ETH Zurich Department of Architecture
ARCHITECTURE OF TERRITORY
Chair of Architecture
and Territorial Planning
Professor Milica Topalović

Agrarian Project
Spring 2023

Dübendorf

A Case for Communal Greenhouses: Protecting Agricultural Land with Communal Urban Agriculture

Claudia da Silva Bütikofer, Martino Galli, and Jennifer Braghetti



Dübendorf is a city located in the agglomeration of Zurich. In the last century, it experienced profound social changes and transformations of its urban and rural fabric. What was once a village of about a hundred inhabitants now counts over 30,000 people. This urban expansion was only possible at the expense of agricultural land, leaving farmers struggling with the remaining land.

In order to remain competitive in the agricultural sector, some farmer families have introduced greenhouses in their practices. Greenhouses allow for an increase in productivity, but they have a high energy consumption. In addition, greenhouses are often built on agricultural land but operate with substrate or elevated cultivation systems which results in a waste of fertile soil.

Designing greenhouses in the city would allow small farmers to regain competitiveness, to avoid the occupation and destruction of fertile land, to bring the workforce closer to work, and to connect agriculture with the city.

From Dübendorf to Dübenstadt



Dübendorf has been an agricultural village since its first documentation around 1000. Despite its early housing culture, it remained small and poor for centuries, before transforming into an urban centre in the 20th century. The Beerstecher family is one of the farming families that witnessed the significant changes that accompanied the transformation from a village to a city.

Since ancient times, the lack of fast and reliable means of transportation forced the inhabitants of Dübendorf to cultivate their own land for a self-sufficient food supply and to concentrate on growing grain.

The agricultural fields formed a large contiguous area that was cultivated in a three-year cycle. The fencing of the cultivated fields was therefore an important matter for the whole village, and each farmer was responsible for the good condition of his fields under threat of punishment.



"ZEHNTENPLAN"
In the 17th century, the land was farmed by feudatories, who had to give the tenth ("Zehnt") part of their yield. The plan from 1681 shows large parcels owned by few.
Source: Staatsarchiv, 1681.



Agriculture expanding over the whole territory



Agriculture expanding over the whole territory



Agriculture expanding over the whole territory



LANDSCAPE DOMINATED BY AGRICULTURE
Agriculture expands in 1923 over the whole territory of Dübendorf.
Source: ETH Bibliothek [https://www.ig-luftfahrt152.de/2018/05/18/mai-treff/]



Sheep herds on the military airport of Dübendorf in 1945.
Source: unknown.

The Beerstecher Farm



Jakob and Berta Beerstecher: starting a legacy

Dübendorf was a small village of about a hundred inhabitants when, at the beginning of the 20th century, changes in the transport infrastructure and in technical progress urbanised the village.

Dübendorf's development was in particular closely linked to the progress of transport infrastructure. It was in fact in 1856, with the opening of the Zürich-Uster railway that the village began its rise, attracting more and more people in the following decades. The population doubled rapidly from 10,000 in 1957 to 20,000 in 1970.

One of the farming families that witnessed these important changes was the Beerstecher farming family, headed by Jakob and Berta Beerstecher. They had to deal firsthand with the changes that the growing village of Dübendorf had to face. In agriculture in particular, there was a transition from manual to mechanised work, which led to a change in the location and size of fields farmed by the family.

Around 1950, the second generation of the Beerstecher family (Willy and Ideli Beerstecher) faced the increasing pressure of urbanisation and decided to buy a plot of land in the center of Dübendorf (in the Hochbord district) to grow vegetables in greenhouses. In this way, it became possible to employ people all year round.



Acquiring promising land



Beerstecher the pioneers of greenhouses in Dübendorf, Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/]



The Beerstecher family caught in the changes of the village



The Beerstecher family caught in the changes of the village



The Beerstecher family caught in the changes of the village



The Beerstecher family caught in the changes of the village



The Beerstecher family caught in the changes of the village



The Beerstecher family caught in the changes of the village



Women working on the fields of the Beerstecher farm. Source: unknown



The Beerstecher family caught in the changes of the village, 1958. Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/]



The Beerstecher family caught in the changes of the village, 1959. Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/]



The Beerstecher family caught in the changes of the village, 1959. Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/]



MECHANISATION
Farming at Beerstecher in 1958.
Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/].



GREENHOUSES
First greenhouses on the Beerstecher farm in 1959.
Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/]



GREENHOUSE CULTIVATION
Expanding a new way of farming in Dübendorf, 1982.
Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/].



GREENHOUSES AND FIELD VEGETABLES
Dübendorf, 1982.
Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/].



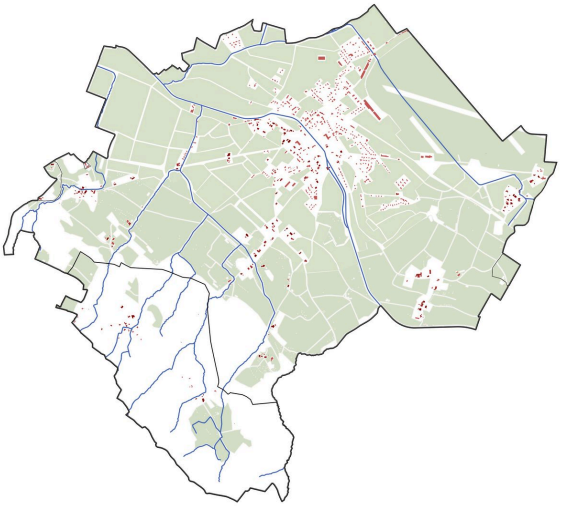
CULTIVATING SEEDLINGS
Beerstecher greenhouse in 1974.
Source: Beerstecher [https://www.beerstecher.ch/unternehmen/geschichte/].

The Urbanisation of Dübendorf

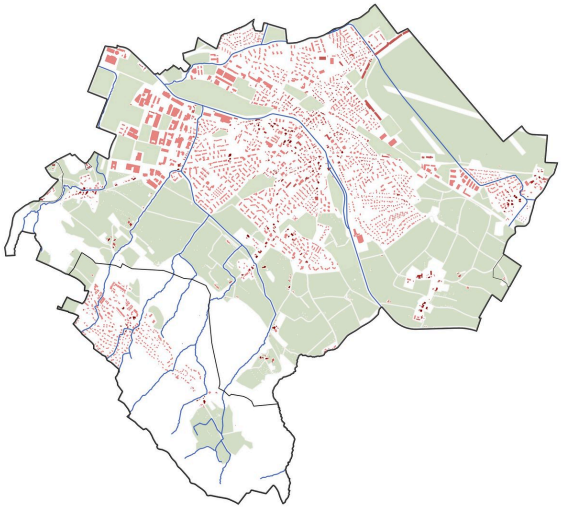
Today, more than 30,000 people live in this urban agglomeration. The increase in traffic and the intensive use of the area by recreation seekers are often in conflict with nature protection as well as with agricultural production.



1900



1950



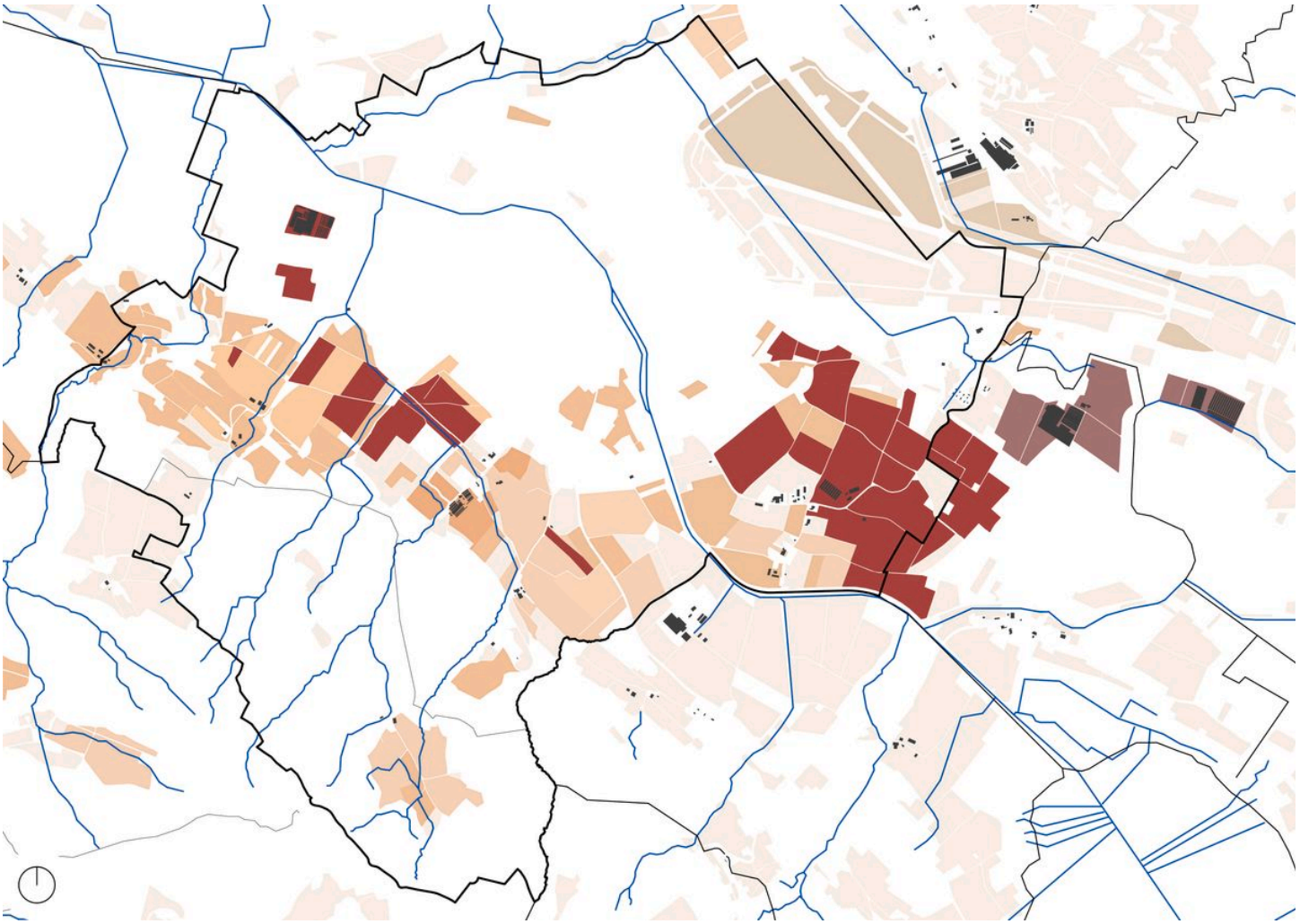
2000

The Footprint of Agribusinesses



Due to rapid urban expansion, agricultural land is under pressure. Today, the agricultural land in Dübendorf is farmed by only 13 farming families. The larger farms tend to expand at the expense of the smaller ones.

Agricultural land in Dübendorf is currently leased and farmed by a dozen companies, which vary greatly in terms of agricultural area, number of employees and production.
The City of Dübendorf leases mainly to larger agricultural companies from which it can expect more profit and economic security. Two farms, Imhof Bio and Beerstecher, stand out in particular in terms of agricultural area, as together they farm over 40 % of the total agricultural area in the commune.



FARMS IN DÜBENDORF
13 farming businesses operate in Dübendorf in 2023.

- ImHof Bio
- Beerstecher
- A. Bayer
- Gfellergut
- R. Müller
- Attinger
- P. Gossweiler
- J. Körbi
- J. Morf
- Wachtel-Michel
- J. Morf
- Others

ARCHICAD EDUCATION VERSION



Who are the big ones?

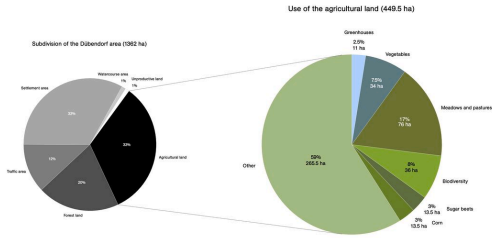
Following the various needs and demands of society, agricultural production has become much more diversified than in the past. Despite greenhouses occupying a smaller portion of agricultural land, the majority of labour and production is concentrated there. The use of modern technology and practices in greenhouse farming helps farmers produce more crops with less land and ultimately increase their profitability throughout a whole year.

This relationship between land size and labor can be attributed to the fact that smaller plots of land require more hands-on, manual work, such as planting and harvesting, due to their limited space and need for precision. On the other hand, larger plots of land can be worked on with the aid of machinery, which can cover more ground quickly and efficiently.

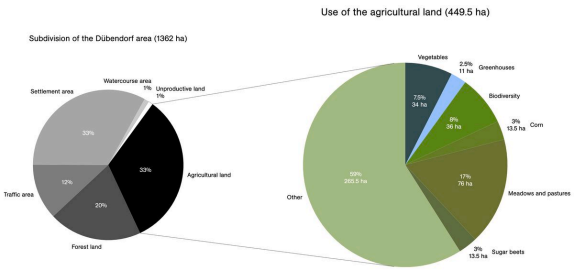


AGRICULTURAL LAND USE

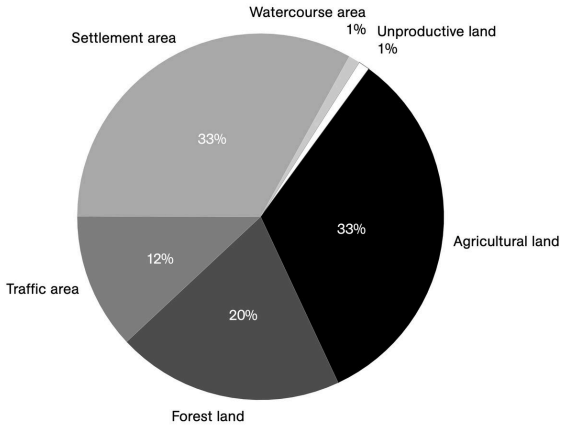
- Greenhouses
- Vegetables
- Biodiversity
- Corn
- Meadows and pastures
- Cropland
- Sugar beets



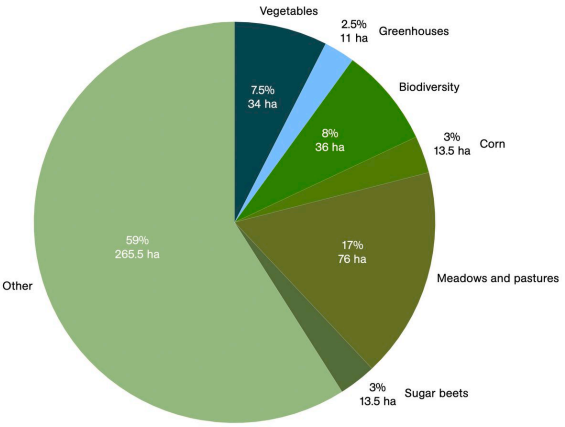
Less land, more productivity



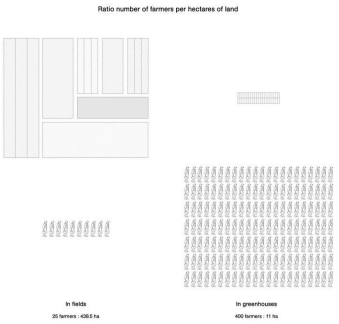
Less land, more diverse productivity.



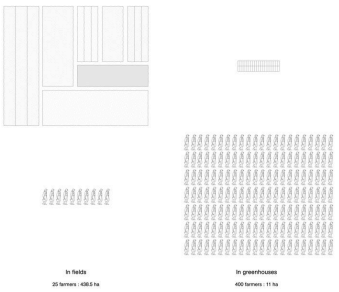
LAND USE DÜBENDORF



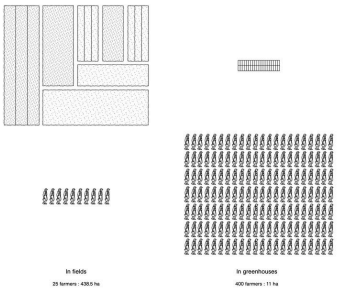
AGRICULTURAL USE DÜBENDORF



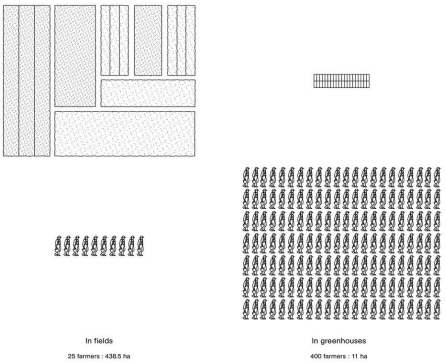
The smaller the place, the larger the amount of labour



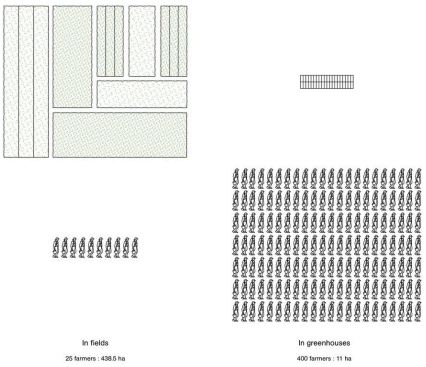
The smaller the place, the larger the amount of labour



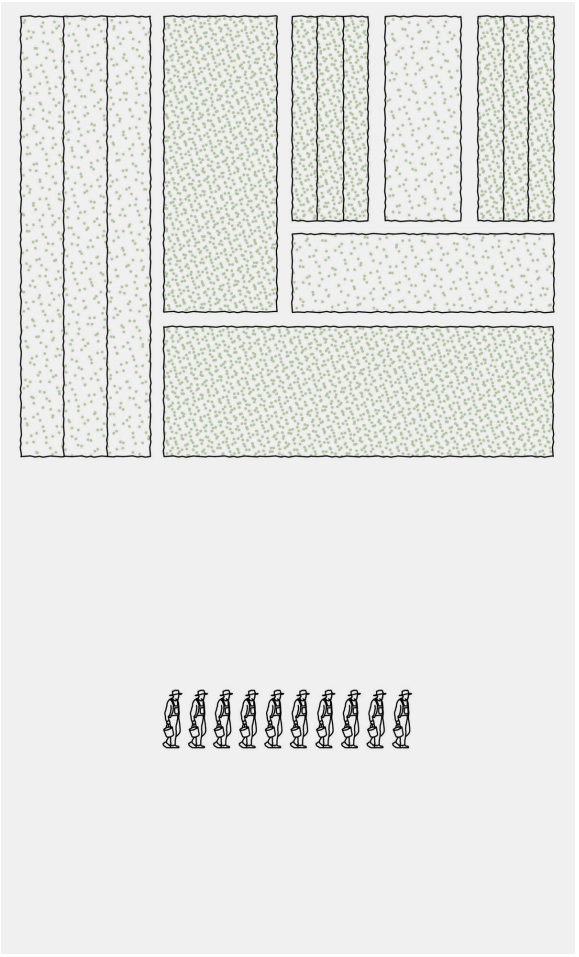
The smaller the place, the larger the amount of labour



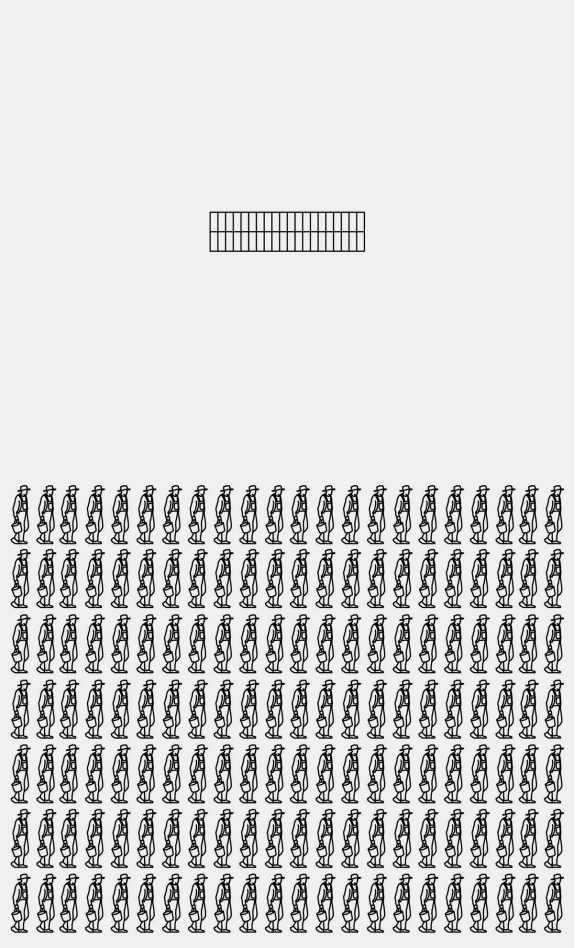
The smaller the place, the larger the amount of labour



The smaller the place, the larger the amount of labour.



OPEN FIELD
25 farmers
438.5 ha

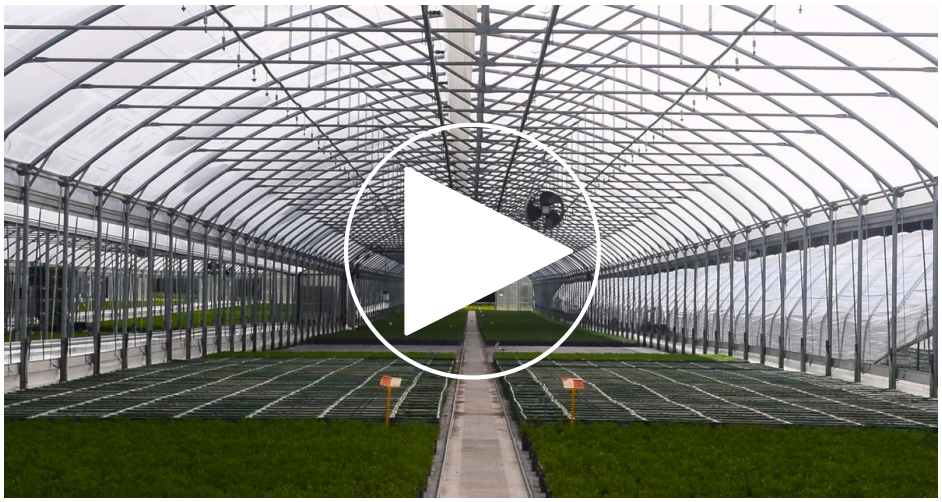


GREENHOUSES
400 farmers
11 hectares

Beerstecher AG and Imhofbio AG: Two Case Studies

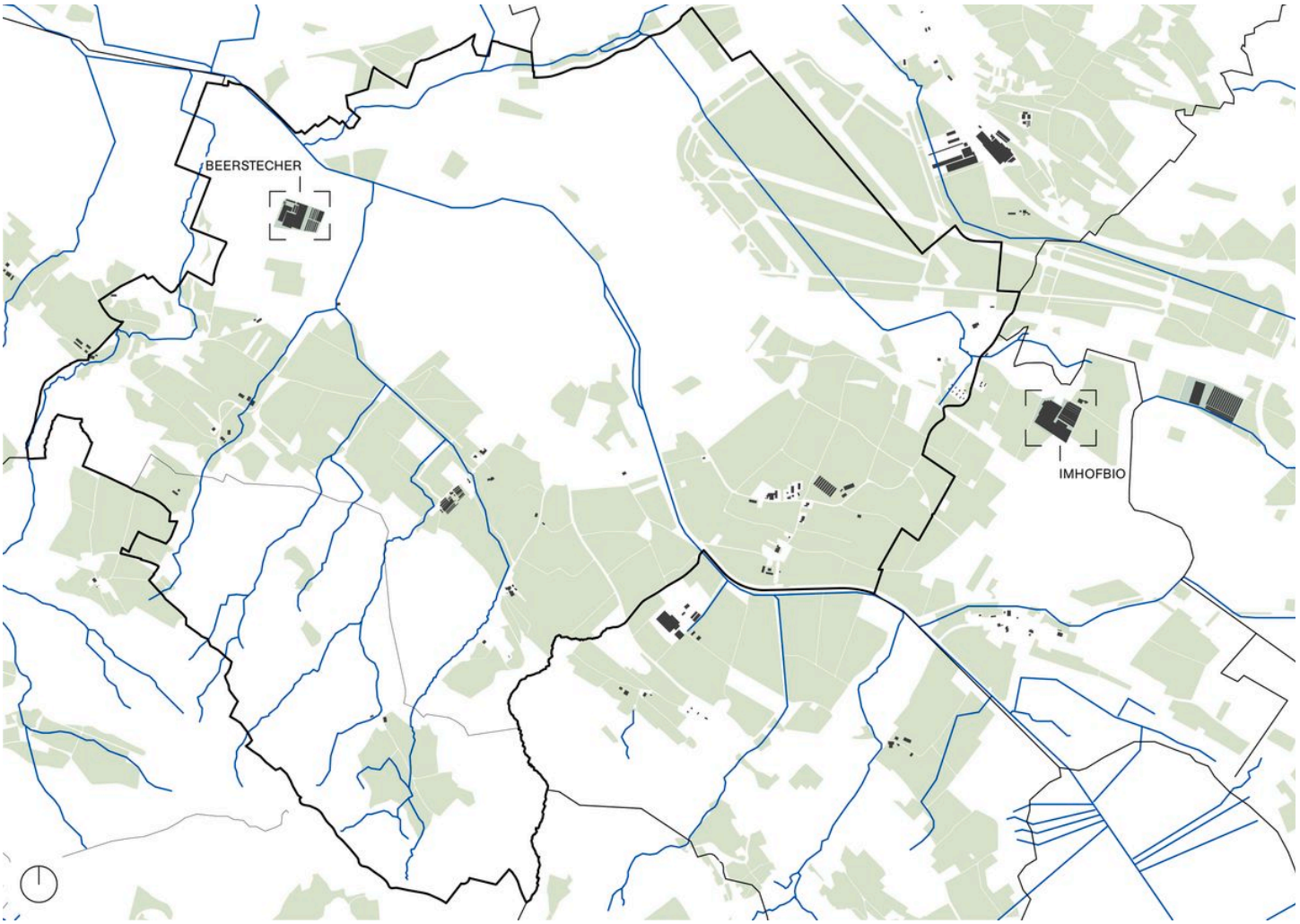


The Beerstecher and Imhof families have become highly competitive and influential agricultural businesses thanks to the introduction of greenhouses. Today, due to the urbanisation of Dübendorf, the greenhouses are located in very different spatial contexts: adjacent to fields and between high-rise buildings in the center of the city.



DÜBENDORF: BETWEEN CITY AND AGRICULTURE

https://vimeo.com/831217671



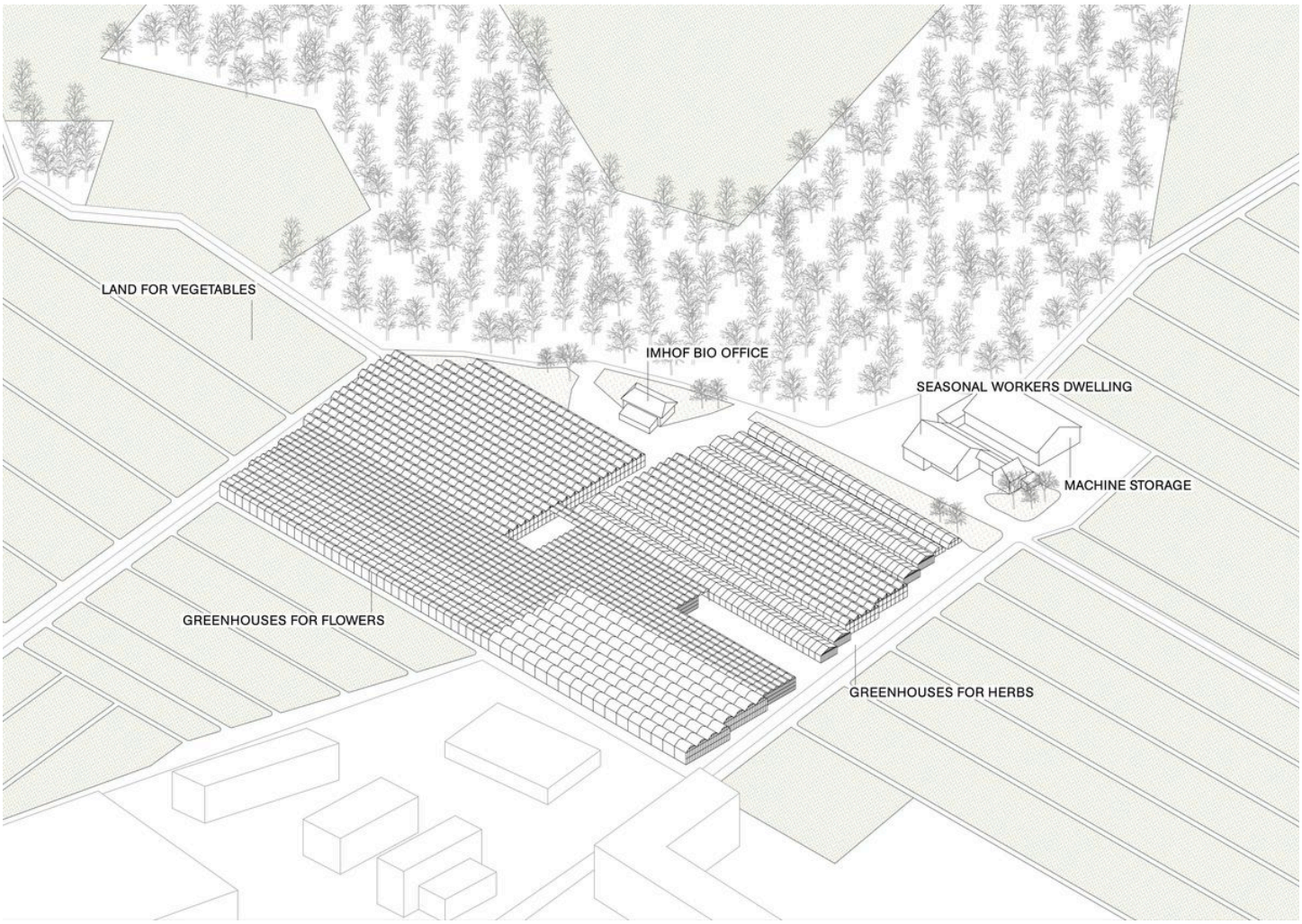
LOCATION OF IMHOFBIO AND BEERSTECHER GREENHOUSES

Imhofbio AG

Imhofbio is a farm that focuses mainly on herb production, but also produces vegetables and flowers on 100 hectares of open land and 2 hectares of greenhouses. In 1997, the family established two branches of the business, which have led to the success and current growth of the company.

Several substrate-based greenhouses are located in the agricultural zone. The greenhouses are based on the same basic module. Inside, the functions are multiple and vary according to the growth stage of the plants and the type of production.

Imhof Bio employs around 180 seasonal workers in the high season and provides them with accommodation, some of which is located at the headquarters and the majority in the neighboring village of Schwerzenbach. Greenhouses and accommodation are located far from the town center. The seasonal workers come mainly from Portugal, Hungary, Poland or Romania.



Imhofbio greenhouses are located next to fields.



Greenhouses conquering agricultural land



Greenhouses conquering agricultural land



1981. Source:



2022



1981



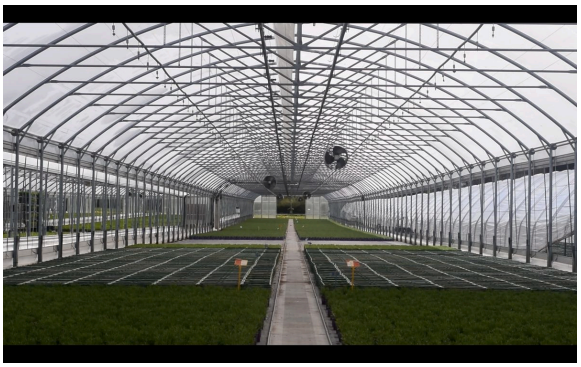
2022



Imhofbio: 1981



Imhofbio: 2022





































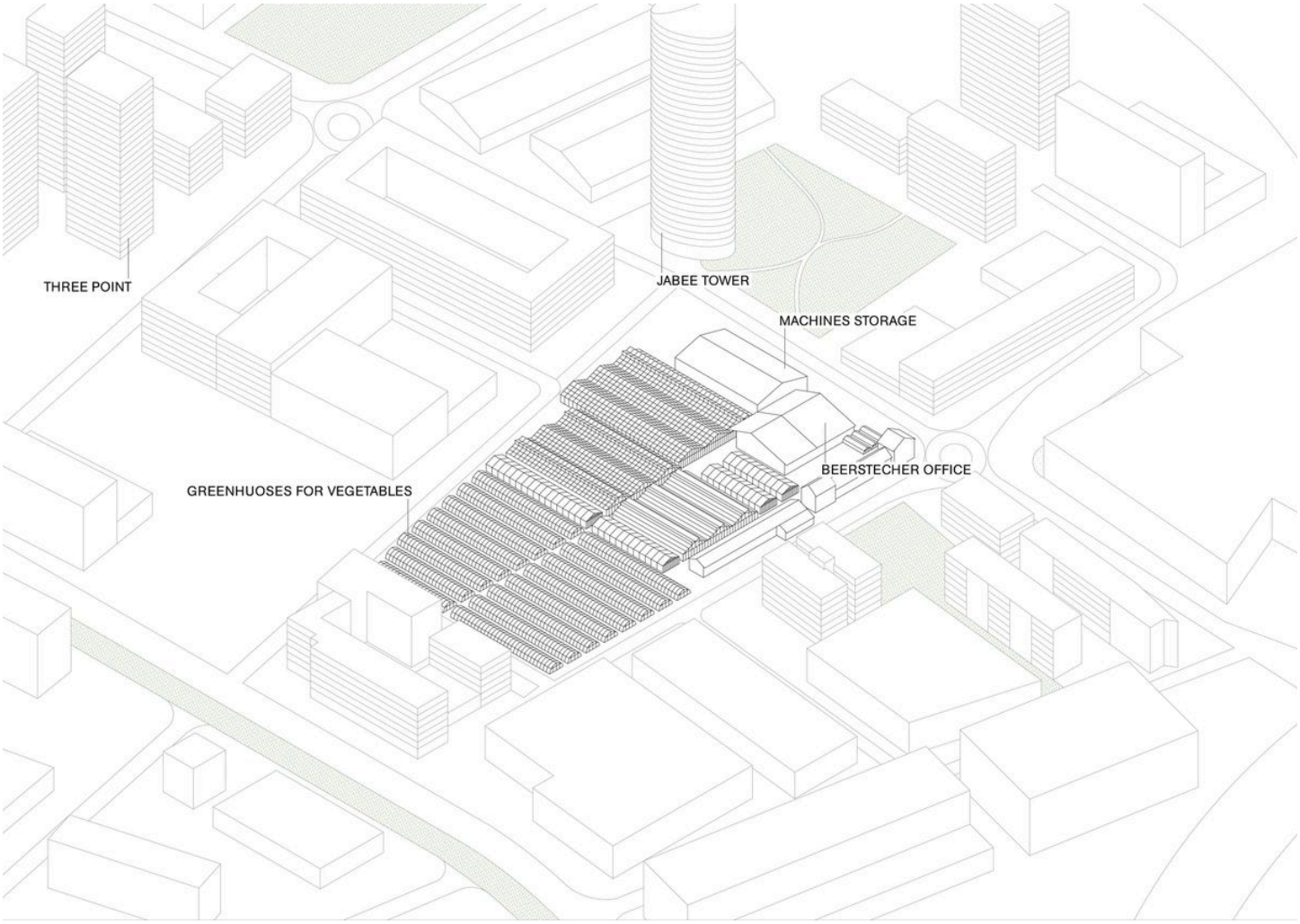
Being highly productive.



Beerstecher AG

The Beerstecher company specialises in growing vegetables on 100 hectares of open land and 5 hectares of greenhouses. Unlike the Imhof organic farms, some of them are located in the central zone, surrounded by residential and commercial buildings, which makes amenities such as shops more accessible to the seasonal workers employed by the Beerstecher AG

Beerstecher AG also invests in real estate, from which it earns large profits. After zoning some land formerly used for agriculture, Beerstecher AG built on it, including the Jabee Tower.



Urban setting of the Beerstecher greenhouses.



Glimpses of greenhouses in the past



Greenhouses nowadays



Beerstecher: 1981



Beerstecher: 2022



THE TRANSFORMATION OF THE HOCHBORD
From agricultural fields to high-rises





Utopia Beerstecher business



Utopia Beerstecher business



Utopia Beerstecher business



Utopia Beerstecher business

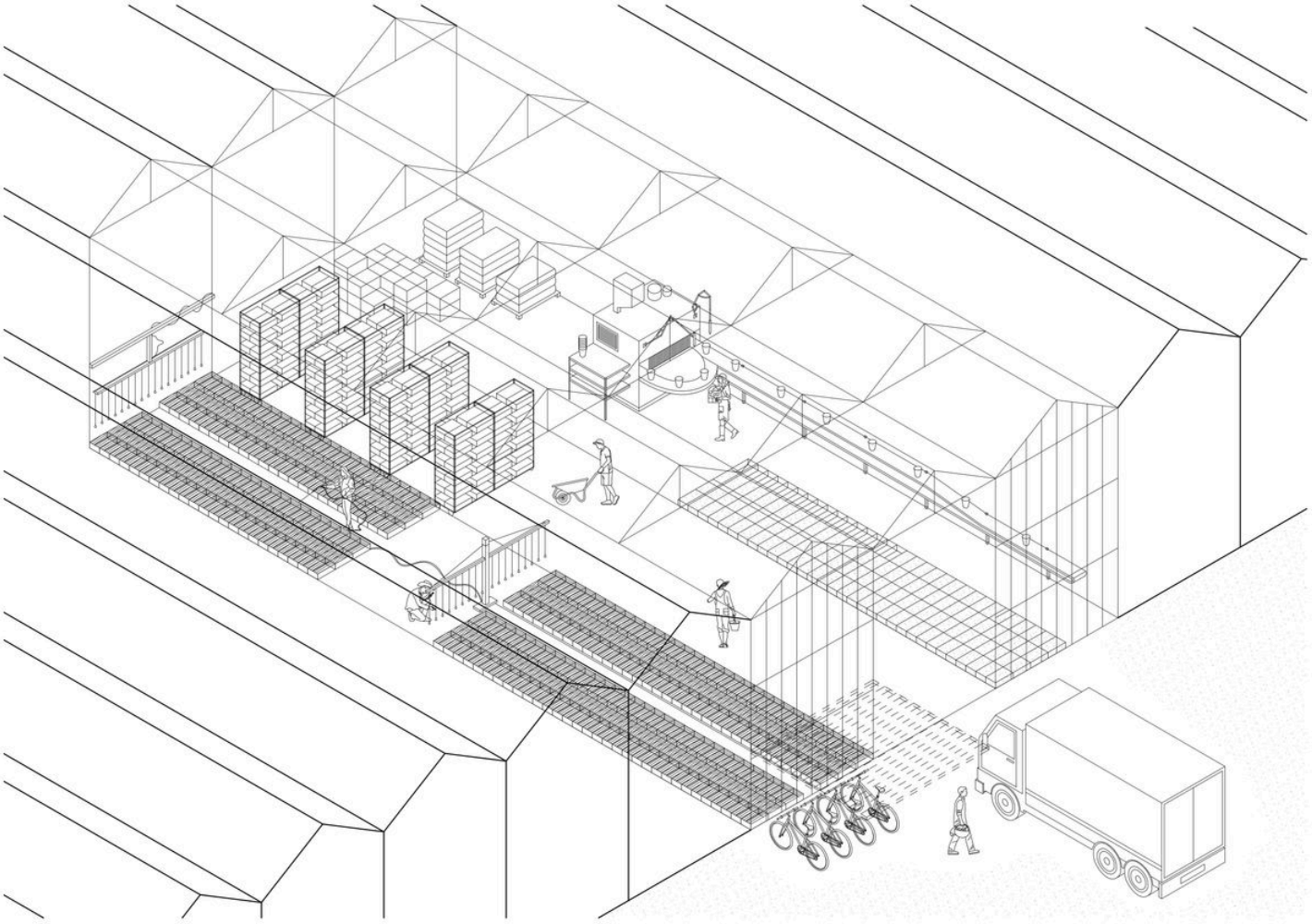


Utopia Beerstecher business



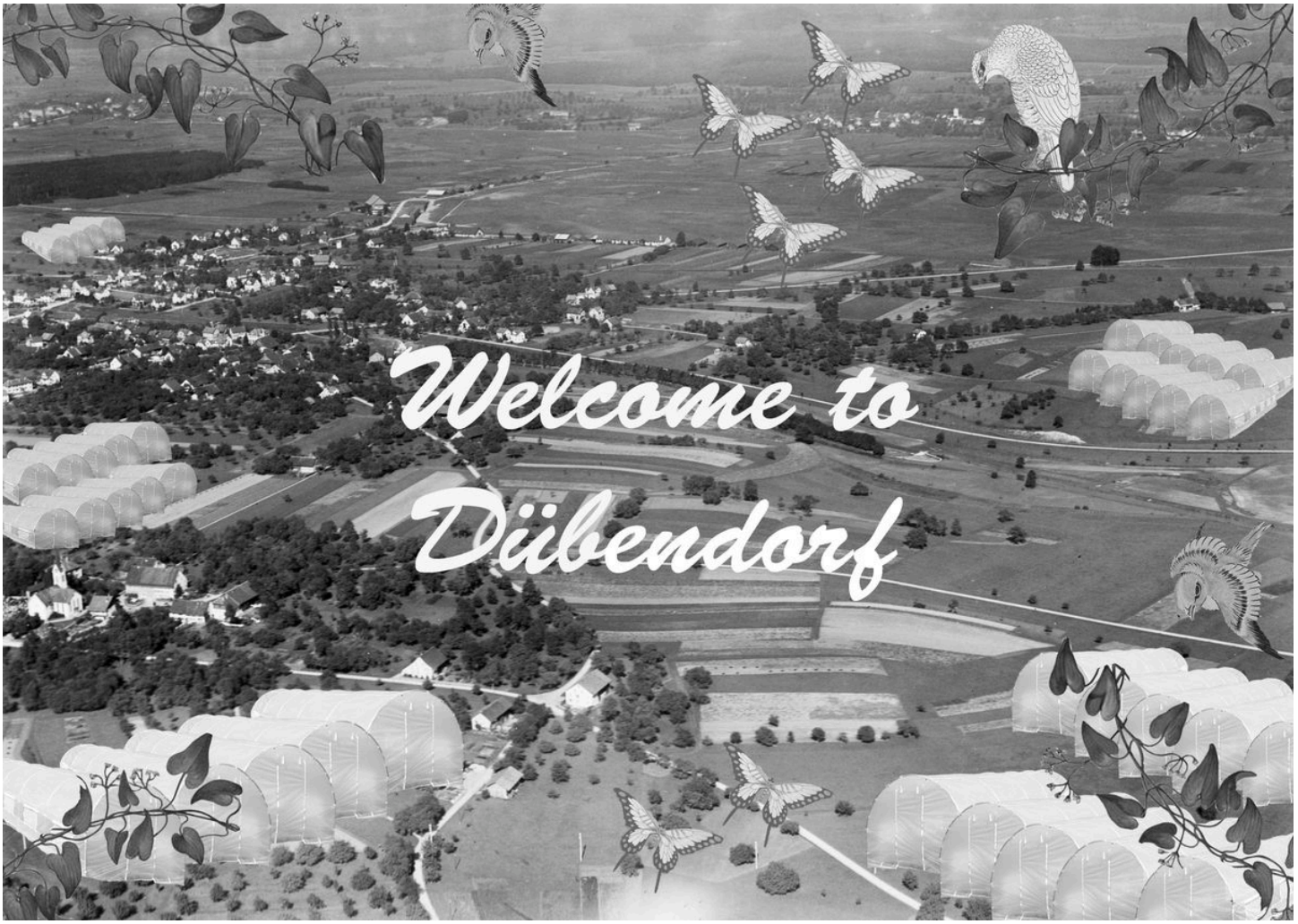




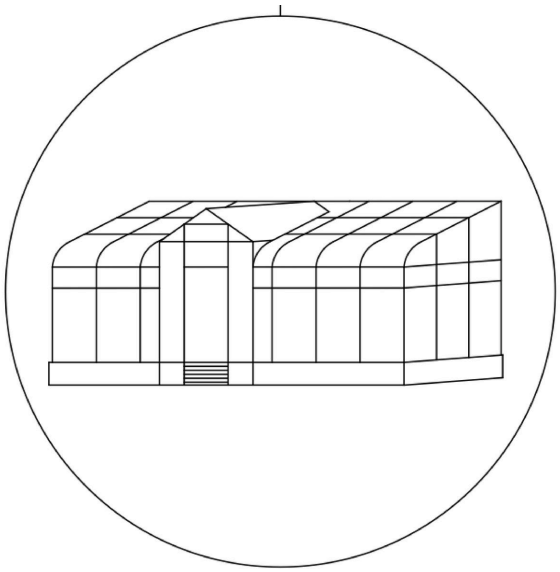


GREENHOUSE PRODUCTION
The processes are closely coordinated in the greenhouse, from cultivation to packaging.

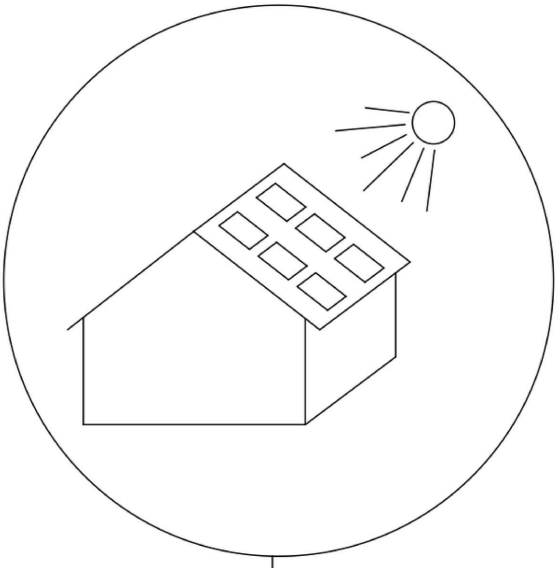
The Future Belongs to a Multifunctional Greenhouse



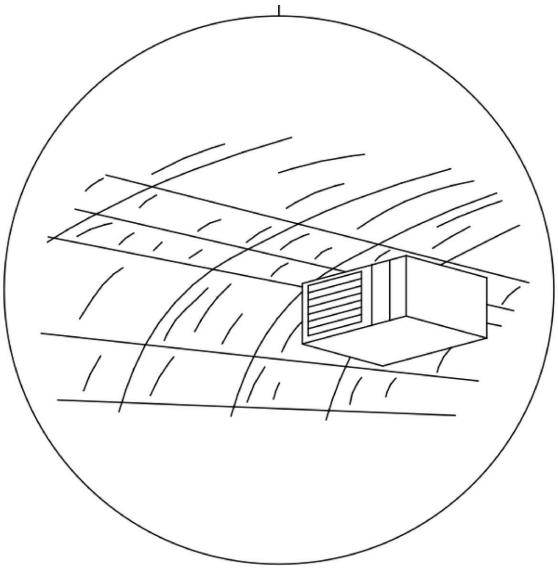
The origin of the greenhouse dates back to the first century AD. Since then, it has evolved both in terms of size and materials, as well as in terms of cultivation, management and working conditions. Today it is a sophisticated production structure that continues to evolve, producing not only material goods but also social values.



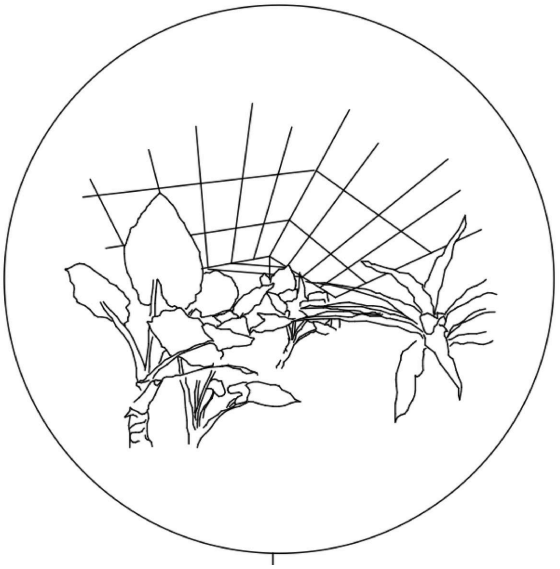
13TH CENTURY
In Europe, the greenhouse construction with glass begins.



20TH CENTURY–TODAY
Greenhouses have evolved to become more efficient, sustainable and adaptable to fluctuating environmental conditions.



19TH CENTURY
Improved heating technologies allow for the use of greenhouses in colder climates.

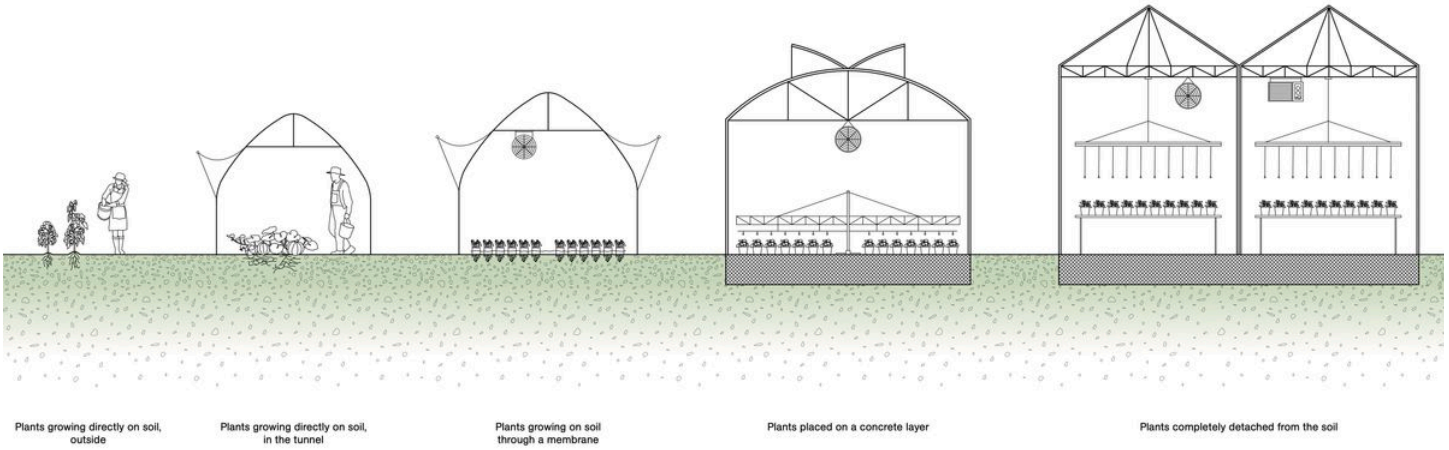


14TH–17TH CENTURY
During the Renaissance, greenhouses became increasingly popular in Europe to grow exotic plants from all over the world.
Source (for alle images): Ancient Greenhouses [https://www.youtube.com/watch?v=CQ8-LtLl11s]

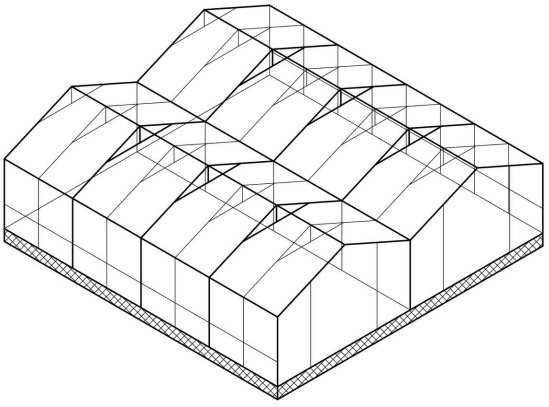


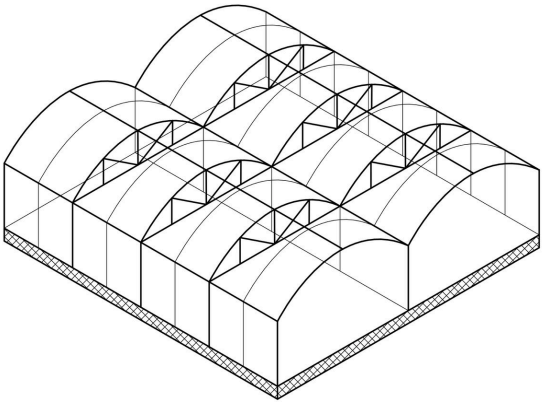
1ST CENTURY
During the Roman empire, structures to grow cucumbers all year round are being built. These are considered one of the earliest greenhouses.

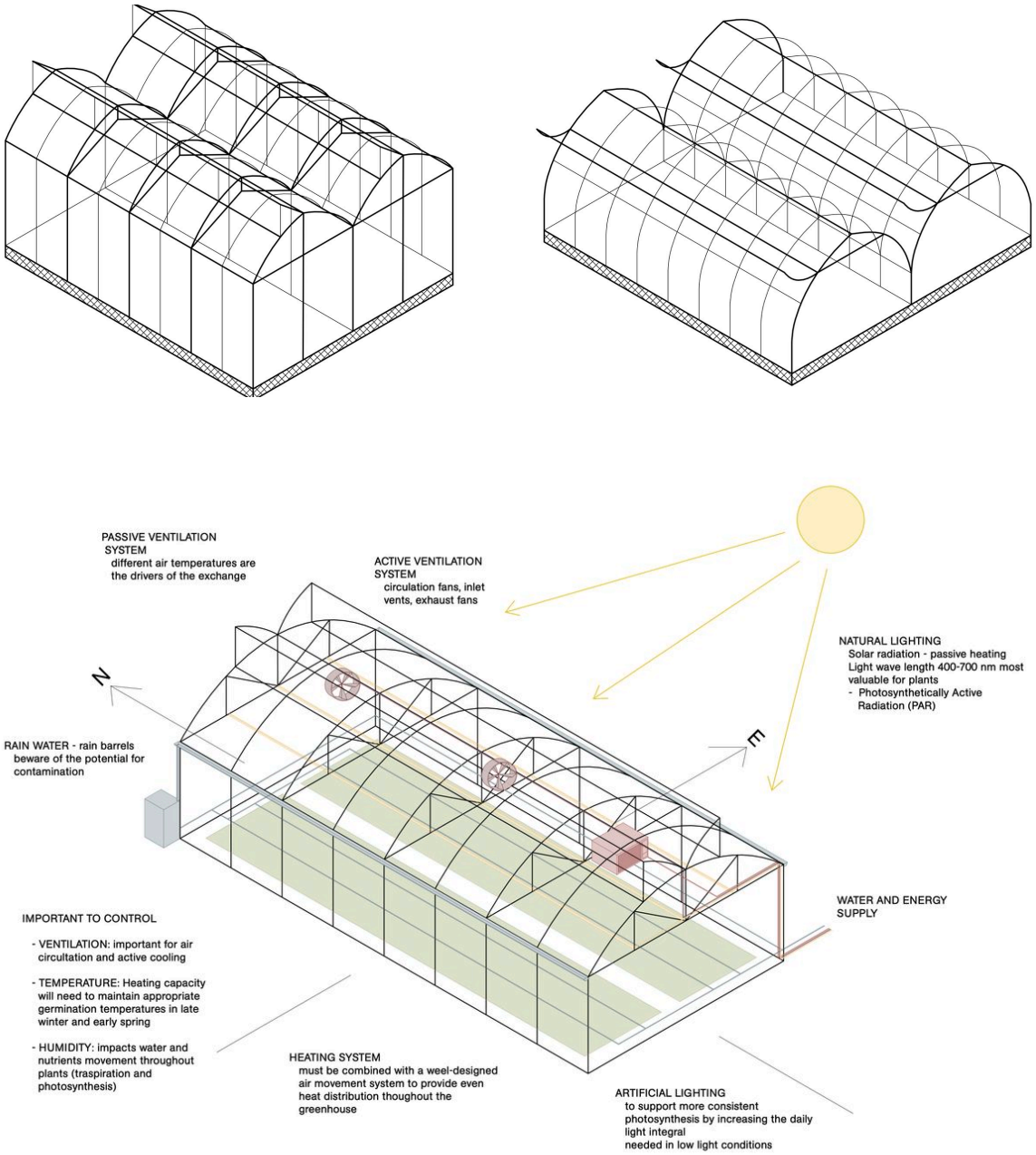
Greenhouse Construction



FROM EARTH TO CONCRETE
Depending on the type of production the materiality of the greenhouse structure and the machines differ, from soil-based tunnels to fully climate-controlled greenhouses made of glass.







More than just glass and warm climate

Depending on the type of production the materiality of the greenhouse structure and the machines differ, from soil-based tunnels to fully climate-controlled greenhouses made of glass.

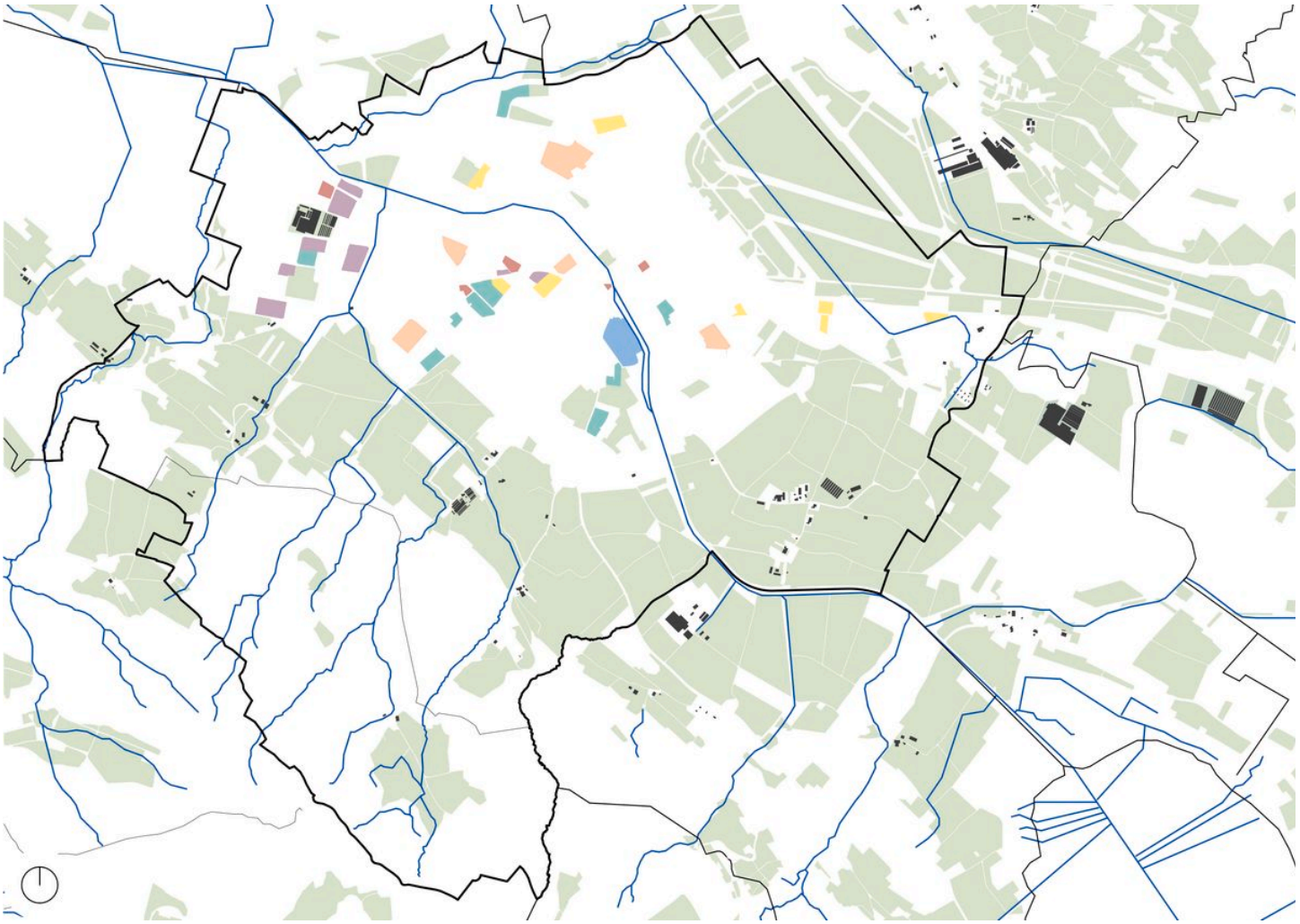
Certain types of greenhouses are not dependent on soil, yet they are still built on arable land, eventually destroying the now rare fertile soil. In Dübendorf and other regions of Switzerland, greenhouses are partly being constructed in the agricultural zone. How to justify the building of soil-independent greenhouses on fertile land?

A Greenhouse Beyond Production



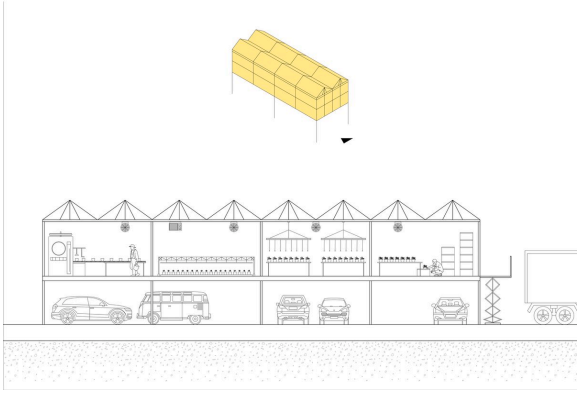
Greenhouses belong in the urban context and should be integrated into it. They have the potential of dual use and could benefit the smaller farms and add value to the urban population. Greenhouses could become places for the exchange of cultures, practices and knowledge.

In an urban context, greenhouses could be combined with already existing structures and services. By merging different uses such as a swimming pool and a greenhouse, agriculture finds its place in the city, creating multifunctional spaces with unique atmospheres. Several plots scattered around the town of Dübendorf are well suited to build new greenhouses and use them beyond their productive function. Small farms from which agricultural land has been taken will have the opportunity to become more competitive by increasing production inside the greenhouses.



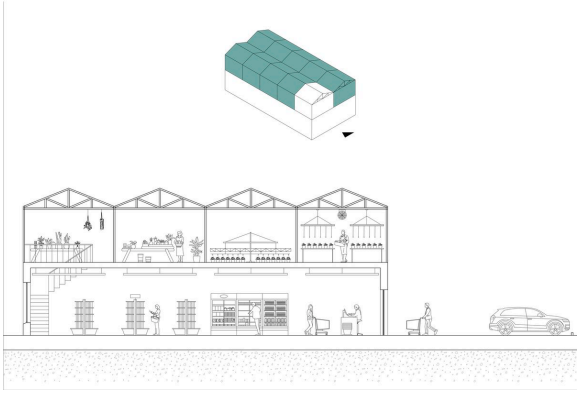
POTENTIAL EXISTING FUNCTIONS FOR DOCKING
Public and semipublic uses in Dübendorf.

- Swimming pool
- School
- Supermarket
- Parking lot
- Residential buildings
- Office buildings
- Agricultural land



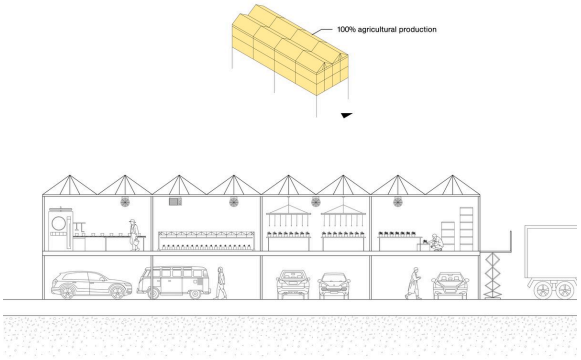
Parking lot + greenhouse.

Building a greenhouse exactly on top of a car park would offer the possibility to make the best use of this urban space, so that it would also become agriculturally productive. Moreover, the big roof extending over the parking spaces would create shade on them, providing protection and increasing comfort especially in the warmer months.

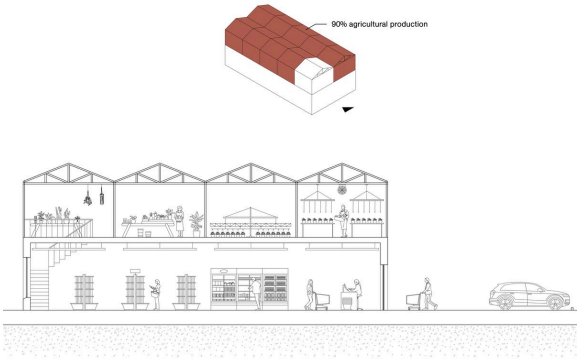


Supermarket + greenhouse.

A greenhouse that is directly connected with a supermarket would give customers the chance to fist-hand pick their flowers, herbs, fruits, and vegetables from there. People who live in the city could also use the greenhouse as a space to grow their plants and those of other customers, while receiving a discount on the products they intend to buy as a sort of recompensation. In addition, this space would also lend itself well to the organization of agriculture courses for adults who are used to urban facilities and want to experience something new.

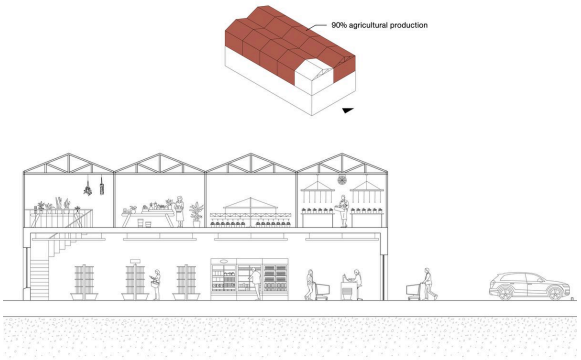


PARKING LOT + GREENHOUSE
Building a greenhouse on top of a car park would offer the possibility to use the space also vertically. Moreover, the roof created by the greenhouse construction could create shade for the parking space.

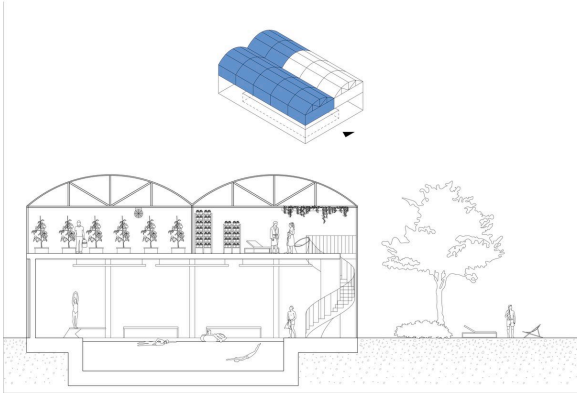


Supermarket + greenhouse.

A greenhouse that is directly connected with a supermarket would give customers the chance to fist-hand pick their flowers, herbs, fruits, and vegetables from there. People who live in the city could also use the greenhouse as a space to grow their plants and those of other customers, while receiving a discount on the products they intend to buy as a sort of recompensation. In addition, this space would also lend itself well to the organization of agriculture courses for adults who are used to urban facilities and want to experience something new.

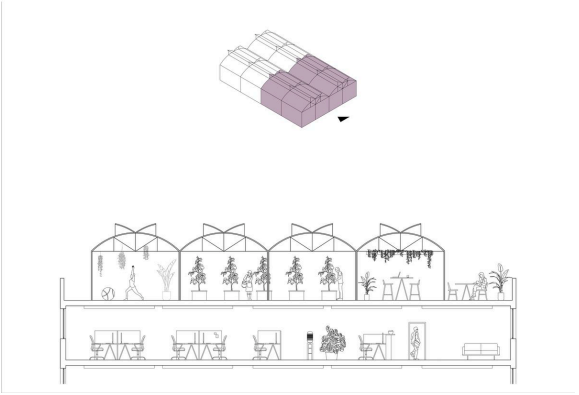


SUPERMARKET + GREENHOUSE
A greenhouse that is connected with a supermarket would give customers the chance to harvest their flowers, herbs, fruits, and vegetables themselves. People who live in the city could also use the greenhouse as a space to grow their plants and those of other customers, while receiving a discount on the products they intend to buy. In addition, this space would also lend itself well to the organisation of agriculture courses.



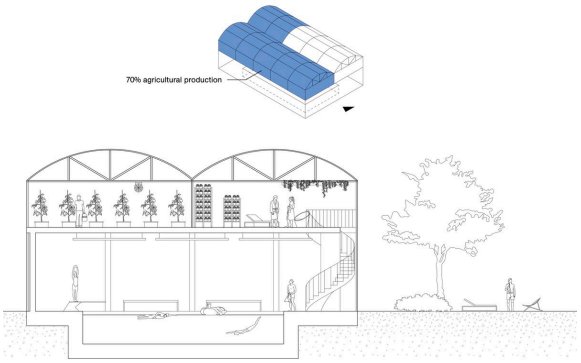
Swimming pool + greenhouse.

Combining an agricultural space with a swimming pool would mean utilizing humidity and heat produced in winter inside the pool structure to also maintain a productive greenhouse on top of it. By slightly increasing the cost of the entrance ticket, swimmers would have the opportunity to pick their own fruits during their stay in the pool. It would also be possible to provide a spa-like space where to relax surrounded by plants, and away from the noise.

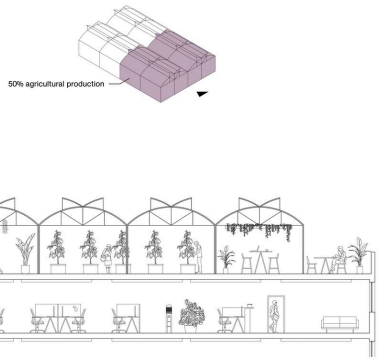


Office building + greenhouse.

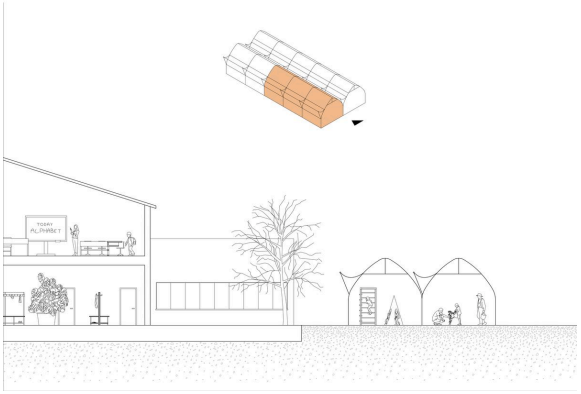
Utilizing the energy and heat constantly produced by a typical workspace and its electrical devices would be an efficient way to sustain a highly productive greenhouse placed on the roof of an office building. Tertiary sector employees would be offered the opportunity to combine their working activity with the primary sector, and therefore to part-time work as farmers. Moreover, a greenhouse in such proximity to an office would give employees the chance to use it as a place to take a break and unwind in an environment surrounded by nature.



SWIMMING POOL + GREENHOUSE
Combining an agricultural space with a swimming pool would allow utilising humidity and heat produced in winter inside the pool structure to also maintain a productive greenhouse on top of it. During summer the productive space would be at 100 %, whereas in winter it would be at 70 % in order to use the remaining 30 % as leisure space. It would also be possible to provide a spa-like space where to relax surrounded by plants. By slightly increasing the cost of the entrance ticket, swimmers would have the opportunity to pick their own fruits during their stay in the pool.

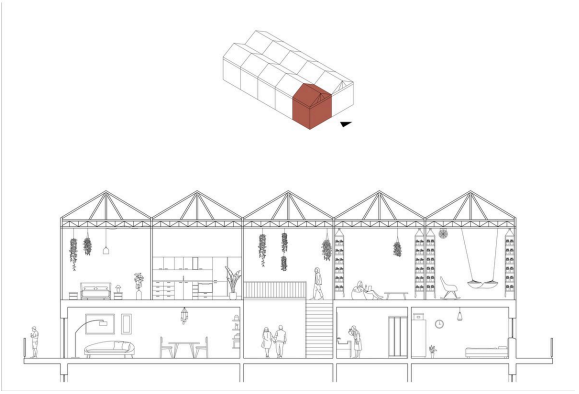


OFFICE BUILDING + GREENHOUSE
Utilising the energy and heat produced by an office space and its electrical devices would be an efficient way to sustain a highly productive greenhouse placed on its roof. The employees would be offered the opportunity to combine their office work with part-time farming work. Moreover, a greenhouse in proximity to an office would give employees the chance to use it as a place to take a break.



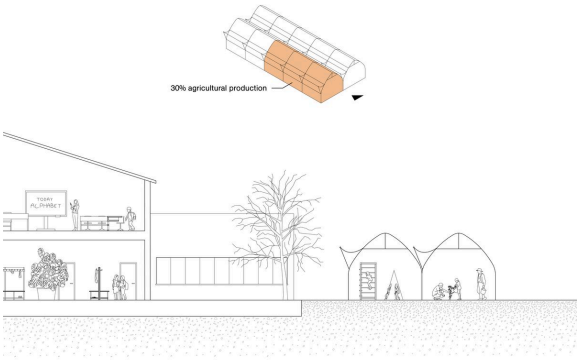
School + greenhouse.

By placing a greenhouse next to an elementary school, children's awareness on the importance of the agricultural sector as the main provider of healthy food can be raised. In this case, it would be possible to educate the younger generation through practical work: children could experience first-hand what it really means to be a farmer, and what this job entails. In their recreational time, children could use a playground inside the greenhouse, to play surrounded by plants and sheltered from cold, rain and snow.

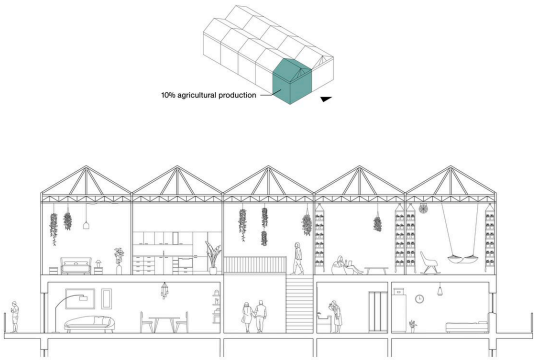


Residential building + greenhouse.

The aims of combining two structures such as a greenhouse and a residential building include providing affordable apartments for agricultural workers as well as other citizens and promoting a more diverse form of housing by mixing cultures and living environments. Building a greenhouse on the flat roof of an apartment building would also create a new common place for the inhabitants of the building, to spend time in contact with nature and grow plants for personal use.



SCHOOL + GREENHOUSE
By placing a greenhouse next to an elementary school, children's awareness on the importance of the agricultural sector could be raised through practical work: children could experience what the farming job entails. In their recreational time, children could use a playground inside the greenhouse to play surrounded by plants and sheltered from cold, rain and snow.

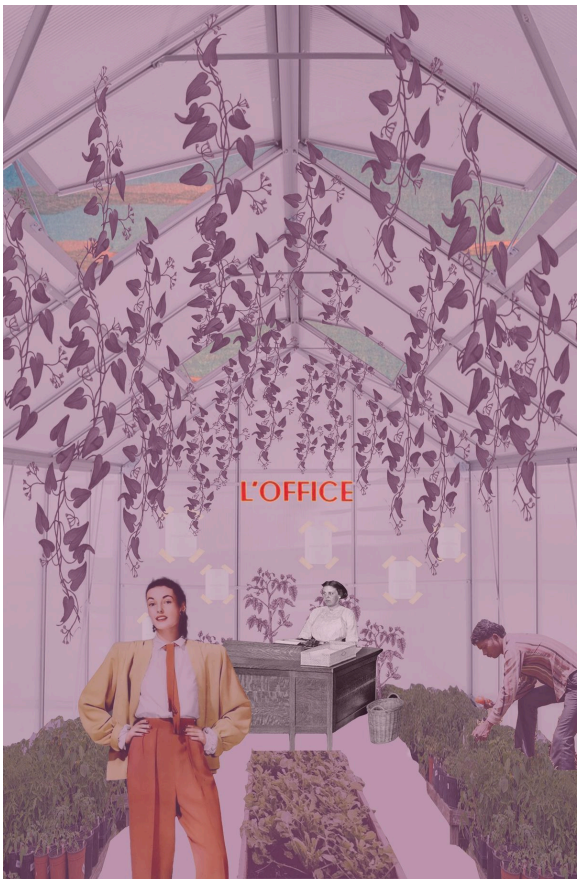


RESIDENTIAL BUILDING + GREENHOUSE
Combining a greenhouse with a residential building could be the chance to provide affordable apartments for agricultural workers and others. Building a greenhouse on the flat roof of an apartment building would also create a new common place for the inhabitants of the building, where they could grow plants for personal use.





Swimming pool.



Office building.





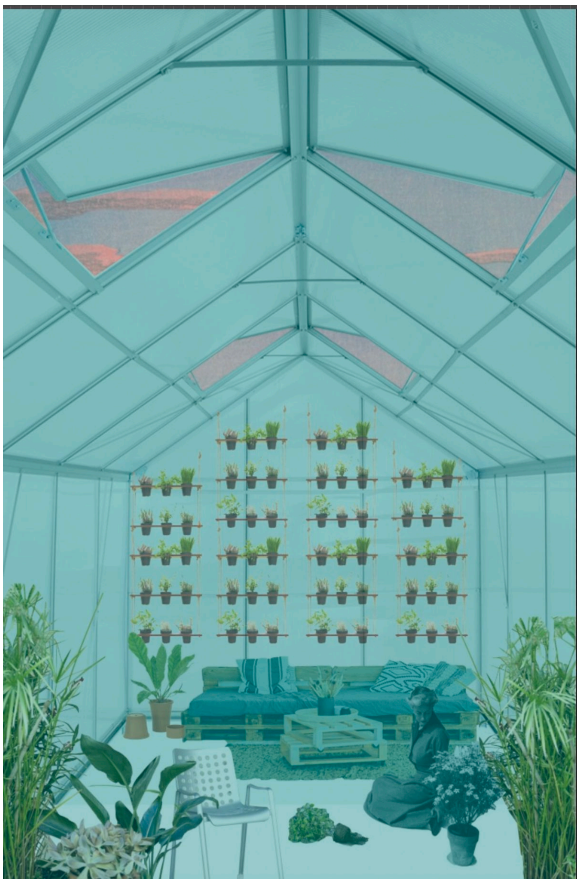
Residential buildings.



Office building.



The Greenhouse Swimming Pool



Residential buildings.



The Greenhouse Office



Residential buildings.



The Greenhouse Living

ACKNOWLEDGEMENTS

We would like to thank all those who made this research possible by helping us understand the role of agriculture in Dübendorf and giving us insights into what agriculture means to them.

In particular we would like to thank Tim Ortner, a research associate at Imhofbio AG, for helping us understand what really happens in a greenhouse; Marco Forster, the project manager of Urban Planning, for giving us a more comprehensive picture of the city of Dübendorf and its future development.

SOURCES

- "Ancient Greenhouses."*Youtube* Video, posted by Simple Tek, Accessed May 2022. https://www.youtube.com/watch?v=CQ8-LtLl11s
- Beerstecher AG https://www.beerstecher.ch/hofladen/
- Bumgarner, Natalie. Virden, Caterine. "Selecting and designing small-scale Greenhouses to fit your needs." *W935-B* online November 2020 https://extension.tennessee.edu/publications/Documents/W935-B.pdf
- Castilla, Nicolás. *Greenhouse Technology and Management, 2nd Edition*. Madrid and Mexico, Ediciones Mundi-Prensa, 2013.
- Dübendorf https://en.wikipedia.org/wiki/D%C3%BCbendor
- Ernst Basler + Partner AG. "Landschaftsentwicklungskonzept (LEK) Dübendorf." Fachbericht. 8.March 2006 https://www.duebendorf.ch/publikationen/49269
- Gossweiler, H. "Der Zehntenplan der Gemeinde Dübendorf aus dem Jahre 1681."*Schweizerische Zeitschrift für Vermessung, Kulturtechnik und Photogrammetrie* PDF creation Mai 2023 https://www.e-periodica.ch/cntmng?pid=geo-004:1951:49::741
- "Greenhouses Model." Gothic Greenhouses https://www.novagric.com/en/greenhouses-apr/greenhouses-for-sale/gothic-greenhouses
- Historisches lexikon der schweiz HLS https://hls-dhs-dss.ch/it/articles/000128/2015-04-22/
- Hotz, Stefan. "Das höchste Wohnhaus der Schweiz: Warum der neue Jabee Tower nicht lange allein an Dübendorfs Himmel kratzen wird."*NZZ* online April 2019 https://www.nzz.ch/zuerich/wohnen-in-luftiger-hoehe-ist-attraktiv-ld.1474755
- Hotz, Stefan. "Mal Dubai, dann Wieder Dorf: Niergendwo ist die Schweiz so urban wie in Dübendorf. Trotrdem tickt die Stadt konservativ."_ NZZ_ online March 2022. https://www.nzz.ch/zuerich/duebendorf-portraet-einer-vorstadt-die-in-die-hoehe-waechst-ld.1675660
- Huber, Werner. Fehlmann, Debora. Neuhaus, Gabriela. "Düberdorf wächst."*Hochparterre* online December 2022. https://issuu.com/hochparterre/docs/hochparterre_duebendorf_2022?fr=sZGU1NjUxMTcQ
- Imhof Bio AG https://imhofbio.ch/de/
- Interaktiv Gemeideporträts – Kanton ZH https://www.zh.ch/de/politik-staat/gemeinden/gemeindeportraet.html
- Staatsarchiv https://www.zh.ch/de/direktion-der-justiz-und-des-innern/staatsarchiv.html
- Stadt Dübendorf: Geschichte https://www.duebendorf.ch/geschichte/6063
- "Wheelwright Prize Lecture: Aleksandra Jaeschke, "In Emergency Break Glass"."*Youtube* Video, posted by Harvard GSD, Accessed May 2022. https://www.youtube.com/watch?v=YxXqQodreKc
- Zonenplan Dübendorf https://www.duebendorf.ch/_docn/3385655/du_Zonenplan_10000_2021-
- Zonenplan Schwerzenbach https://www.schwerzenbach.ch/dl.php/de/6156c5feb0391/28804_05G_210907_ZP_Rev.pdf

This work by Claudia da Silva Bütikofer, Martino Galli, and Jennifer Braghetti was created as part of the design studio Agrarian Project at ETH Zurich in Spring 2023. The PDF is intended for educational purposes only. Its commercial distribution is strictly forbidden.

© 2025, Architecture of Territory

Architecture of Territory
Professor Milica Topalović

TEACHING TEAM
Dorothee Hahn
Milica Topalović
Jakob Walter
Jan Westerheide

Prof. Milica Topalović
ETH Zurich
ONA G41
Neunbrunnenstrasse 50
8093 Zurich
Switzerland
+41 (0)44 633 86 88
www.topalovic.arch.ethz.ch