we consume and to become more aware of our
   food production, the foodstore and restaurant will have
   an educational character, educating the consumer in
   sustainable food production.

3. helpdesk
   The building is part of a local network of production and
   consumption, and will provide knowledge and technology
   for local producers of South-Chicago. The helpdesk is
   placed at a public central position within the building.

4. community centre and municipality office
   Part of the program is dedicated to the local community,
   providing ground for discussion and meeting. An added
   municipality pavilion will reduce the distance between
   community and the city of Chicago.

5. exposition
   On urban food-systems and consumption

6. exterior Community gardens
   As Viljoen describes, greening the 21st century city will
   improve our health, stabilize our economy and bring us all
   closer together as we meet in the garden⁵.

1. practical education: vocational school for
   urban agriculture
   A school for urban agriculture, is a field currently missing
   in agricultural education in the U.S.A. although there are
   successful programs that provide education in this field as
   minors.

   The school will be part of a cluster of agricultural
   education and research connecting it to a larger
   framework of agricultural of educational and research
   in Illinois. The field of urban agriculture adds value far
   beyond food production alone. The school can become a
   place providing a more self-sufficient future¹

Production and research
Various food production systems integrated into the
building. Examples are rooftop greenhouses or gardens
and high-tech systems such as aquaponics, hydroponics
and drip-irrigation.

3 PROGRAMMATIC ELEMENTS

2. VOCATIONAL EDUCATION

3. CONSUMPTION AND PRODUCTION
PROGRAMMATIC RELATIONS

civic engagement
- library/computer lab
- flexible space (workshop, exposition)
- entrance court
- central hall/lobby
- bike stands

school & research institute
- interior
  - class / flexible workspace
  - specialized educational rooms
  - small lecture rooms

- research facilities
  - research labs
  - vertical farming
  - rooftop agriculture
  - sublevel agriculture
  - interior agriculture
  - test fields

- exterior
  - machinery
  - farm buildings
  - storage
  - test fields

public functions
- community gardens
- gardens
- restaurant
- store
- helpdesk

technical
- AREA ?
- vertical farming system
- roofing greenhouse
- sublevel agriculture
- interior agriculture
- technical AREA ?
direct connections and visual relations between programmatic elements

relations learning - production - consumption
shared functions or "common ground"
CONCLUSION

Food producing systems as elements within all programmatic elements. The public atrium is can be seen as binding element, a common ground.
smaller atria guide the visitor further into the building
CONCLUSION
VISUAL INTER-RELATIONS ATRIA AND
VARIOUS PRODUCTION METHODS

Section 1:50

AA'
TOTAL PROGRAM

public

civic engagement

ISO Program
Ground floor

- Community center and municipality office
- Hardware store
- Municipality office
- Licence desk
- Small café
- Job applications
- Pop-up stores and local initiatives
- Exposition
- Community pavilions

Various interior food producing systems
(See chapter environmental relations)

Helpdesk

Mensa/restaurant
First floor

- Library
- School
- Ateliers
- Machine shop
- Classical education
- Various interior food producing systems
  (See chapter environmental relations)
- Research labs
- Lecture hall
Ground floor

various interior food producing systems (See chapter environmental relations)

research labs
## PROGRAM OF REQUIREMENTS

### public functions

**Entrance court and atrium**
A square and urban moment marks the school on 83rd street, a place of meeting for local producers and consumers, students, local inhabitants and visitors of the research institute and school.

<table>
<thead>
<tr>
<th>Square and atrium</th>
<th>20 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helpdesk</td>
<td>20 m²</td>
</tr>
<tr>
<td>Public computers</td>
<td>30 m²</td>
</tr>
<tr>
<td>Multiple pavilions</td>
<td></td>
</tr>
<tr>
<td>Hardware store</td>
<td></td>
</tr>
<tr>
<td>Municipal office</td>
<td></td>
</tr>
<tr>
<td>Licence desk</td>
<td></td>
</tr>
<tr>
<td>Small cafe</td>
<td></td>
</tr>
<tr>
<td>Job applications</td>
<td></td>
</tr>
<tr>
<td>Pop-up stores and local initiatives</td>
<td></td>
</tr>
<tr>
<td>Exposition</td>
<td></td>
</tr>
<tr>
<td>Community rooms</td>
<td></td>
</tr>
</tbody>
</table>

The building is part of a local network of production and consumption, and will provide knowledge and technology for local producers of South-Chicago. The helpdesk is placed in the lobby.

**Library and computer lab**
200 students + 100 visitors

| Public computers        | 50 m² |
| Small discussion room 4 p. | 2 x 20 m² |
| Large discussion room 10 p. | 1 x 50 m² |

| Lecture rooms            |       |
| Theatre                  | 120 p. | 100 m² |
| Restaurant, workshop & store | 250 p. | 200 m² |

**Kitchen**

| Preparation              | 30 m² |
| Cooking                  | 40 m² |
| Storage                  | 11 m² |
| Dishwashing              | 15 m² |

Visitors of the restaurant walk a route that crosses all production facilities, and under supervision of an expert the visitor will choose what to eat. Products are then taken directly from the source, as fresh as can be. At the workshop area one will receive additional information or cooking lessons can be followed.

**Workshop area**
max 50 p. 250 m²
Vocational school for urban agriculture

Vocational education for 200 students
requirements: open and flexible space to ensure possible future change in curriculum and spatial requirements

<table>
<thead>
<tr>
<th>Space Type</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical space</td>
<td>750 m²</td>
</tr>
<tr>
<td>ateliers</td>
<td></td>
</tr>
<tr>
<td>closed classroom</td>
<td>90 m²</td>
</tr>
<tr>
<td>demonstration L</td>
<td>200 m²</td>
</tr>
<tr>
<td>demonstration M</td>
<td>75 m²</td>
</tr>
<tr>
<td>toilets</td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>14 m²</td>
</tr>
<tr>
<td>female</td>
<td>14 m²</td>
</tr>
<tr>
<td>machine shop</td>
<td></td>
</tr>
<tr>
<td>machinery (highly ventilated)</td>
<td>40 m²</td>
</tr>
<tr>
<td>machinery (ventilated)</td>
<td>80 m²</td>
</tr>
<tr>
<td>workstations and test labs</td>
<td>300 m²</td>
</tr>
<tr>
<td>vocational workspace</td>
<td>2 x 180 m²</td>
</tr>
<tr>
<td>washing room</td>
<td>75 m²</td>
</tr>
<tr>
<td>classical education</td>
<td></td>
</tr>
<tr>
<td>classrooms 15 p</td>
<td>65 m²</td>
</tr>
<tr>
<td>growing labs 40 p</td>
<td>2 x 180 m²</td>
</tr>
<tr>
<td>storage</td>
<td>2 x 50 m²</td>
</tr>
<tr>
<td>toilets and staff rooms</td>
<td></td>
</tr>
<tr>
<td>toilets total</td>
<td></td>
</tr>
<tr>
<td>male 400 p.</td>
<td>32 m²</td>
</tr>
<tr>
<td>female 400 p.</td>
<td>52 m²</td>
</tr>
<tr>
<td>100 staff</td>
<td>50 m²</td>
</tr>
<tr>
<td>administration</td>
<td></td>
</tr>
<tr>
<td>staffroom</td>
<td>80 m²</td>
</tr>
<tr>
<td>offices</td>
<td>3 x 20 m²</td>
</tr>
<tr>
<td>staff toilets</td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>15 m²</td>
</tr>
<tr>
<td>female</td>
<td>15 m²</td>
</tr>
<tr>
<td>bike stands and locker rooms</td>
<td></td>
</tr>
<tr>
<td>bike stands</td>
<td>300 m²</td>
</tr>
<tr>
<td>locker rooms</td>
<td></td>
</tr>
</tbody>
</table>
research production and consumption

Research on production is based on the state of the art in urban agriculture.

labs + workstations
- labs general research 10 x 20m²
- labs connected to productive fields 10 x 20m²
- supporting functions
  - (coffee corner, pantries) 4 x 20m²

Vertical farming (area based on small greenhouse of 5.000 m²)
- hydroponics, aeroponics, drip irrigation, aquaponics,
- greenhouse, rooftop gardens.

head house 7 m³ per 100 m² greenhouse area
- 5.000 m² interior production: 350 m²

Technical requirements:
- Irrigation Systems
- Fertigation
- Liquid fertilizer injection system
- CO2 distribution system
- Environmental Control Systems
- Computer control

loading dock min. requirement 60 m², min height 4.7 m (3 trucks)
- cooling and storage of produce 50 m²
- based on small-size greenhouse 5.000 m³
3. ENVIRONMENTAL RELATIONS -
FOOD IN THE CITY

PRECEDEENTS
FOOD PRODUCTION: STATE OF THE ART
OPTIMAL ORIENTATION
CONCLUSION
PRECEDENTS

Gary Corner youth centre, Chicago, Ill.
This vegetable green roof garden designed as an outdoor classroom adds an unusual dimension to traditional green roof design. A full-time gardener utilizes a planting system custom-designed by Hoerr Schaudt to teach inner-city youth methods in gardening. The garden maximizes two heat sources, ambient heat from the building and solar energy, which allows for gardening nearly all year. Soil depths of nearly a foot allow for a wide variety of plant material.

Superfarm, Research Institute & Exposition Centre for Vertical
Attributes such as planting techniques, programming and systems used have been juxtaposed to fit one another to produce a framework for a vertical farm prototype first implemented in Malaysia.

La tour vivante, Paris
La tour vivante is a combination of agricultural production, dwelling, and offices. Designed as an autonomous ecological system. In this way, the architects state that cities could be denser and more autonomous themselves.

Vertical Farming Research Institute, thesis
Designed as a response to the significant food-import of Malaysia. The building integrates the entire food, energy, and waste-cycle.
AGRITECTURE // from rooftop garden to vertical farming

Gary Corner youth centre, Chicago, Ill.  Superfarm, Research Institute & Exposition Centre for Vertical Farming  La tour vivante, Paris  Vertical Farming Research Institute

HOERR SCHAUET landscape architects  All season rooftop garden  Yasmin Rahman  SOA Architects  MDRXA
FOOD PRODUCTION: STATE OF THE ART
STATE OF THE ART IN URBAN AGRICULTURE AND FOOD PRODUCTION

1. Vertical Farming Research Institute (Thesis project)
2. Gary Corner youth centre, Chicago, Ill.
3. Rooftop greenhouses, Toronto

Yasmin Rahma
Mardi vertical farm

SOA Architects, vertical farm concept

HOERR SCHAUDT landscape architects

LUFA farms,
4. basement agriculture, PASONA 02, Tokyo
5. interior agriculture, PASONA 02, Tokyo
6. soil based urban agriculture, Chicago, Illinois
URBAN AGRICULTURE AND FOOD PRODUCTION SYSTEMS
Aeroponics, Aquaponics, Hydroponics

Drains from the lower growing bed run, and the cycle begins anew. The fish (tilapia) and more recently the fish (tilapia and more recently tilapia) are destined to be harvested.

Tilapia: A small trout, this hearty fish is native to the Nile River. The aquaculture mimics the Nile’s murky, 68-70-degree water, making it ideal for the tilapia.
URBAN AGRICULTURE AND FOOD PRODUCTION
SYSTEM INTEGRATED INTO THE DESIGN

Programmatic relations
- Tower
- Rooftop
- Sublevels
- Interior
- Exterior

- Vertical farming
- Rooftop greenhouses
- Basement
- Interior
- Conventional

System
- Tower relations
- Rooftop relations
- Sublevels relations
- Interior relations
- Exterior relations

- Vertical farming
- Rooftop greenhouses
- Basement
- Interior
- Conventional

- Solar
- Heat
- Clean water
- Treatment system
- 1. Wetlands
- 2. Interior RESP system
- Grey water
- Storage
- Heat
- Industrial excess heat
- Cascades
- Wind
- Solar
- Industrial excess heat

Urban agriculture and food production system integrated into the design.
CONCLUSION
INTEGRATING MULTIPLE PRODUCTION METHODS IN A CLOSED WATER/ENERGY/WASTE SYSTEM
A vertical agricultural system integrating multiple types of production methods.

1. Wetlands
2. Interior RECIP system
3. Clean water treatment system
4. Rooftop u.a.
5. Cascades

Southern facade: Photovoltaic panels

Western and Northern facades: Passivhaus

Innovative structural building strategies:
- Open façades
- Vertical open space
- Integrating floor planks
- Full-height glass façades

Production tower:
- Soil/trays
- Hydroponics
- Aeroponics
- Vertical farming
- Incubation
- Incineration
- Locally produced bio waste
- Compost
- Test lab
- Nursery
- Greenhouse
- Basement
- Rooftop

Rooftop greenhouses:
- Rainwater collection
- Grey water
- Groceries
- Restaurants
- Shipping
- Receiving
- Cooling
- Storage

'Learning street': Exposition and vocational experiments

1. Rainwater storage
2. Vertical farming
3. Hydroponics
4. Drip irrigation
5. Aeroponics
6. Incubation
Climate design

heating and cooling aided by greenhouses

*Hydronic heating and cooling in a closed system*
Dimensioning primary water main

Necessary daily water requirements for agricultural production:

As an example: tomatoes use 29.0 litres/m²
The system should support the daily needs for a period of 6 hours

Total production area = 5.000 m²
Total water requirements for 5.000 m² of tomatoes (highest water requirement compared to other crops) = 145.000 l water/day = 6.74 l/s
flow rate standard greenhouse = 1.5 m/s

Flow rate is affected by:

*Water pressure*

*Pipe diameters – The smaller the internal diameter of the pipe, the lower the pressure and flow rate.*

*Pipe lengths – longer pipes will result in a lower flow rate*

*Number of bends and fittings – the more bends in a length of pipework and the more fittings, the lower the flow rate*

Using a water main calculator one can find the necessary diameter of the main water line: (http://irrigation.wsu.edu/Content/Calculators/General/Pipe-Velocity.php)

Necessary capacity 6.74 l/s
At 30 m, the water pressure can be max 2 Bar, at ground level te pressure will be 5 Bar. This means the main pump must be able to produce 5 bars of pressure.

Minimum pipe diameter 0.075 m
Flow rate 5 fps
Necessary flow rate = 1.5 m/s
CONCLUSION
OPTIMAL ORIENTATION FOR PRODUCTIVE GREENHOUSES
\[ \text{Winter} \]

\[ 124^\circ \]

\[ 11.49 \]

\[ 14:23 \]

\[ 145^\circ \]

\[ 145^\circ \]

\[ \text{max solar radianum} \]

\[ \text{max solar radianum} \]

\[ \text{maximum winter radian} = \frac{180 - 145}{2} = 17.5^\circ \]

\[ \text{radius} = 165 - 18.3 = 172^\circ \]

\[ \text{shift due to considered to } 180^\circ. \]
material labs // ETFE with integrated voltaic panels

material vertical greenhouse // ETFE
Ventilation

6 Climatic zones

m³ zones
A1 = 7.200 m³
A2 = 4.800 m³
B = 4.000 m³
C1 = 3.600 m³
C2 = 3.600 m³
D = 3.200 m³
E = 30.000 m³

zones function per zone

VENTILATION
A1. SCHOOL
A2. LIBRARY & LECTURE HALL
B. ATRIUM & COMM. FUNCTIONS
C1. LABS & RESTAURANT
C2. RESTAURANT
   C25 = 50 m² AIR/h
   = 12,500 m³/h
A2. Max 100 + 120 p.
   = 11,000 m³/h
B. ATUM
   Max 400 p.
   = 20,000 m³/h
C1. High performance rate
   600 m³/h, max 20 p. 10,000
Dimensioning main and secondary shafts (AIR CHANGE per HOUR) cross referenced with maximum amount of people/room x 50 m³/h

Duct 1 A1 A2
60,000 m³/h / 36,000
= 1.66 m²

\[ d = 1.29 \text{ m} \times 1.29 \text{ m} \]

Duct 2 C1 C2
100,000 m³/h / 36,000 = 2.86 m²

\[ d = 1.27 \text{ m} \times 1.27 \text{ m} \]

Duct 3 B E
14,000 m³/h / 36,000 = 4.7 m²

\[ d = 2.17 \text{ m} \times 2.17 \text{ m} \]

Duct 4 E
3,200 m³/h / 36,000 = 0.55 m²

\[ d = 0.44 \text{ m} \times 0.66 \text{ m} \]
Natural ventilation

ZONE A2, B, C1 & C2, E
The atrium: natural ventilation and chimney effect

zone C1, C2 and E need permanent mechanical ventilation
Zone A1
greenhouse as buffer zone
4. STRUCTURAL DESIGN
contextual relations

humble materials in relation with the context, the typical wooden suburb architecture in Chicago-South.

changing and environmental relations

facilitating change and re-use for an unknown future.

atmosphere, color, contrast

The beauty of wood and steel structures
atmosphere of building masses

Athmosphere of atrium
façade design principle, guiding the visitor towards the atrium.
North Facade - open vs closed facade design and placement of productive tower directs the visitor towards the atrium
structural design concept

A. Steel posts
Laminated beams

B. Steel table structure
Laminated beams

C. Steel columns
Single field truss
Dimensions

Primary load bearing structure

standard steel column
3 building layers
3 < l < 8 m -- width = l/20 a 1/25 h

h basement/ground floor = 4 m
column = 0.2 x 0.2 m

h ground floor/first floor = 4 m
column = 0.2 x 0.2 m

h first floor/second floor = 7 m
column = 0.35 x 0.35 m

standard steel beam
Span max = 6 m
h = 1/15 l
h beam = 0.4 m

Secondary load bearing structure

laminated beam
wood, C24
depth = 1/20 length
width 1/3 - 1 h

standard laminated beam
span max = 6 m
depth = 0.3 m
width = 0.075 m
+ extra weight green roof + lab
equipment factor
1.5 = 0.45 x 0.9

Building structure part A

Primary load bearing structure: portals (steel columns and beams)
secondary structure: engineered wooden beams

stability

Concrete cores
stable floor slab (nailed chipwood)
building structure building part B
main structure: portals (steel columns and beams in a table structure)
secondary structure: engineered wooden beams

stability
columns (fixed momentum)
stable floor slab (nailed chipwood)
dilatation at A

Dimensions
Primary load bearing structure
Columns
3 building layers
3 < l < 8 m -- width = l/20 a l/25 x h
h ground floor - = 6 m
column = 0.3 x 0.3 m

h first floor = 7 m
l column = 0.35 x 0.35 m

standard column size = 0.35 x 0.35 m

steel beams
Span max = 13 m
h = 1/15 l
h = 0.86 m

secondary load bearing structure

laminated beams
wood, C24
Depth = 1/20 length
width 1/3 - 1 laminated beams

Span max = 10 m
depth = 0.5 m
width = 0.2 m
building structure part C

Structure: steel columns and single field trusses

stability
A combination of steel trusses and steel scaffolds forms a three-dimensional tri-angular structure so that torsion forces created by the structure itself can be relieved via the concrete core.

In dialogue with my structural tutor, we have decided to focus on the wooden structure in the base of the building, as the idea of a rotating steel structure contributes to complex forces and torsion in the steel structure of the tower. The representation of the steel structure is an approximation, but in reality, the structure may differ in size and dimensions.
Food production from city to detail

contextual relations

SCALE // URBAN

integration of agriculture on an urban scale

SCALE // NEIGHBOURHOOD

the fragment: point of collision of city and nature

SCALE // BLOCK

the square as urban moment. Architecture guiding the gaze towards nature and the productive land

the public atrium: place of social interaction, meeting or ignoring, agreements or disagreements
The school has intricate relations with society, performs as a social engine for the community of Chicago South, and is an initiator for economic relations, collaboration of public & private parties and economic events.

food production as central programmatic element, marking the interior route by visual relations towards the atrium.

Integrating food production systems throughout the building, e.g. walls and furniture.

food production in a closed bio-system, research and awareness for the future.

making use of a demountable building system of steel and engineered wood, produced.
VERTICAL URBAN FARMING
PARADIGM SHIFT IN ARCHITECTURE

Dr. Dickson Despommier, expert on vertical farming

The vertical farm and its benefits compared to traditional agriculture: It is possible to produce all year round and there is no weather-related crop failures. There is no agricultural runoff, allowing the ecosystem to restore itself. No pesticides, herbicides, or fertilizers have to be used. The entire system could use 70–95 percent less water and food miles (distance food has to be covered to consumer) is drastically reduced. Another advantage is more control of food safety and security, and last but not least, agriculture in the city offers new employment opportunities for a multiple levels of degree.

Tom Bosschaert, founder of except integrated sustainability

“it is necessary to continue to push for experimentation and exploration of this realm. The technologies are known, but they've hardly been used in such a way before. Also, the economical characteristics are not entirely known. Without test sites and further research into the implementation of vertical farms into the fabric of the city it will remain guess work.”

HOE MUCH FOOD WOULD THE BUILDING PRODUCE?

the typology of the vertical farm is not only a that of the tower, but a superimposition of the typologies of Agricultural research and educational institutes and the agricultural tower. A symbiosis that will form a centre for advanced metropolitan agriculture.

N. Meyer states that in order to feed 1 person on a complete vegetarian diet one would need 0.07 ha per person\(^8\). While this is done with traditional agriculture, the land needed when using advanced vertical farming would be drastically reduced. Dickson Despommier states that Advanced vertical farming could be 4-6 times more productive compared to traditional agriculture. (4-6 ha vertical farming is equal to 1 ha productive land. This means, for 400 people one would need:

\[
0.07 \times 400 = 28 \text{ ha of vertical farming} \\
28 \div 6 = 4.6 \text{ ha} \\
= 46,000 \text{ m}^2
\]

The school contains 5,000 m\(^2\) of interior productive area (which is 5 times more efficient than regular agricultural land, so that means an equivalent of 25,000 m\(^2\). The exterior houses 20,000 m\(^2\) of exterior agricultural fields and greenhouses. In the most positive (and unrealistic scenario, where all people are vegetarian), the school would provide 54% of daily food needs for its 400 users. The current food intake of Americans would mean the percentage is a fraction of this number. But, the real value of integrating food production into architecture and the city lies more in the production of awareness for our food. Integrating food systems into architecture shows us where our food comes from and how much land we actually need to sustain our consumption.

---

A regular vegetarian diet means 0.44 acres of land is required to feed one person per day.

The school could then be sufficient to feed 25 people per day.

All diet requires around 2.0 acres of land to feed one person.

The school requires around 5-6 people a day.

An average American diet requires 3500 calories, 175% more than the average of 2000 necessary for an adult.

This means the school can be sufficient to feed 3.4 people per day.
research fields
- crop yield and data generation
- soil chemistry and fertility
- soil management
- crop production
- weed science
- entomology
- plant pathology

vocational fields
- teaching and practical education in the field of urban agriculture. For students and local inhabitants.

greenhouses
- used extensively for both research and teaching, the Research Greenhouses provide facilities and support for production of agronomic, horticultural, ornamental, and forest plants.

wetlands and nature trail
- natural water treatment system providing leisure and a wide variety of wild plant life.

centre for advanced urban agriculture

For students and local inhabitants.
Feeding 4 people on an American diet!
Conclusion: awareness for Common Ground

By bringing people with different backgrounds together through food, which is something we all need, that binds us, a collective awareness for our current consumption behaviour can possible be achieved. Althought the building is not a solution for the structural problems in the area, social, economic and environmental isolation, it can be an urban catalyst as a start for better conditions in the neighbourhood, providing work, education and social diversity. By exhibiting food production with architectural tools such as contextual, programmatic and spatial relations, light, materiality and spatial configuration food can be experienced, smelled, seen and touched.

As this entire complex is only sufficient to feed 4 people, on its own it will not be an answer for our current food problematics and overconsumption. Again, rethinking how we produce and consume can create more awareness for the effort it takes to feed us.
APPENDIX
THE SCHOOL

Although focus lies on implementing food production on all scales of the design, the spatial conditions of the actual school have been explored in design. See also the P2 report for additional information on vocational (agricultural) education. This has resulted in the following design for classical and vocational education.
# PRECEDENTS

<table>
<thead>
<tr>
<th>1. CIVIC ENGAGEMENT</th>
<th>2. PRACTICAL EDUCATION</th>
<th>3. RESEARCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>local initiatives</td>
<td>interior programmatic study</td>
<td>Research facility, Groningen</td>
</tr>
<tr>
<td>Tostifabriek, Amsterdam</td>
<td>Jåttå Vocational School, Norway</td>
<td></td>
</tr>
<tr>
<td>e. Goode S.T.E.M., Chicago</td>
<td>E. Goode S.T.E.M., Chicago</td>
<td></td>
</tr>
<tr>
<td>exterior program study</td>
<td>W.B. Paul High School of agricultural sciences, Philadelpia</td>
<td></td>
</tr>
</tbody>
</table>
1. CIVIC ENGAGEMENT AND LOCAL INITIATIVES

Learning together

<table>
<thead>
<tr>
<th>Urban agriculture, Chicago</th>
<th>Kwun Tong, Hong Kong</th>
<th>Roof top algae, Bangkok</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasona 02, Tokyo</td>
<td>Transparant urban farm, Tokyo</td>
<td>Hydroponics, London</td>
</tr>
<tr>
<td>Travelling food truck market</td>
<td>Tostifabriek, Amsterdam</td>
<td>Greenhouse roof, New York</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>area</th>
<th>program description</th>
</tr>
</thead>
<tbody>
<tr>
<td>180 m² cafe/rest.</td>
<td>small cafe/restaurant (100 seats)</td>
</tr>
<tr>
<td>400 m² service</td>
<td>Help-desk/office/information and material store</td>
</tr>
<tr>
<td>5.000 m² gardens</td>
<td>community gardens &amp; greenhouses</td>
</tr>
</tbody>
</table>

Civic urban agricultural initiatives can be supported by providing knowledge on urban agriculture and by providing expertise and technical equipment when necessary. Freshly produced food is sold in the cafe/restaurant.
JÅTTÅ VOCATIONAL SCHOOL, JÅTTÅ NORWAY

<table>
<thead>
<tr>
<th>8.000 m² vocational</th>
<th>5.000 m² classical</th>
<th>3.000 m² serv.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>area</strong></td>
<td><strong>program description</strong></td>
<td><strong>specified</strong></td>
</tr>
<tr>
<td>16.000 m²</td>
<td>vocational education</td>
<td>8000 m²</td>
</tr>
<tr>
<td></td>
<td>5100 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vocational classrooms</td>
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</tr>
<tr>
<td></td>
<td>1400 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1500 m²</td>
<td></td>
</tr>
<tr>
<td>5000 m²</td>
<td>classical education</td>
<td>1500 m²</td>
</tr>
<tr>
<td></td>
<td>600 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1000 m²</td>
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</tr>
<tr>
<td></td>
<td>1000 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>900 m²</td>
<td></td>
</tr>
<tr>
<td>3000 m²</td>
<td>collective space</td>
<td>1300 m²</td>
</tr>
<tr>
<td></td>
<td>1300 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>400 m²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1300 m²</td>
<td></td>
</tr>
<tr>
<td>4500 m²</td>
<td>indoor sports facilities</td>
<td>2700 m²</td>
</tr>
<tr>
<td>1000 m²</td>
<td>outdoor sports facilities</td>
<td>1000 m²</td>
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<tr>
<td>800 m²</td>
<td>courtyard</td>
<td>800 m²</td>
</tr>
</tbody>
</table>

Type: Vocational high-school
Nr. of students: 1600
Age: 12-16 year
Architect: Henning Larsen
City: Jatta, Norway
Size: 16.000 m² school
2.700 m² sports
SPATIAL CONCEPT

- school and sports facilities
- “the street” collective interior space
- urban quarters
- teaching environment
SECTION // THE STREET

All collective functions are placed in this double height central space.
Vocational education and classrooms are clustered.

Urban quarters provided access to different teaching environments.
The E. Goode S.T.E.M academy shows programmatic similarities with Jatta vocational school.
2. PROGRAM EDUCATION EXTERIOR

Experiential based education

Type: vocational high-school
Nr. of students: 530
Age: 12-16 year
Architect: unknown
City: Philadelphia, U.S.A.

<table>
<thead>
<tr>
<th>area</th>
<th>program description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.105 m²</td>
<td>educational land</td>
</tr>
<tr>
<td>990 m²</td>
<td>land life stock</td>
</tr>
<tr>
<td>1000 m²</td>
<td>agriculture test fields</td>
</tr>
<tr>
<td>100 m²</td>
<td>farm building</td>
</tr>
<tr>
<td>200 m²</td>
<td>small animals (25 m² build, 175 m² land)</td>
</tr>
<tr>
<td>800 m²</td>
<td>land around farm buildings</td>
</tr>
<tr>
<td>3.100 m²</td>
<td>arboretum</td>
</tr>
<tr>
<td>1.850 m²</td>
<td>additional crop fields</td>
</tr>
</tbody>
</table>
SPATIAL PROGRAM
1. academic, agricultural, Greenhouses
2. main building, classical teaching
3. small animal building
4. arboretum
5. farm which houses poultry, dairy, swine, sheep, horses and meat Science program, pasture area livestock
6. field crops
7. academic buildings / Physical Education
8. athletic fields

Academic program
Agricultural and Food Products Processing
Animal Science
Applied Horticulture
Natural Resources Management and Policy

http://webgui.phila.k12.pa.us/schools/s/saul/about-us
Type: Research facility
Nr. of students: unknown
Degree: College
Architect: PvdB architecten
City: Groningen, the Netherlands
Size: 8.500 m²
2.000 m² lab & offices
Shared facilities
Every college has its shared building or building section where lectures are given, research is done and students can work. The campus buildings work together to provide for education, research, food, leisure and work. It operates as a small city.

Relation field of Agriculture
Faculties and the agriculture industry share knowledge, enhancing each other.

Agricultural Sciences
Animal Science
Biological and Agricultural engineering
Entomology and Nematology
plant Pathology
Plant Sciences
Viticulture and Enology

Environmental Sciences
Environmental Sciences and Policy
Environmental Policy
Environmental Toxicology
Human Ecology
Land, Air, and water Resources
Wildlife, Fish, and Conservation Biology

http://www.caes.ucdavis.edu/research/centers
PROGRAM

**school (total 17,100 m²)**
- main building: 3600 m²
- secondary buildings: 2400 m²

**facilitating functions**
- indoor sports facilities: 1,600 m²
- outdoor sport fields: 1,900 m²
- baseball field: 10,000 m²
- Entrance courtyard: 2,600 m²

**exterior**
- Vocational (total 6,105 m²)
  - farm buildings: 100 m²
  - land for farm buildings: 800 m²
  - Agriculture test fields: 1,000 m²
  - small animal building: 25 m²
  - small animal land: 180 m²
  - arboretum: 3,100 m²
  - Crop field: 1,300 m²
### Programmatic Requirements Based on Precedents

#### 1. Civic Engagement
- **1,000 m² interior**
  - **500 m²** cafe/restaurant
  - **500 m²** help-desk/office/information and store
  - **12,000 m²** community gardens & greenhouses (defined in the urban strategy of Common Ground)

#### 2. Practical Education // 18,000 m² interior
- **7,000 m² exterior**
  - **18,000 m²** vocational education
  - **5,000 m²** classical education
  - **5,000 m²** collective space

#### 3. Research // 4,000 m² interior
- **4,000 m²** labs and offices

#### Area and Program Description

<table>
<thead>
<tr>
<th>Area</th>
<th>Program Description</th>
<th>Specified Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,000 m²</td>
<td>vocational education</td>
<td>3,000 m² vocational classrooms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 m² 2 double high halls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 m² instructional rooms</td>
</tr>
<tr>
<td>5,000 m²</td>
<td>classical education</td>
<td>1,000 m² flexible classical rooms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 m² 2 lecture rooms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 m² lecture hall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 m² entrance/lobby/expos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500 m² self study</td>
</tr>
<tr>
<td>5,000 m²</td>
<td>collective space</td>
<td>1,000 m² library</td>
</tr>
<tr>
<td></td>
<td></td>
<td>400 m² restaurant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,000 m² flexible space</td>
</tr>
<tr>
<td>7,000 m²</td>
<td>land life stock</td>
<td>900 m² land life stock</td>
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<tr>
<td></td>
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</tr>
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<td></td>
<td>additional crop fields</td>
<td>1,850 additional crop fields</td>
</tr>
</tbody>
</table>
SCALE ON SITE

square form (with interior street)

rectangular

cluster
SPATIAL PRECEDENTS

SCHOOL ATRIUM

Titaan Hoorn
Herman Hertzberger
Inholland University
Erick van Egeraat

Jatta vocational school
Hennig Larson
LEARNING STREET

Chr. Hogeschool Windesheim Zwolle
Broek Bakema

work balconies
Het Montessori College Oost
Architectuurstudio Herman Hertzberger

Multifunctional street
Inholland University
Erick van Egeraat
LECTURE HALL

Multifunctional patio
X Block learning centre
Planet 3 studios

Lecture room and central hall
Jatta vocational school
Hennig Larson

Closed lecture room
Institute of Science and Technology Austria
workstations

Jatta vocational school
Hennig Larson

vocational room

SSIC, Gordola
Durisch Nolli
CLASSICAL EDUCATION

classroom
SSIC, Gordola
Durisch Nolli

MENSA/RESTAURANT

mensa
Jatta vocational school
Hennig Larson