

A farm in the Sahara Desert

A farm in the Sahara Desert

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Diploma program fall 2020

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Summary

A memory as a premise for an architectural project.

Water
Shadow
Sand
Color



1.
El-Nacérah. Dattiers, Rives du Nil et Barques
Félix Teynard
Egypt
1853

Memory of a place

A small place created by a family of farmers
Buildings made from the dirt of the land
Created for the purpose of utility and beauty

Rooms for the family, spaces for work and rest
Shelter for the animals
Spaces where light was absent
Changes in temperature and humidity

A home in the eastern part of the Sahara in Egypt,
not far from the river Nile
– My great grandfathers dwelling

Building on this memory I want to create a farm in the Sahara desert that respond to the place it exists and the people that build it.

A farm is formed from the place it stands, and the functions it has to serve.

Here people and animals co-exist and together they create the opportunity for plants and food to grow.

I will create the site of the farm from my memory of the landscape combined with my research. This will give me a deeper understanding of the site.

Architectural exploration

In modern times, farmers have started to drill wells in order to pump water up from the aquifers. This water can serve crop-lands where local irrigations systems is scarce. In this way of farming, I see a lot of potential for architectural exploration: Saving water, and creating new micro climates that benefit not just the plants, but also the people and animals living there.

Water system

Wast landscape

Structure



2.

Ancient Waterways in Morocco

Earthzine

Morocco

November 29, 2016

Conditions

Location

Eastern part of the Sahara desert near the Nile valley

Size

1 hectare of land + cluster of buildings

Topography

Flat landscape, sandy hills, bigger mountains

Ground conditions

Upper layer of desert sand, middle layer sandy clay, bottom layer sandstone.

Water

Subterranean water from mountain

Irrigations systems from well or public irrigations systems

Water system
Wast landscape
Structure
Co-existence



3.
A native irrigation plant, near the pyramids
Mr. S. Sayers
Egypt
1915

The Farm

Houses

Main house 100-150 sq.m.

Shed

5-30 animals 30-150 sq.m.

Infrastructure

Water, energy, shadow

Storage/preservation

Granary, hayloft, silo, nursery

Number of people

14 a big family

Animals

5-30

Water buffalo

Goats

Plants

Mainly date palms

Some, figs and vegetables

Manual labor

Landscape

Tools

Drought



4.

Untitled

Niger

1990

House

Shared space

Food

Social life

Pray

Sleep

Wash

Read/Rest

Sleep

Light
Shadow
Structure
Hills



5.
Dwelling in Djenne, Mail
Spectacular Vernacular
1980-83

Shed 30-150m²

House for 5-30 animals

Water buffalo

Goats

Divided space

Inside

Outside

Food station

Water station

Wind
Structure
Shelter



6.
Paillote, Niamey Straw matting hut
Lacaton & Vassal
Niamey, Niger
1984

Infrastructure

Water, energy, shadow

Structure for water

Irrigation system

Solar energy

Shadow

Trees

Structure for the crop land

Structure for the public space

Light
Shadow
Structure
People



7.
Marketplace, Rissani, Morocco
Spectacular Vernacular
1981

Storage/preservation

Farm building

Basement storage

Nursery

Mud
Storage
Tools
Labor



8.

Granaries in Affala, Niger, West Africa

Spectacular vernacular

1980-83

Method

Understanding materials light and structure is essential in the process of creating architecture.

I believe the best way to investigate this is with physical models. The models are going to be an investigation throughout the diploma and the proses will start with the creation a generic site at the start of the semester.

By creating my own site I hopefully gain a deeper knowledge about the landscape and how to work with it.

With the knowledge gained in that process the aim is to first create an overall plan and organization of the farm in 1:1000. And throughout the semester zoom in and investigate all the structures of the farm in details from a scale of 1:100 to 1:25 in models and drawings.

Light
Shadow
Material
Touch



9.
Untitled
Oslo
2020

Submitted material

Drawings

Landscape plan 1:1000

Outdoor plan 1:250

Buildings plan and section 1:100/1:20

Elevations 1:100

Details 1:20

Axonometric 1:150

Models

Series of test-models different scale

Section of Building 1:25

Landscape 1000

Illustrations 2-5

Abstract

Memory

Photographs of models

Research

Hand drawings

Schedule

0.07.20

Start creating the site i drawings

0.10.20 - 21.08.20

Creat the site in model and situation plan

Section and landscape model

21.08.20 - 26.08.20

Layout

26.08.20 - 18.09.20

Creating the overall plan of the project

Plan

Section

Models

Illustration

20.09.20 -20.10.20

Zoom inn to scale of 1:50

Models in 1:20/1:1

Start working with the buildings and structures in detail.

14.12.20

Delivery due date

11.01.21- 15.01.20

Final presentation

Research

The Sahara Desert

According to the UN Food and Agriculture Organization (FAO), two-thirds of the African continent is classified as desert or drylands. Climate change has led to prolonged periods of drought. Over-intensive farming and over-grazing have caused land degradation; and deforestation has turned once fertile land into desert in many areas.

Desertification is happening throughout the whole region of the Sahara and it has created a food shortage. The food shortage is a huge problem in the countries surrounding the Sahara and all of them are developing strategies for regaining land in the desert. The “Great green wall project” south of the Sahara desert is a perfect example of a sustainable way of handling the problems in the border between Crop lands and the desert.

Construction of illegal houses near the big cities and desertification has forced farmers to try farming in dry arid places in the desert. For those who are living in the Sahara water scarcity has never been bigger. Huge amounts of water is tapped from the aquifers underneath the desert making the water level in the important wells throughout the desert drop. The way modern farmers in the desert water there fields is by drilling wells where they pump water up to the dry surface and water the field, without a strategy to use the water in a sustainable way. Throughout time, farmers in oasis have developed ways of sustainably utilising the water from the aquifers to water their land.

Animals
Plants
Wind
Sandstorm



10.
A mild sandstorm, Nema, Mauritania
Spectacular vernacular
1980-83

Farm

Most of the rural poor people depend directly or indirectly on agriculture for their livelihoods. Agricultural development and the modernization of the rural areas are focusing on supporting smallholder farmers would be important for rural poverty reduction.

Agriculture in and around the Sahara is very different from the situation we have here in the Nordic climate. It is a very intensive agriculture with two or three plantings every year.

A typical farm is a small family farm that owns from 1 to 3 hectares of land. The family members employ themselves with multiple activities like agriculture, animal production and of farm employment. Most farms have animals like water buffaloes, goats and sheep.

Water irrigation

Plants

Farmland

Houses



11.

“City of Ur.” Digital image.

Mr. Marini’s Class.

vAugust 8, 2017.

Reclamation of arid land

To irrigate is to water crops by bringing in water from pipes, canals, sprinklers, or other. The irrigation systems are man made, rather than relying on rainfall alone.

Trees are used to break the wind so that the topsoil do not blow away. They make shadow that creates cooler and more humid air, which again creates a micro climate.

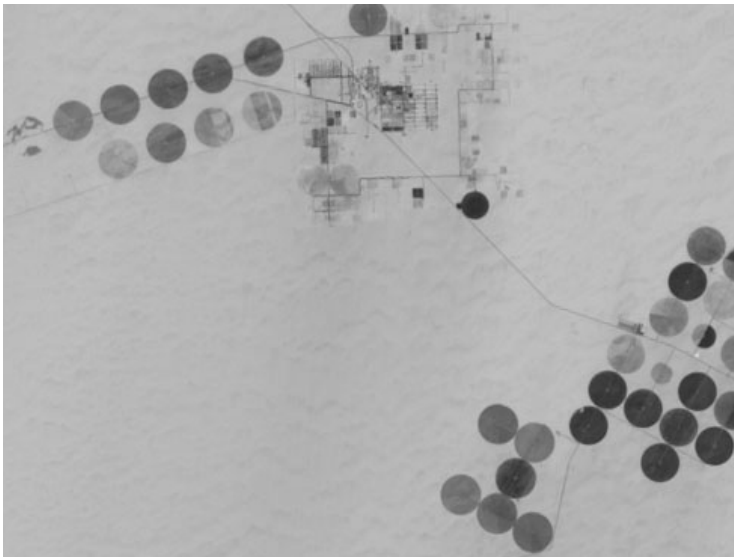
The groundwater level slowly rises because of the cooler surface and it contributes to the micro climate created by the trees. Once the land is reclaimed, animals play an essential role in the process of cultivating it, and in the general balance of the ecosystem.

Water irrigation

Village

Farmland

Reclamation



12.

Sahara from the air: Rotating pivot irrigation with a central pump creates circular areas

December 2001

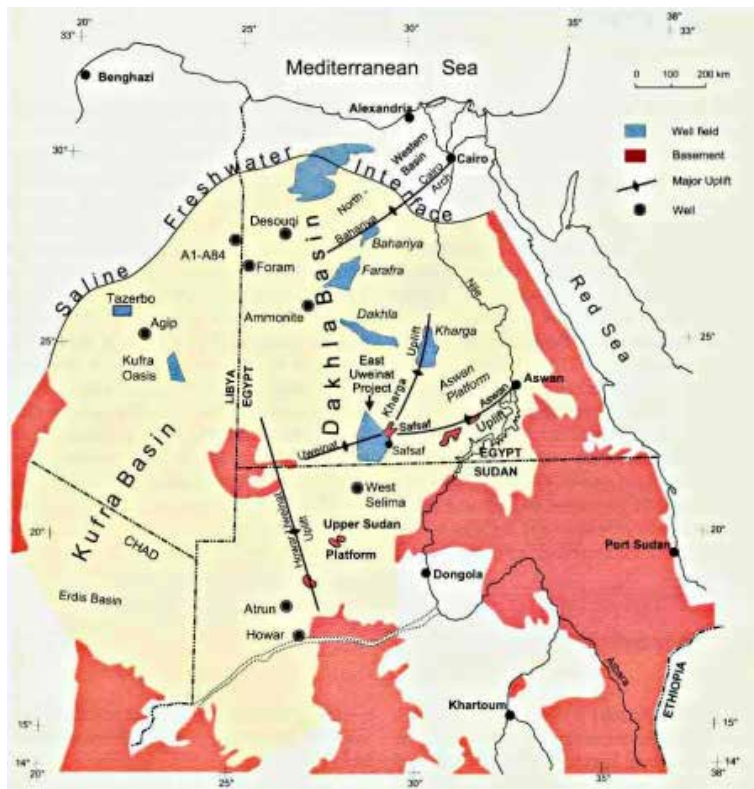
Water

The water under the surface of Sahara have been to great importance for people living and traveling in the Sahara throughout the ages.

The Nubian Aquifer System is the largest known fossil water aquifer system in the world. It is located in the Eastern part of Sahara, in south-eastern Libya, north-eastern Chad, northern Sudan and Egypt

Its major structural elements are the Kufra Basin in south-eastern Libya and the Dakhla Basin in south-western Egypt, each with an aquifer system up to 4000 m thick. Based on effective porosities of 7 to 10% of the sediments, the total groundwater storage amounts to 150 000 km³, a giant groundwater resource.

The rain can vary from 5 mm to 50 mm rain in a year in the Sahara, so this has been the main supply of fresh water in many parts of the eastern Sahara.



13.
 General map of the nubian aquifer system area.
 1972

Oasis

The word Oasis comes from the Arabic word Wah or Ouah that means dwelling place.

An oasis is an area made fertile by a source of freshwater in an otherwise dry and arid region. Oases are irrigated by natural springs or underground water sources. They vary in size from a cluster of date palms around a well or a spring, to a city and its irrigated cropland.

These oases and wells have through the ages been important landmarks in the modern and ancient travel routes across the Sahara.



14.

Fata morgana

As seen in the desert between Abu Simbel and Aswan.

October 31, 2008

Shadow

Irrigated agriculture forms the existential and economic basis of the oasis.

However, the high evaporation rate quickly leads to salting of the irrigated areas. Steps must be taken to flush and drain the soil, to dissolve and wash away the salts.

Adequate sun protection, which can reduce evaporation, is equally important for maintaining soil fertility. For thousands of years, man has sought to protect his cultivated fields from strong solar radiation.

The date palm tree, which is the most important food plant of the oases, is used by forming a canopy that gives shade over the vegetable and fruit gardens.



15.

Maadid, southern Morocco

Network of cool, dark tunnels, refreshingly humid even at harshest midday.

Spectacular vernacular

1980-83

MUD

The tradition of building in sun-dried mud is older than recorded history. Earthen architecture is the product of a relatively simple yet highly effective technology. Sand and clay are dug from the ground, mixed with water, and usually chopped straw. The sand is the filler, the clay and the straw is what keeps it together. This mix is formed into bricks that dry in the sun for up to 14 days or the mix is poured into the formwork where workers stomp barefoot or use a tool to stomp the earth mix to create a homogeneous wall of earth. This method is called pisè or rammed earth.



16.

untitled

Morocco

Thor Arne Hauer

2014

Plants

Farmers who live in or near the desert must manage land and water use carefully; fields must be irrigated to grow plants like apricots, dates, figs, and olives.

The most important plant in an oasis is the date palm, which forms the upper layer. These palm trees provide shade for smaller trees like peach trees, which form the middle layer.

By growing plants in different layers, the farmers make best use of the soil and water. Many vegetables are also grown and some cereals, such as barley, millet, and wheat, are grown where there is more moisture.

The word Paradise comes from the name of the "walled Garden" in The First Persian Empire.



17.

Book of the Dead, Papyrus of Nakht: Worshipping Osiris

Provenance unknown

New Kingdom, late Eighteenth or early Nineteenth Dynasty (about 1336-1294 B.C.)

Papyrus, painted, 15-5/8 x 36-3/4 in.

Photos:

1.
El-Nâcêrah. Dattiers, Rives du Nil et Barques
Artist/Maker: Félix Teynard (French, 1817 - 1892)
Place: Egypt
Date: negative 1851–1852; print 1853
<https://www.loc.gov/item/2001695257/>
2.
Ancient Waterways in Morocco
Earthzine
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November 29, 2016
<https://earthzine.org/ancient-waterways-in-morocco/>
3.
A native irrigation plant, near the pyramids.
Place: Egypt
Date: 1915
<https://www.awm.gov.au/collection/C3204>
4.
Untitled
Niger
1990
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5.
Dwelling in Djenne, Mail
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page: 10
1983
6.
Paillote, Niamey Straw matting hut
Lacaton & Vassal
Niamey, Niger
1984
<https://www.lacatonvassal.com/index.php?idp=24>
7.
Marketplace, Rissani, Morocco
Spectacular Vernacular, The Adobe Tradition
page: 98
1981
8.
Granaries in Affala, Niger, West Africa
Spectacular vernacular, The Adobe Tradition
page: 69
1981
9.
Untitled
Oslo
2020
Photo: Alexander Minge Salim
10.
A mild sandstorm, Nema, Mauritania
Spectacular vernacular, a new appreciation of traditional desert architecture
page: 11
1981
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“City of Ur.” Digital image.
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Sahara from the air: Rotating pivot irrigation with a central pump creates circular areas
December 2001
https://de.wikipedia.org/wiki/Bew%C3%A4sserung#/media/Datei:Irrigation_in_the_Heart_of_the_Sahara.jpg
13.
General map of the nubian aquifer system area.
Groundwater Resources of the Nubian Aquifer System NE-Africa
Synthesis
Ulf Thorweihe & Manfred Heintz
Technical University of Berlin
1972

Photos:

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As seen in the desert between Abu Simbel and Aswan.

October 31, 2008

<https://www.flickr.com/photos/geertvandenweghe/5019348969/>

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Network of cool, dark tunnels, refreshingly humid even at harshest midday.

Spectacular vernacular, a new appreciation of traditional desert architecture

page: 63

1983

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untitled

Morocco

Thor Arne Hauer

2014

<https://www.arkitektnytt.no/nyheter/til-marokko-med-skisseblokk-og-fotoapparat>

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Papyrus, painted, 15-5/8 x 36-3/4 in.

EA 10471/2, acquired in 1888, purchases via Sir E.A.W. Budge (cat. no. 100)

© Trustees of The British Museum, Courtesy AFA

18.

Straw matting hut

Niamey, Niger

1984

Lacaton Vassal

<https://www.lacatonvassal.com/index.php?idp=24>

19.

Straw matting hut, plan

Niamey, Niger

1984

Lacaton Vassal

<https://www.lacatonvassal.com/index.php?idp=24>

20.

Image 6 of 18 from gallery of "Inhabiting the Desert" Since 1914: Morocco at the 2014 Venice Biennale.

Courtesy of BAO + Ultra Architettura

21.

Image 7 of 18 from gallery of "Inhabiting the Desert" Since 1914: Morocco at the 2014 Venice Biennale.

Courtesy of BAO + Ultra Architettura

Books:

1.
Spectacular Vernacular, a new appreciation of traditional desert architecture
By: Jean-louis Bourgeois
photographs by: Carollee Pelos
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2.
Spectacular Vernacular, The Adobe Tradition
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Realized with the Technical University of Berlin
With the support of the Bundesanstalt für Geowissenschaften und Rohstoffe (BGR, Hannover) and the Deutsche Forschungsgemeinschaft (DFG, Bonn)
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<https://thonesaharadesert.weebly.com/plants.html>