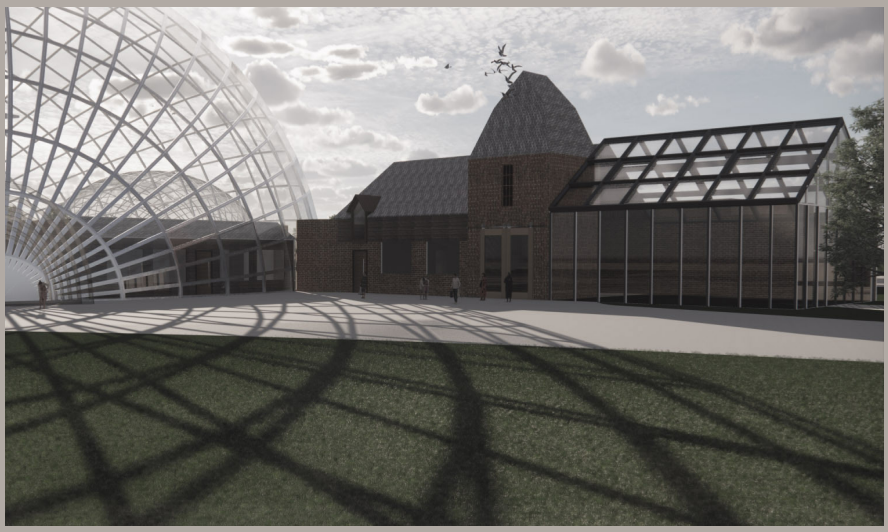
Prepared Farms
Kent-UK



by Komal Hayat
University for the Creative Arts
Canterbury School of Architecture

Project Details

Designer:	Komal Hayat
Design Participant:	UCA MA Architecture Student
Title:	Prepared Farms, Kent - UK
Type:	Prepared architecture for preventive conservation of cultural heritage & their future speculation.
Site:	Perry Court Farm - Chartham
Session:	2020 September -October 2021


ENTRANCE

FIG 18
VERRY COURT FARM
CHARTHAM

Research Agenda and Process

Overview

It is evident that we have existed for a long time, indifferent and inconsiderate of the carbon footprint we are creating on our planet, until in 1971 Victor Papanek booked the revolutionary timeless concept of a design that was deliberately planned to heal the planet in his work 'Design for the Real World'.

Besides many causes of carbon emissions and pollution, the agriculture industry itself is one of the biggest contributors to the carbon emissions nourishing this global threat. The global warming has led the climate to become extreme and highly unpredictable. The farms have been receiving too much or too little water variably and according to a report published by the European Environment Agency, the quality and nutritions of the soil have been observed to be deteriorating steadily. Due to this rapid increase in the global warming, it is vital to rethink the way we conduct our food production and revise our farming practices and gain control of the farming environment and adapt a nouveau vernacular.

The current farms are struggling to stay afloat financially leading to many of these farms expanding and branching out their business revenue generation by adapting to farmshops, retaurants, cafes, Bed & Breakfasts or any other activities that may attract clientele to generate business. Research has also shown that people from big cities like London often visit farms and country sides in Kent to rejunevate.

Anthony Dunne and Fiona Raby state in their book Speculative Everything: Design Fiction and Social Dreaming (Dunne and Raby, 2013), "We believe that our behaviour does need to change, but it should be up to either individuals to make changes to their behaviour (for example in health and exercise) or the government to ban some kinds of behaviour (such as smoking, which effects everyone, not just the smoker). At both extremes the rationale for change is explicit. Design can play a role in highlighting what might happen if the behaviour does not change, what can be achieved if it does, or simply communicating what needs to change and how."

Research led us to believe that yesterday's intense is tomorrow's status quo. Fiction is an instigation to architecture. The fantasy and fabrication the architects indite prognosticate the fabric of the future urban development that drafts history whilst holding on and progressing the contemporary branches of their revenue generation. Perhaps bio-domes can be the future of farming due to their efficiency in controlling the environment. The area of study includes farming fields in Chartham, Kent – also known as the Garden of England.

Fig.01 *(previous page)*
The Perry Court Farm,Chartham

Research Questions

1. Is there a way in which, we as architects, can play a constructive role in order to educate or establish affordable and sustainable norms, to help acquire a standardized minimum of a good quality of architectural existence?

2. Will the future reveal the revival of the past, birth of a new or then a possible marriage of both in order to acquire a constructive, sustainable and a "prepared" living in agricultural architecture?

3. How would the food production industry evolve refering to the steadily progressing global warming?

4. Will we see the current branches of revenue generations into the future of the farm industry?

Significance and Contribution

Applying 'Prepared Architecture' through the farming norms today would allow the farming industry to amend the environmental hazard it creates and suffers from. This means that by adapting a new vernacular in the form of bio-domes would promise a better food production in the future. As evident, many farms have been switiching to tunnel and sheltered farming in order to take control of the unpredictable climatic affects. Along with catering to the food production, the bio-domes would also allow the excitement of an extraordinary structure into the ordinary lives by offering the branching business revenues.

Methodologies

1. The initial research was made by in-person interviews with the local farmers

2. Compilation of news articles and text available from reliable re-sources giving details of the farms in Kent and their history

3. Researching into the structures which help control the climatic factors

4. Researching the types of farming through text books, science journals and online research in order to propose a more 'Prepared' farming

Design Proposal

Provide a brief final project proposal description/summary

The steady increase of the global warming leaves us in need of a smarter food production. Situating our project at an existing farm in Chartham, I explore the prospects of a futuristic farm offering a far-sighted solution catering to the unpredictable and extreme weathers.

Research has led me to observe that many farms have been opting to switch towards shelter farming and vertical farming which comprises of hydroponics, aquaponics and aeroponics. These offer greater control over the growth factors of the yield.

In relation to the farming method that offers controlled agriculture I have also studied structures that can help control the atmospheric aspects of a farm; I have proposed the usage of bio-domes for sustaining aeroponics to establish vertical farms independent of the environemental factors.

The current business extensions of the farm-shop and tea-rooms will be improvised into proper farm-to-table restaurants, farm-shops, spa and chalets attracting a continuous clientele.

The improvised farming methods also aims to giving land back to nature to allow it to heal.

Key outcomes of proposal

Technological or other outcomes (i.e. issues that need to be solved in the above proposal)

1. Studying the possibility of creating farms independent of the environmental factors which could lead to a longer and stronger survival of life on Earth mutually beneficial to mankind and the ecology of our planet

2. The fiscal and practical feasibility of the project in the long run

Fig.02 *(above left) The* Eden project walkways
Fig. 03 (above right) Aeroponics farm in Pittsburgh

Design Research Context

Field of Work

& Relevant precedents

My project explores the possibility of creating farms independent of the environemental factors. This means that the project aims to create an agricultural space as independent of the environmental factors as possible while it also explores the methodologies that help out of season and out of region farming as independently as possible.

Work by others

Similar projects where bio-domes have helped create an atmospehere to support biological life out of season and out of region are:

1. **The Eden Project** - The Eden Project embraces a tropical garden in the South of England for recreational & educational purposes.

2. **Biosphere 2** - originated as an experiment in the deserts of Arizona to be the first vivarium (closed ecological system). The experiment failed; however, the facility remains as a research and development centre with a Landscape Evolution Observatory (LEO), the Lunar Greenhouse which seeks to understand how to develop vegetation on Mars or Moon through a bioregenerative life support system and a Vertical Farm with zero effect from external weather conditions.

3. **Kew Gardens** - a botanic garden in London that boasts of the most diverse and largest botanical and mycological collections in the world.

4. **Thanet Earth** - Britain's most successful glasshouse complex proudly embraced by the landscapes of East Kent producing 400 million tomatoes, 24 million peppers and 30 million cucumbers per year.

5. **The Grow Up Box** - is situated in London. It is an urban aquaponics farm. The farm produces fish and about 400+ salads and herbs using modern day vertical farming techniques.

6. **Growing Underground** - An underground farm that is based on LED lighting and an integrated hydroponics system growing a range of delicacies, using controlled evironment farming.

Fig.04 *(above)* Kew Gadrens Interiors

Design Methodologies

Design methodologies and relevance to work

The main focus of my design methodology comprises the implmentation of bio-domes in architecture. Nearing the apocalypse it would become vital to take control of the environmental factors especially for the food production. The project also incorporates aeroponics for the plantation method which is by far the most environmentally independent method of artificial farming.

Along with this, the project also allows the growth of tropical plantation within its domes, hence ornating the spa and the main arena with a recreational and rejuvenational ambience of an out of region and out of season nature.

The project's methodologies also focuses on allowing the extraordinary meld with the ordinary. This is achieved by an ordinary farm with an extraordinary structure. The existing farm structure is conserved for future. The tea-room and the farmshop retain their functions as tea-rooms and farmshops with improvisations. The project goes through preventive conservation of cultural heritage and its future speculation.

Critical Design Elements

The key design elements of my proposal

1. The bio-domes structure using the MERO system
2. Suggested use of ETFE
3. Further research into the material 'aerographene' to replace ETFE
4. Use of aeroponics and its technicalities
5. The ventilation and functionality of the bio-domes

Design Narrative

Detailed breakdown of the protoyping and design narrative processes as relevant/ applied to solve each of the critical design elements listed.

The bio-domes are made out of steel and ETFE. The joinery of the steel rods of the domes structure will be done using the MERO joints which are seen applied in many space structures. Unlike previous domes where we often see the bio-domes consisting of triangular or hexagonal pockets, we are designing our domes to be gradient panels joined through perpendicular gradient tubes.

Fig.05 *(left)*
ETFE Panels from the Eden Project

a. Element testing

The suggested material for the bio-domes structural pockets is ETFE. However, it is felt that aerographene has a lot more potential as its replacement.

b. Fixings and bracing

The steel structure of the bio-domes will make use of the MERO joinery system that allows the structural rods to be joined at various angles. The MERO joints have a proven track record of structural strength contributing to spcae shuttle structures, airports, stadiums, etc.

c. Structural tests

The feasibility of the structure was tested through the study of precedents and their foundation details. The Eden project has domes foundation piles 1.5 m thick and 12 m deep, which is the case in our project too given the similar structural physics.

d. Overall form models

The structure of the bio-domes has been studied and engineered starting with conventional hexagonal slots of the dome. However, the dome finally reached a final implementation of a much simpler structure.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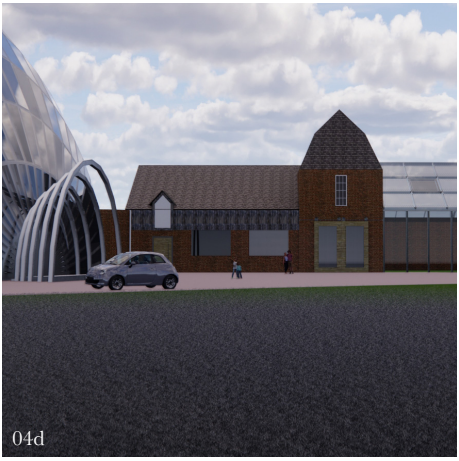
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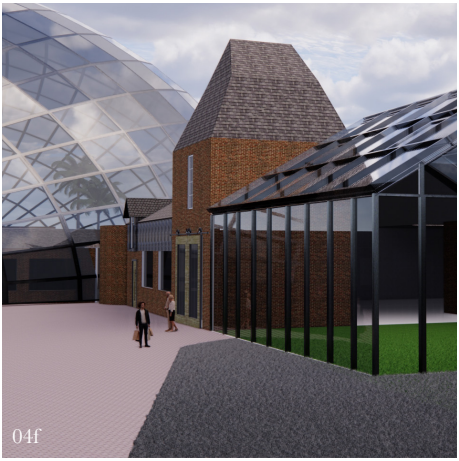
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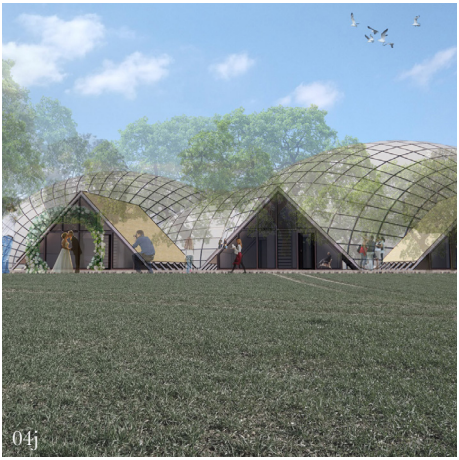
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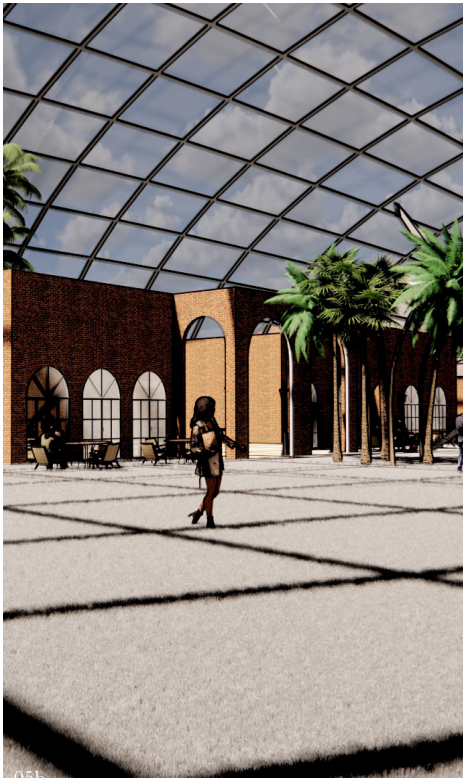

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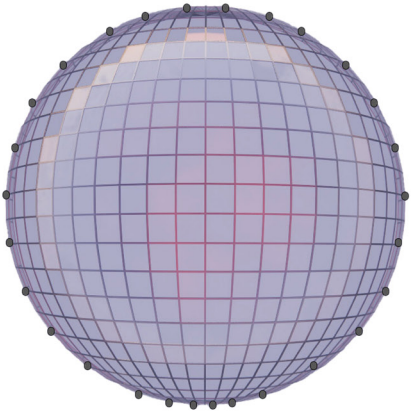
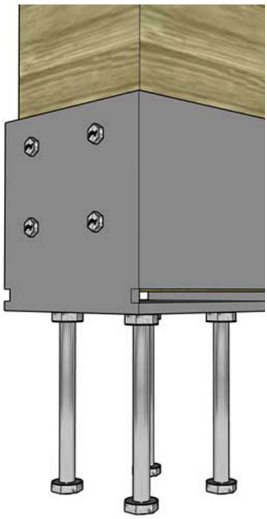




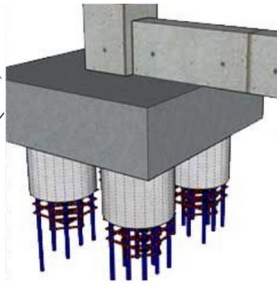


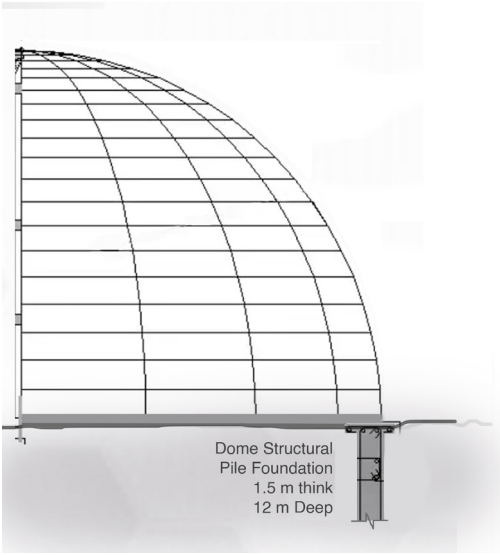
Fig.06 & 07 *(above & right)*
Pile foundation details for the domes

Visualisation and Realisation Techniques

Brief explanation of the visualisation and realisation techniques selected for the project design.

The domes' structure have been carefully studied and amended to adapt a much simpler form keeping the physical and structural strength intact. The structural details have been studies individually as well as through a thorough study and investigation into the precedents.

Studying the precedent domes from the Eden project by the Grimshaw architects, the spherical glass Apple store dome in Singapore and the Reichstag dome in Berlin, Germany by Foster + Partners, I have applied simple geometric panels to my domes.



a. Element testing

Studying the materials from the precedents and by individual material investigation, I concluded to use ETFE (Ethylene tetrafluoroethylene). ETFE is a fluorine based plastic. It was designed to have high resistance to corrosion and strength over a wide range of temperature. It is also ideal as it is less than 1% than the weight of glass but is strong enough to support the weight of a car, it can transmit UV light, it is non-stick and self-cleaning.

b. Fixings and bracing

The steel structure of the domes is developed from the MERO space frame system: pipes are bolted together by means of nodes. The joinery nodes make use of the MERO connector technology which helps and allows joints to be bolted at various angles required for a dome structure.

c. Structural tests

The foundations of the dome structure are designed to be supported by foundation piles 1.5 metres thick and 12 metres deep.

d. Overall form models

The structure of the domes weave together amongst the existing farm structures in order to explore speculative design and preventive conservation of cultural heritage.

Fig.08 (below) MERO connector technical details

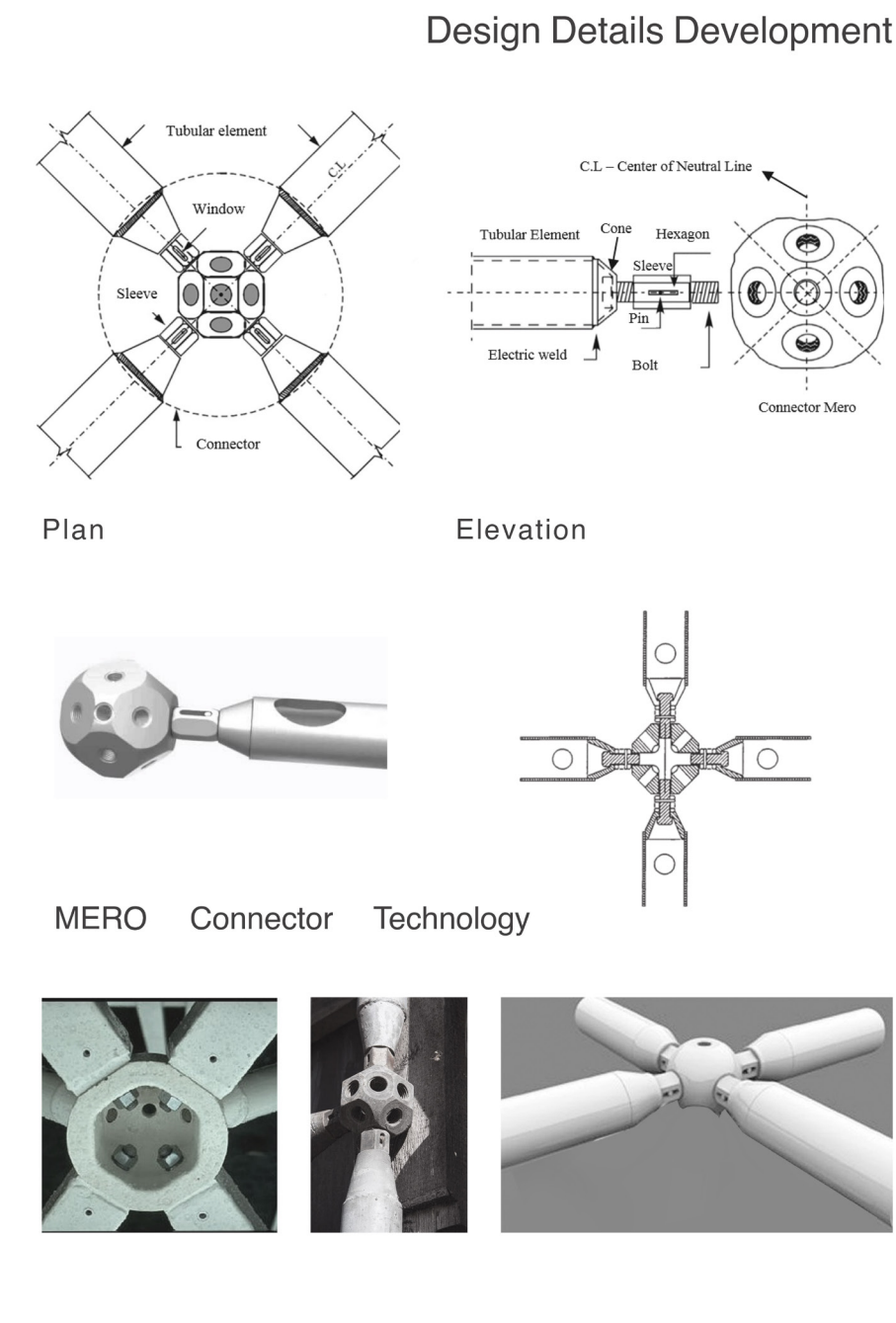
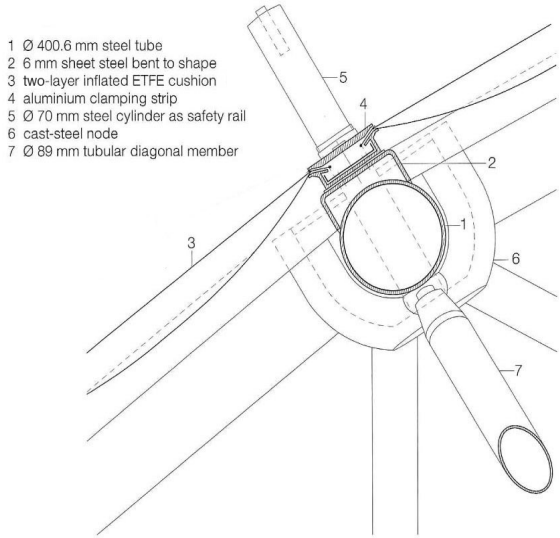
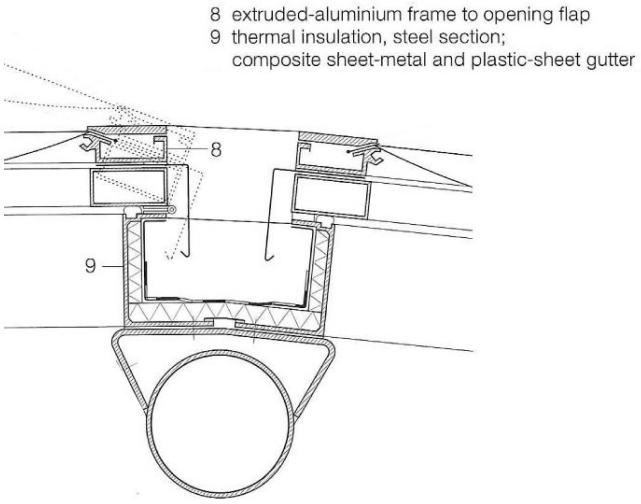
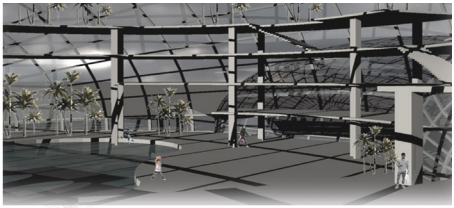


Fig.09 (below) Dome structural joinery and connection details







Stage 2

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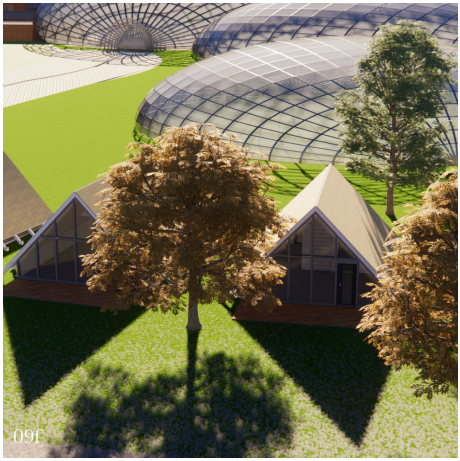

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Challenges and Opportunities

Challenges and opportunitoes that were faced during the design process.

Understanding the critical context of practice plays a dominant role in the design of contemporary architecture

Anthony Dunne and Fiona Raby state in their book Speculative Everything: Design Fiction and Social Dreaming (Dunne and Raby, 2013), “Design can play a role in highlighting what might happen if the behaviour does not change, what can be achieved if it does, or simply communicating what needs to change and how.”

a. Challenges 1

The existing structure has portions where the structure has reached extreme deterioration. It was a challenge to see how those structures could be restored and brought back to life. The nouveau dome structures were also a challenge to meld amidst the existing structure helping the exisiting structures to gracefully carry on without overshadowing their cultural character.

b. Challenge 2

Due to COVID a lot of the in-person research was limited to online communication. I was unable to visit farming facilities like Thanet Earth in person; however, the facility gave me a great deal of insight into their venture on call and online.

c. Design Drivers

To cater to the design drivers I addressed the design purpose, quality attributes, primary functionality, architectural concerns and constraints of the project. This was done by studying the current status of the situated farm and far-sighted speculation of the design and functions.

d. Opportunities

The project offers an opportunity to understand the conservation of biodiversity, long term improvements in productivity and social improvements through sustainable practices (both fiscal and non-fiscal).

Fig.10 *(far left)*
Views from the proposed design and design development

Fig.11 *(left)*
Perry Court Farm existing abandoned structure

Inhabitation and Interaction

The success criteria of the project interaction / effect aims.

The project's feasibility report shows how a long-term investment into the farming business and technology can help achieve a better survival rate which can be mutually beneficial for mankind and the planets ecological system.

As the current state of farms suggests business extensions for revenue generations, my project design offers a far-sighted and improvised version of these business extensions. The business structure also attracts clientele to partake farming activities which lead to farm-to-table restaurants, foraging and farm visits, fruit picking,etc.

During my research I realized the fact that a number of people from other bigger cities opted to visit farms with BnBs and rentals to rejuvenate away from the loud and busy hustle bustle of the city.

The recreational activities adapted into the project cater to the recreational and holiday

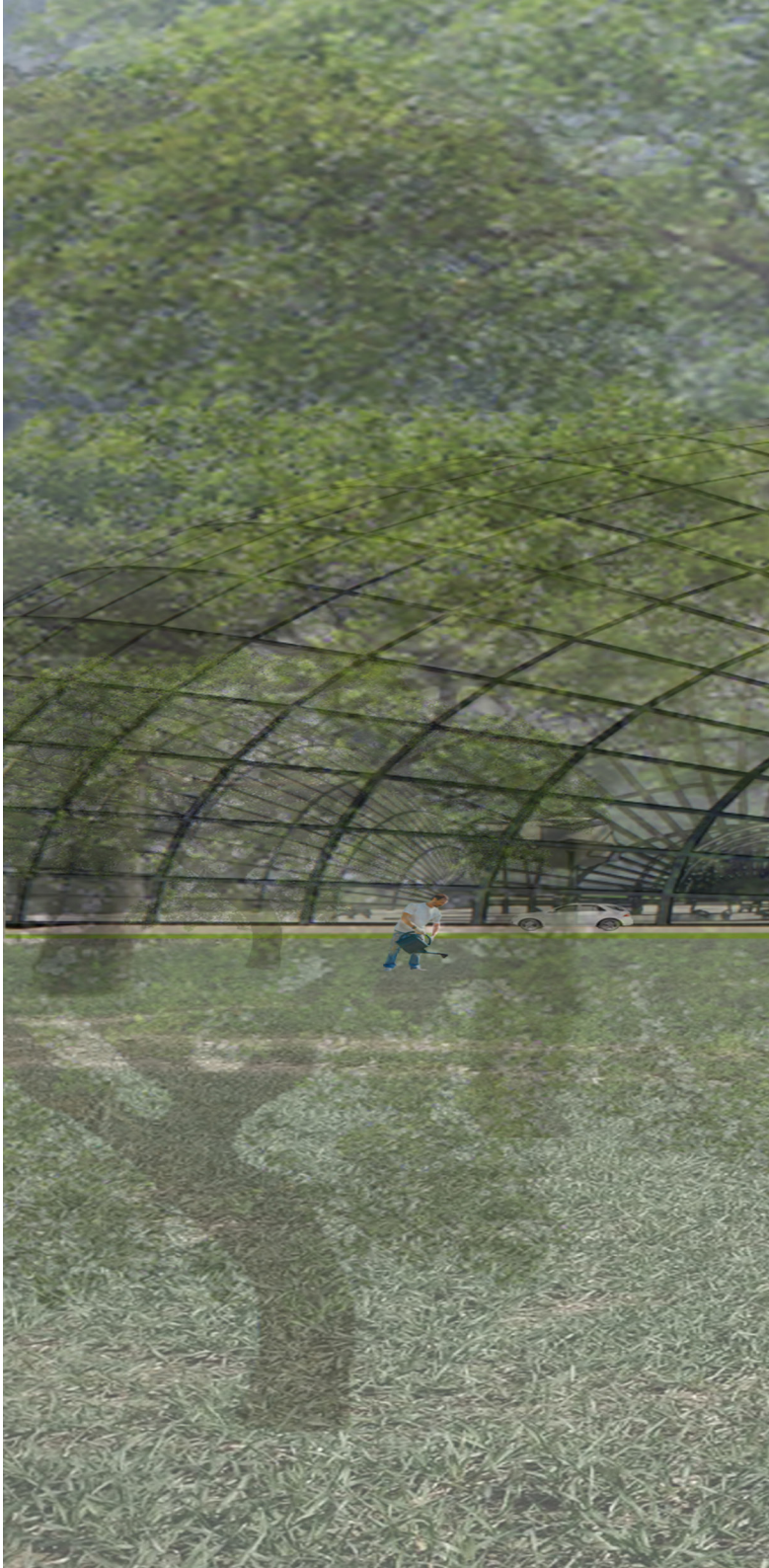
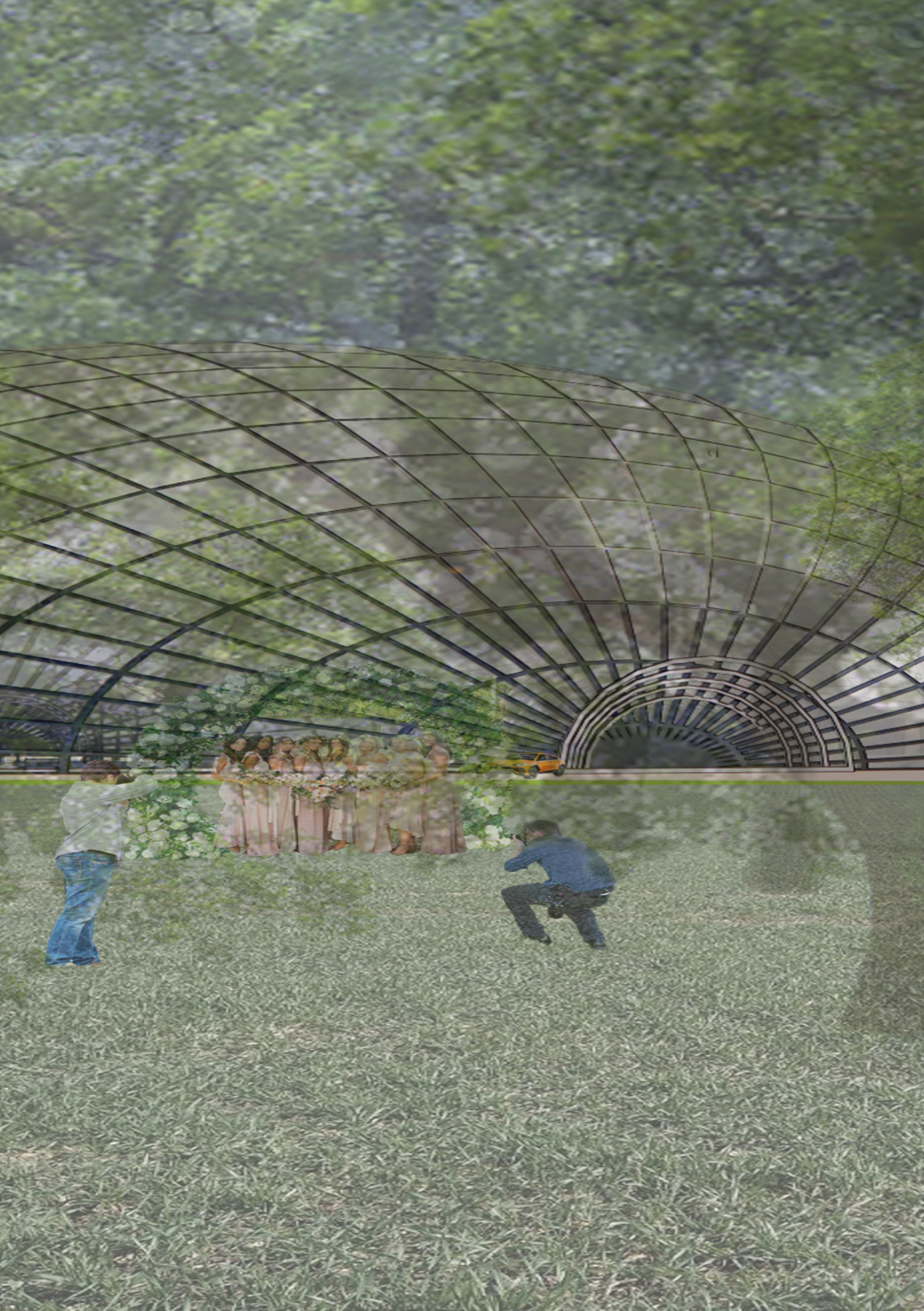
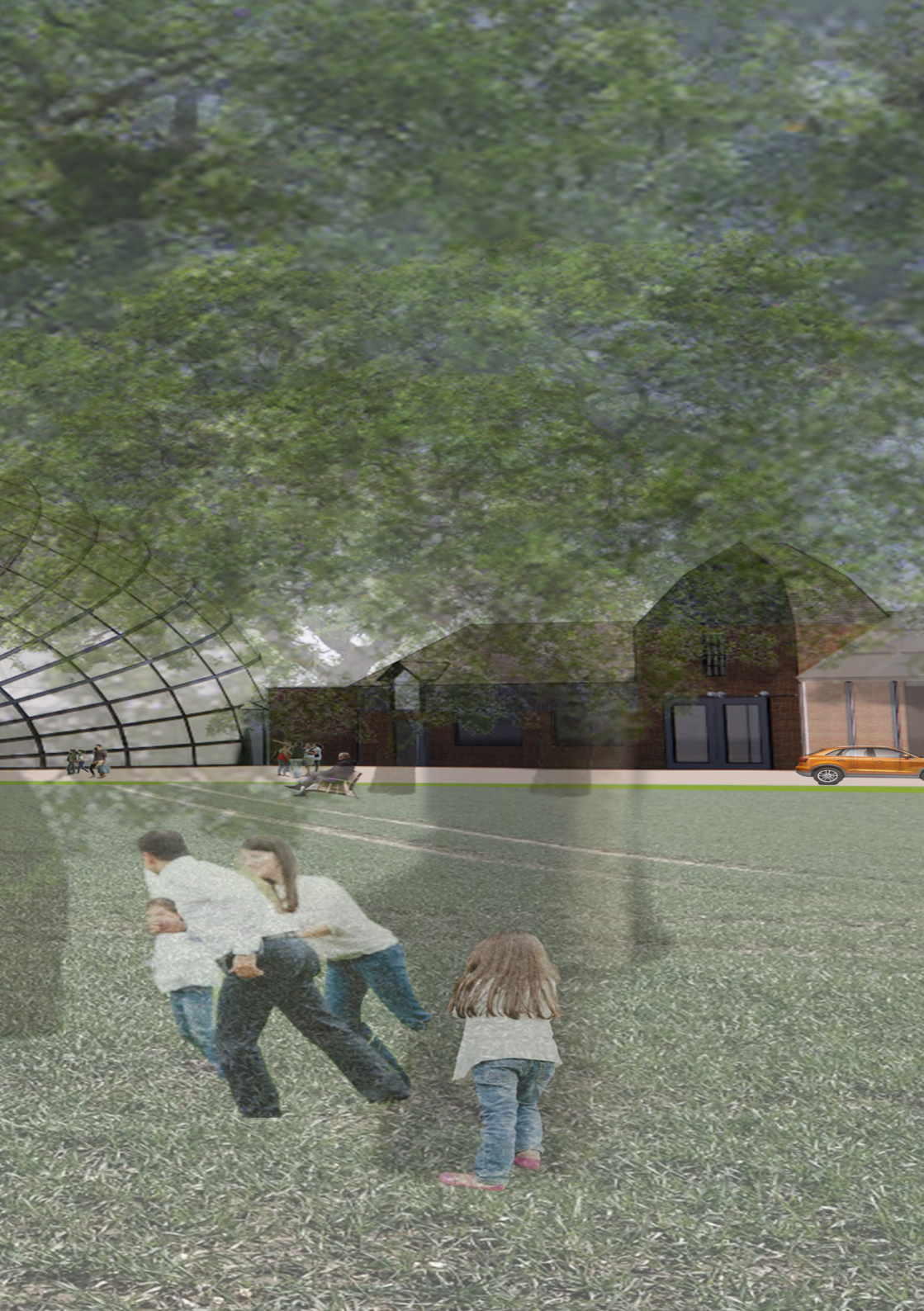


Fig.12 *(left)*
Inhabitation along with rejuvenation

Figs.13, 14 & 15 *(right and continued overleaf)*
Speculated activities on site





needs of such visitors, who are looking for a getaway away from the big cities. The recreational activities comprise of a spa, restaturant, fine dining, cafe and bar, a farm shop, tea-room, floating walkways within a tropical ambience, a gift shop and bio-dome farms.

The project also boasts a multipurpose events' hall which may cater concerts, seminars, educational gatherings, weddings, social gatherings, etc.

All these facilities provided right along the main link road, A28, promise the travellers from other cities, passing through Chartham, a rejunevating and recreational experience.

The project allows the users to experience a extraordinary structure and venue at a ordinary farm. Melding the ordinary and the exxtraordinary, providing the out of season and out of region experence, the projects pushes to serve an excelling architectural adventure.

Dissemination and Future Work

Furthering my work, I have been triggered to research furhter into the material 'Aerographene' as a material for construction. This is the material I was alternatively thinking about in place of ETFE. Aerographene has characteristics which have potential to play wonders in the architectural industry. Aerographene is stronger than steel and lighter than air. Its current potential uses include automative engineering and aeronautical engineering.

My current work and research have been blogged on my personal website komalhayat.com. All my publications and architectural activities will be updated on the site regularly. I hope that my project may allow the future farming industry insights into the potential they could be achieve.

Fig.16 *(left)*
Design proposal view

Appendix

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Fig.02: Architecture at Eden (2015) [Photograph] At: https://www.edenproject.com/eden-story/behind-the-scenes/architecture-at-eden (Accessed 10/05/2021).

Fig. 03: Olson, J. (s.d.) Aeroponics: A Compliment to Hydroponics and the Food System of Space. [Photograph of an aeroponics farm] At: http://web.colby.edu/st297-global18/2018/11/26/aeroponics-a-compliment-to-hydroponics-and-the-food-system-of-space/ (Accessed 10/05/2021).

Fig.05: Architecture at Eden (2015) [Photograph] At: https://www.edenproject.com/eden-story/behind-the-scenes/architecture-at-eden (Accessed 10/05/2021).

Fig.08: Silva, W. V. et al. (2020) Experimental Analysis of Space Trusses Using Spacers of Concrete with Steel Fiber and Sisal Fiber. At: http://dx.doi.org/10.3390/ma13102305

Fig.09: Example of Biomorphic Architecture (s.d.) At: https://www.pinterest.co.uk/pin/319755642270501070/ (Accessed 23/08/2021).

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Credits

MA Architecture Course Convenor:
Lucy Jones

MA Architecture Design Tutor:
Lucy Jones

Visiting Critics 2020/21:
Ewa Lenart – Purcell

Matt Walker - Robert Hirschfield Architects

Charles Bain-Smith - National Trust

Hubert Green – Studio He

Tom Parsons - Self employed Architect

James Roach - Roach Matthews

Tim Orourke - Settle Studio

Adam Draper - Draper Studio

David Kay - Child Graddon Lewis

Adrienne Bennie - University of the Arts London

Sally Hilal- University of the Arts London

Mary Konstantopoulou - Ravensboure University

Rosanna Ziccieri - Stanton Williams

Mattew Gibbs - Yotel

Stephen Henderson - Marshmallow Laser Feast

Amy Johnson - Marshmallow Laser Feast

Ravin Raori - Self employed artist and creative producer. Lecturer at London Fields Design School

Abel Enklaar - Self employed artist, director and researcher. Lecturer at ArtEZ University, Netherlands

Veronika Bojic - B+H Architect

University for the Creative Arts

Canterbury School of Architecture UCA