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YUNIBESITHI YA PRETORIA

INTRODUCTION



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01



CHAPTER 1 INTRODUCTION

INTRODUCTION

The neolithic revolution (advent of agriculture) led to a series of events that would change the relationship between man and nature forever. (WILSON, E O, 1992)

The ability to cultivate a reliable food supply resulted in an unprecedented increase in the human population's growth as a species to the point now of domination over the natural world from which we evolved.

Farming catalysed humans transformation from primitive hunter-gatherers to sophisticated urban dwellers in just 10,000 years. The development of traditional farming as a specific vocation practiced in rural areas would eventually lead to the division of labour (producers and consumers), and the division between town and country (areas of production and areas of consumption). (LEFEBVRE, Henri, 1996)

Today, over 800 million hectares or about 38% of the total landmass of the earth is used for traditional soil-based agriculture. This practice has re-arranged the landscape in favour of cultivated fields at the expense of natural ecosystems, reducing most natural areas to fragmented, semi-functional units, while completely eliminating many others.

Despite the obvious advantage of not having to hunt or scavenge for food, farming has led to new health hazards by creating ecotones between the natural world and our cultivated fields. As the result, transmission rates of numerous infectious disease agents have dramatically increased- influenza, rabies, yellow fever, dengue fever, malaria, trypanosomiasis, hookworm, schistosomiasis – and today these agents emerge and re-emerge with devastating regularity at the tropical and sub-tropical agricultural interface.

Modern agriculture employs a multitude of chemical products, and exposure to toxic levels of some classes of agrochemicals (pesticides, fungicides) have created other significant health risks that are only now being addressed by epidemiologists and toxicologists.

However the major concern has to do with available arable land. It is predicted that over the next 50 years, the human population is expected to rise to at least 8.6 billion, requiring an additional 109 hectares (roughly the size of Brazil) to feed them using current technologies. That quantity of additional arable land is simply not available. (DESPOMMIER, Dickson, 2010)

Large parts of the world already suffer from the effects of food shortage, with undernourishment rates being highest in Africa and other parts of the developing world as indicated by Figure 01.

Without an alternative strategy for dealing with just this one problem, social chaos could replace orderly behaviour in even the most developed countries. Novel ways for obtaining an abundant and varied food supply without encroachment into the few remaining functional ecosystems must be seriously entertained.

One solution involves the construction of building integrated agriculture and productive urban landscapes to serve as local food production centres within towns and cities. (DESPOMMIER, Dickson, 2010)

If we could engineer this approach to food production, then no crops would never fail due to severe weather events (floods, droughts, hurricanes, etc.). Produce would be available to city dwellers without the need to transport it thousands of miles from rural farms to city markets. Spoilage would be greatly reduced, since crops would be sold and consumed within moments after harvesting.

If urban farming becomes the norm, then one anticipated long-term benefit would be the gradual repair of many of the world's damaged ecosystems through the systematic abandonment of farmland.

Other benefits of urban farming include the creation of a sustainable urban environment that encourages good health for all who choose to live there; new employment opportunities, fewer abandoned lots and buildings, cleaner air, safe use of municipal liquid waste, and an abundant supply of safe drinking water.

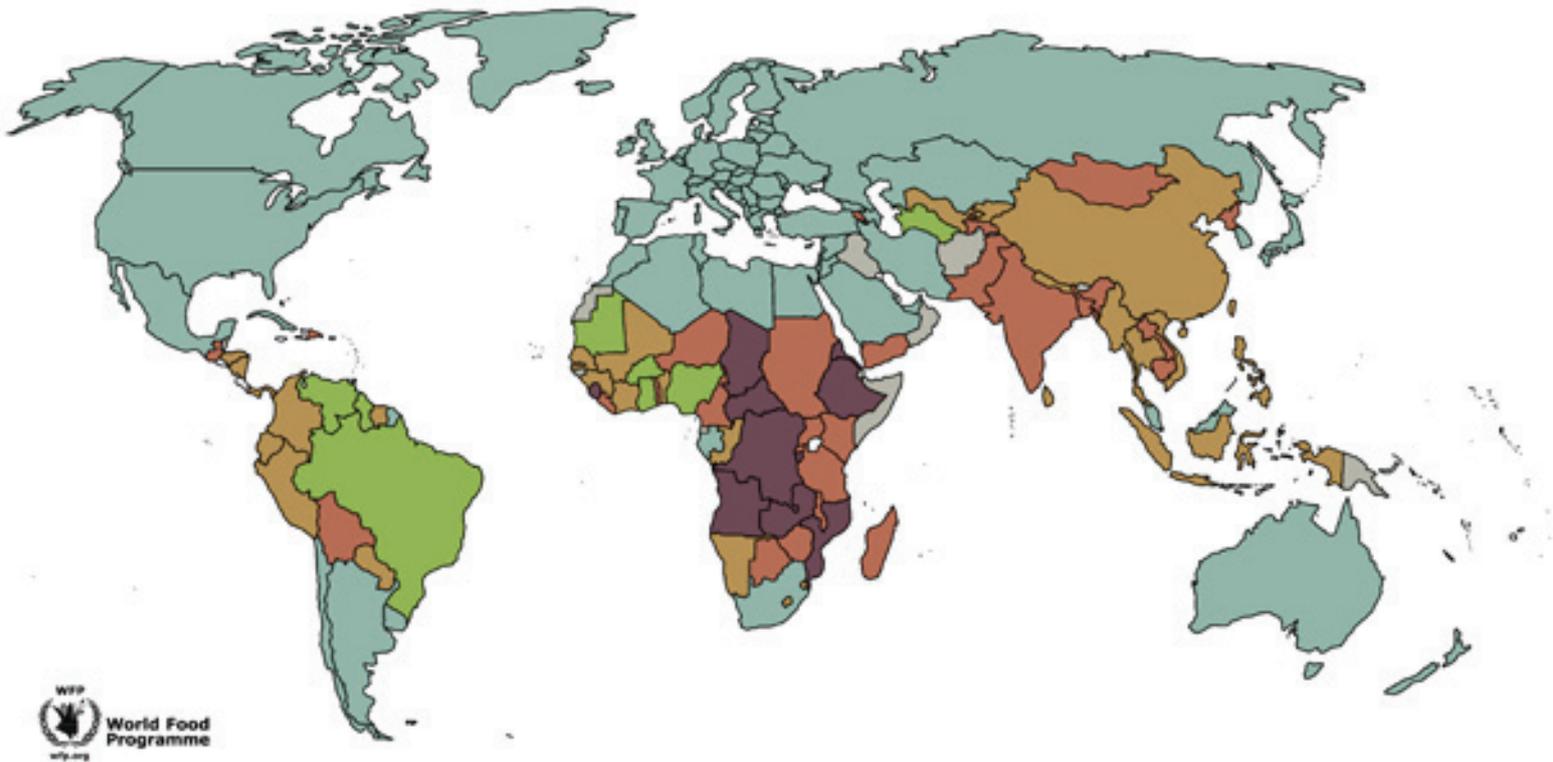


Figure 01: Map indicating global undernourishment by category.

Category	1	2	3	4	5	Incomplete data
Undernourished	<5%	5-9%	10-19%	20-34%	≥35%	Incomplete data
Description	Extremely low	Very low	Moderately low	Moderately high	Very high	

Illustration 03: Hunger in the developing world.





STUDY OVERVIEW

RESEARCH PROBLEM

The general public has become so removed from the process of food production that it has resulted in a wasteful and energy intensive process.

The research will focus on gaining a better understanding of the causes of this problem specifically related to space, proximity, energy and waste.

RESEARCH METHODOLOGY

Table 01 gives a brief overview of the research methodology, sources and expected outcomes found in each of the main study areas.

The research will start with an investigation into current commercial agricultural practice to help identify problems resulting from this.

A closer look at the history of human food production from prehistoric times to current day gives us some clues as to why we have come to this crossroads.

Alternative methods of farming will then be defined to give a understanding of possible solutions that would be appropriate in an urban environment.

Research Area	Methodology	Source	Exp. Outcome
Problem Analysis	Quantitative / Intuitive	Statistical data, Literature (news, journals), Historic Literature.	Research problem and sub-problems.
Theory Study	Qualitative	Theory Literature (books, journal articles)	Applicable theory base and design drivers.
Context Study	Qualitative	Historic Literature (books, newspaper articles), Images (photos, paintings, sketches)	Appropriate site selection.
Site Analysis	Quantitative / Intuitive	Existing Frameworks, Climatic Database, GIS, Maps, Photos	Contextual response and urban objectives.
Precedent Studies	Qualitative	Site Visit, Literature, Photographs, Drawings.	Connect theoretical problem with practical implementaion.

Table 01: Research Methodology used in study.

DESIGN OVERVIEW

DESIGN PROBLEM

To integrate food production into a building and public urban environment.

SUB-PROBLEMS

AVAILABLE LAND

To make urban agriculture feasible the building footprint required to produce crops will need to be reduced beyond that required by normal agriculture or even greenhouse practice.

This can be done by exploring vertical crop production therefore multiplying building footprint by the amount of available ground floor space.

ENERGY

Vertical solutions have practical problems with giving crops enough access to natural sunlight.

High Energy demands are expected for running a “indoor” food production facility: artificial lighting, ventilation, services.

The energy requirements can be reduced by using low energy solutions as well as renewable energy sources.

PROGRAM

Historically production / industrial environments have resulted in negative urban spaces and have been located on the fringe areas within cities.

By introducing ground floor activities that engage with the public realm the negative impact of production can be removed at this level.

GENERAL OBJECTIVES

To promote sustainable food production in urban areas through research, development and training of urban farmers, small food business and community members.

URBAN OBJECTIVES

To reconnect the urban dweller with their natural environment by creating active links between urban form and natural elements.

To identify and activate lost or indeterminate green spaces within the city, thereby increasing the open green space network.

ARCHITECTURAL OBJECTIVES

To use architecture as a mediator between:

- Techno-sphere and biosphere
- Lost space (Apies River) and the city dweller
- Production and Consumption
- Urban scale and pedestrian scale

SOCIO ECONOMIC OBJECTIVES

Empowering local communities by educating them in methods of large and small scale local food production methods that can be applied in their own living and working environments.



PROPOSAL

This dissertation proposes the development of a Urban Food Research and Development Centre with it's main focus on research and education of ecosystemic production process including urban agriculture, urban aquaculture, rainwater harvesting and renewal and local energy production.

Both research and education is implemented with a “working example” approach. Appropriate methods of urban and building integrated farming is programmed into the building and site. This allows researchers to document yields as different crops are rotated through systems, at the same time visitors and students are able to learn through experience.

USERS

PRIMARY USERS:

- Researchers
- Urban Farmers
- Retailers
- Students

SECONDARY USERS:

- Pedestrians
- Restaurant goers
- Shoppers

CLIENT

Joint venture between:

- Agri SA
- CSIR
- City of Tshwane

SITE

Location: c/o Nelson Mandela Dr & Church Str

The chosen site is deemed appropriate for this investigation due to the specific history and qualities of both the site and the surrounding area.

The site is located between a prominent (yet seemingly forgotten) natural element (the Apies river) and the historic city edge, this serves as a appropriate laboratory to explore the tension that exists between techno-sphere and biosphere giving the designer a opportunity to address this problem.

PROGRAM

- Research,
- Education,
- Urban Agriculture,
- Retail



ASSUMPTIONS & EXCLUSIONS

It is assumed that:

Given the conclusions made in the framework proposal that the site will become available for redevelopment.

The possibility of the demolition of existing buildings would be deemed appropriate based on framework requirements.

It is my belief that the design and planning of public open spaces and urban form should be a responsibility that is shared by all design disciplines.

I will not attempt to resolve the urban planning guidelines or landscape design to completion but merely indicate the intent and more importantly show the reciprocal relationship that can exist between other design disciplines and Architecture.

CONSTRAINTS

The agricultural component of the design requires very specific services and indoor environments that will put certain constraints on the design. These constraints will be used as design generators and will be further explored in the design development and technical chapters.