Participatory Design for Sustainable Community Development

Case Study: A Dates Pack-house in the Egyptian Western Desert

Abstract

Participatory approach in architecture design has been gaining a huge momentum in recent years. This study investigates how participatory design can affect and benefit the locals of El-Heiz area in the Egyptian Western Desert. This project at El-Heiz Oasis is part of a sustainable development initiative to help in creating a sustainable community economy. This research is methodologically executed through studying the history of the area, developing and mapping a participatory design process, then analyzing the results. Mapping the process includes both qualitative and quantitative evaluation through being a participant observer to document the process, workshops, interviews, and collecting statistics. A triple bottom line [1] sustainability analysis is applied as well, and the design is assessed in terms of practicality. While this research answers some questions about participatory design in architecture, it also raises others through the analysis of participatory approach for creating Egyptian sustainable community economies. Finally, the research offers recommendations for designing commercial facilities that are community based and sustainable.

Introduction

Background of the Problem

In the field of agriculture, there is always the issue of the gap between the local farmers and the end market. The farmers do not participate in the value chain process of their products, and do not get a high share of the selling of these products in end markets, because they sell them once harvested to several middlemen till they reach the consumers. One of the examples where this is the case is El-Heiz, which is a small village near Bahariya Oasis in Egypt. People of El-Heiz have some of the best dates in Egypt. According to the United Nation's Food and Agriculture Organization, Egypt is the biggest dates producer in the world, with dates produced in the Nile Delta, the Nile Valley (specifically Siwa, Baharia, Farafra, Dakla, Kharga and Fayoum oases), Sinai, and Matrouh (Riad, 1996).

[1] Triple Bottom Line: A framework that includes social, environmental and economic aspects or "people, planet, and profit".

Tina Jaskolski, a professor in the American University in Cairo and a researcher at AUC Center for Applied Research on the Environment and Sustainability (CARES) and Mohamed Batran, a PhD student in the New School in New York decided to take this opportunity and invest in building a dates pack-house at El-Heiz. They worked with a master's class at the Sustainable Development program in the American University in Cairo to develop this project through participation with the locals.

Designing the dates pack-house was very challenging; The locals process the dates in their own unique ways, specifically that instead of fumigation, they over-dry the dates. Moreover, they have their own cultural traditions in terms of women employment, so they divide work accordingly, so that some tasks are done at homes by women and others are done by men. For these reasons, participatory design approach was selected for designing the dates pack-house to create a building that satisfies the needs of the locals and be sustainable withstanding time.

Research Objectives

Objective: This research seeks to better comprehend the nature of participatory design applying it on the project of the dates pack-house at El-Heiz to help creating a more sustainable community economy.

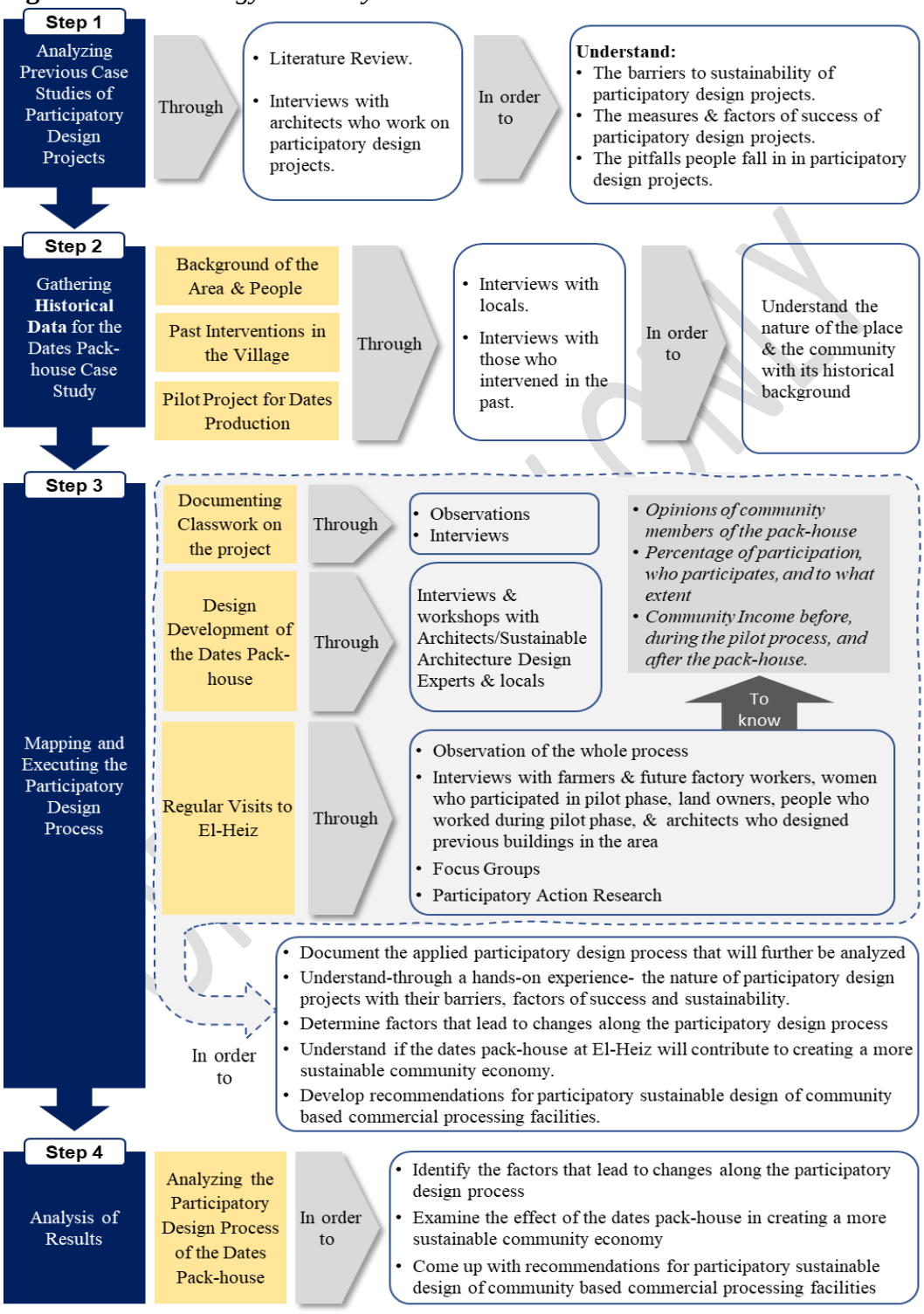
Broader Impact: Creating a prototype project that can be replicated in different community-based facility buildings in Egypt to contribute to more sustainable communities.

This study focuses on integrating participatory design approaches in architecture with environmental sustainability to help in creating economic sustainability of a community.

From here forward, this paper is organized as follows: the methodology, literature review, project decription of El Heiz dates-pack-house participatory design process, sustainability aspects, emergent themes, concluding discussions, and the limitations and recommendation.

Methodology

Figure 1. *Methodology Summary*



The methodology for this research can be summarized as studying precedent cases, then becoming a participant observer in the project of the dates pack-house participatory design where there is data gathering, design workshops, process documentation, followed by analysis. The involvement of the researcher in the process means that the researcher affected and was affected by the process. Documentation of all reactions and opinions ensures setting the picture clear without biases from the researcher.

Literature Review

Participatory Design Process

Participatory Action Research (PAR) promotes empowerment, equality and social justice for all (Katoppo & Sudradjat, 2015). Participatory design approach combines participatory action research with design thinking. Design thinking brings back design to its essence of being a problem solving method that is both innovative and human centered (Katoppo & Sudradjat, 2015). Design thinking encourages comprehensive and collaborative ways of thinking, and bridges the gap between the theoretical knowledge and design practice. Design thinking should not be tied to architectural design, it is actually a method of thinking that can be applied to different fields such as management and business service, interactive design, healthcare system, and institutionalized policy makings (Katoppo & Sudradjat, 2015).

Sustainability

In 1994, in the United Nations World Commission on Environment and Development report, sustainable development was defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Focusing on sustainable architecture was very important since lack of electricity in El Heiz requires natural cooling and daylight. Also, well designed green buildings are important on the social level too, since they increase comfort level and create healthy environments for the users through aspects like improving indoor air quality, natural daylight, and thermal comfort (Al-Hajeri, 2013). While sustainability means balancing between the environmental, social, and economic aspects, their co-existence result in complexities and require challenging trade-offs (Giovannoni & Fabietti, 2013). There is a link between participatory design in architecture and sustainability. Participation enables people to address their own problems and implement positive solutions (Oakley, 1991).

Case Studies

The selected projects were studied to understand both:

- Community/user participation in the design process
- Environmental, social, and economic sustainable building designs.

Case Studies in Egypt

New Baris Village by Hassan Fathy

This project was studied as a case for an environmentally sustainable building within a similar desert condition as the dates pack-house. In this project, Hassan Fathy did not have a community to design for. It was located where they discovered a water well 60 km south of the Kharga Oasis back in 1963. An agricultural community project was proposed by the organization for desert.

Hassan Fathy was commissioned to design a market complex, two large houses, one small house, a bus terminal waiting room, unfinished administrative center, and a car workshop a bit further. Since the temperature there was very high and the fruits and vegetables needed cool storage prior to their transportation, so Hassan Fathy built an underground space using passive design techniques for natural ventilation.

The building's Nubian vaults are at different heights, with openings, so that they capture the wind into the building. This technique results in fifteen degrees Celsius temperature drop in the underground room that will be for temporary storage.

Balat- Vernacular Architecture

This was a project in the Dakhla Oasis that aimed for preserving vernacular architecture, and the approach was to design a prototype for a vernacular home through participation. The project started by an Egyptian professor and researcher in Lund University in Sweden, aiming to preserve vernacular architecture in Egypt, and Balat was a case study. Interviews, seminars and workshops with the locals helped in understanding the reasons people are abandoning their old houses, and thus creating designs that solve these issues while keeping the vernacular architecture.

Studying this project helped in understanding different ways to perceive the local needs and encourage user participation.

Case Studies in the World

Farmworker Housing Project

This project aimed at improving the conditions of farm workers houses in North Carolina as the farmers' houses were in bad conditions. Professor Henry Sanoff in the N.C. State University School of Design created a formed a group of fifteen students to design new houses in a participatory manner. Methods for participation included field visits for observation of the current housing and its issues, then

design workshops. These workshops were done in order to validate the findings of the field visits, and to prioritize the problems found.
In this project, to ensure that the local farmers and professionals were on the same ground, a variety of methods were used: physical models, games, and conversations. The idea of reaching common ground is very important especially when the professionals and the participants have different educational and social levels.

Private Sezin School Open Roof Space / ATÖLYE

This project was a school in Istanbul that was creating a new rooftop space for students encouraging enable problem based learning and knowledge of the latest skills. This project focused on engaging the different stakeholders. The beginning was observation by architects to witness the lifestyle of students. Following this was a design thinking workshop for encouraging collaboration. There were also regular site visits, interviews, and workshops along the process. These workshops involved the Education Reform Initiative which is a leading institution aiming to promote and enhance education in Istanbul. The goal was to trigger collaborations between institutions, therefore enabling the replication of the project in other schools, and this was a sustainability consideration from the start of the project.
Throughout the implementation, students and teachers participated in making the lighting fixtures, which increased their sense of ownership.

Summary

The studies projects helped in developing a participatory design process for the dates pack-house. The steps of the process begin with pre-design workshops with the locals, the design workshops and focus groups, then implementation in which the users participate as well. Participatory design methods included sketching in workshops, one-on-one interviews with the locals, along with digital models for visualization. The interview questions were created to understand the locals experience with dates production as well as their future vision for the dates pack-house.

Project Description

Project Background: El-Heiz

El-Heiz is a small village near Bahariya Oasis in the Egyptian western desert. El-Heiz has 3800 residents with homes scattered around 17 hamlets. People live in extended families and they mostly work in farming. People of El-Heiz are very conservative; women are usually inside their homes, or in the courtyards in between the houses of extended families. At El-Heiz, there is a huge issue of lack of electricity; people only have electricity 6 hours a day.

Figure 2. *Map of Egypt*

Source: Google Maps

Pilot Project

The pilot project was a trial with the locals in which they developed a dates production process with Batran and Tina the researchers working with them. They carried out this process on a small amount of dates, and the researchers took the packed dates to Mahaly shop at Maadi to test selling them. The result was a success, consumers loved the taste and quality. According to CARES and Batran, the feedback from the locals about the pilot project was very positive, that they became enthusiastic to work on the big scale project of the dates pack-house building. Upon the decision to start a big scale project, Dr. Tina introduced the project to the 'Implementing Green Technologies in Local Communities' class which I was registered for in Spring 2018, and this was when I became part of the project.

Project Stages of Development

Classwork

It all started when Tina explained the project to the "Implementing Green Technologies in Local Communities" master's class which I was taking in Spring 2018. We were divided into teams: the financial team dealing with all the cash flows, the technical team for all the equipment needs, electricity supply options,

and all technical details, and the architecture design team which included Sara Harb and myself. Since then I decided to take it further, and not let my role end with the end of the course, but to go on completing the design of the building, documenting the whole process of participatory design, and analyzing it.

The dates pack-house was to be located on part of the land adjacent to the water educational center. The land was owned by the Freija family. Freija and one of his relatives were invited to attend a class with us. In this class, they explained the different processes the dates go through for production. We had preliminary ideas which we discussed with them. For example, we asked them if having an underground cool room will help in storing the dates away from the heat. They mentioned that they had previous issues with the military before, because they refuse building underground in this part of the desert for security reasons.

While thinking of the design, Sara and I had different alternatives for the layout and the location of the building on site. Freija explained to us that this land is a shared family. In case a family member needs part of the land anytime, they should find it available. Therefore, we should choose a location on one of the edges of the land, to allow for efficient land utilization by other members of the family when they need it. This early discussion helped create design constraints that would have never been the same without the input of the local representative, who gave us some insights before we start the workshops at El-Heiz. Added to this, we had a discussion about the process of dates production.

Interviews: With Architects Zeyad Amer, Sherif Ramzy, and Ahmed Rashwan

While working on the design development, it was essential to meet Egyptian architects who worked on similar projects. Through these interviews, we went through their experience with working with different materials, desert challenges, working with locals and the challenges they met.
This helped understanding that no matter how well we plan, things will come up along the process and alter these plans. Construction delays always happen, locals' disagreements, and others were things to get ready for.

Pre-design Workshops with the locals

During the visits to El-Heiz, I had several interviews with date providers, land owners, and the workers who worked on the pilot project. The interviews were open ended, I let them tell me about their village, about their traditions with dates selling, their experience with the pilot project, their opinion of the dates pack-house project, and what they see as priorities for the project to be successful. During the interviews with the locals, I gave them some aspects and asked them to rate them in terms of priority. These were: aesthetics of the building, design functionality and space divisions, project duration, sustainability, cost, and the pack-house capacity. Each interviewee gave a weight for each aspect in terms of its importance. On average, they cared about the interior space divisions and relationship of spaces the most. None of them gave high importance to the exterior

architecture of the building. Almost everyone pointed out that the most important factor for the process was the cleanliness of the building, mentioning statements like "keeping the pack-house clean and protecting the dates from infection is very important", and "all these aspects deserve weight, but the most important thing for the quality of the dates we produce is that we keep the pack-house clean."

Design Development and Workshops at El-Heiz

Design Process

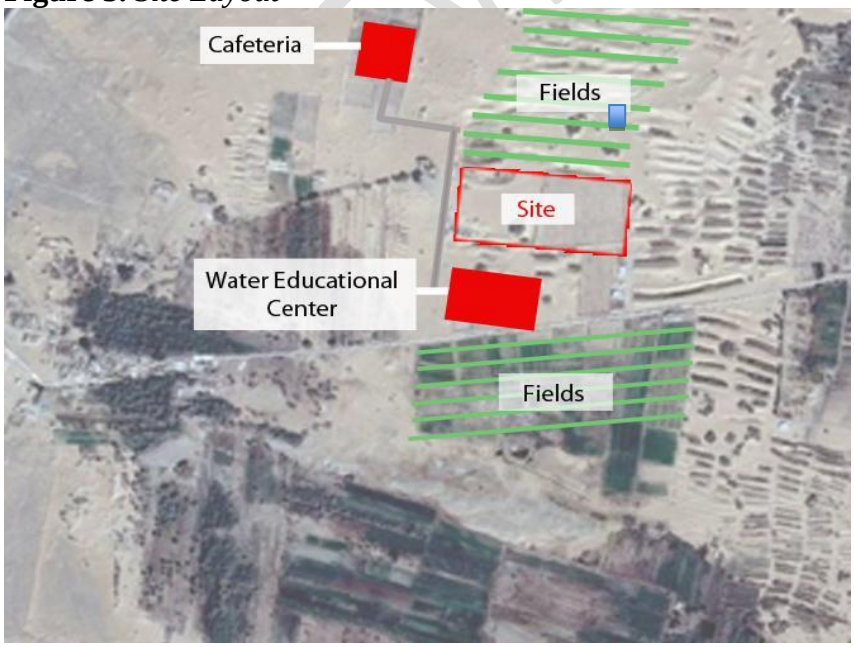
The design process was a series of discussions and drawings with the locals, producing plan drawings, and discussing them again with the locals. The design team was myself and Sara Harb who was also part of the class, and all class teams attended the workshops.

Design Criteria

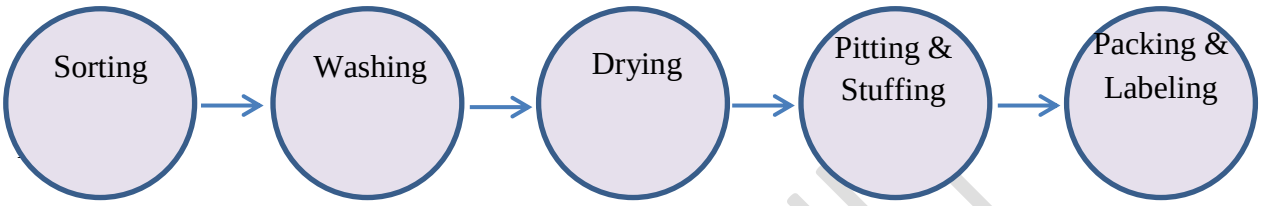
The initial design criteria was building a functional pack-house within budget that satisfies the locals needs. Throughout the workshops, more specific criteria were added which were providing maximum natural ventilation and daylight, outdoor space for smoking, a prayer room, and a renewable source of energy.

Design Concept

Figure 3. *Site Layout*



The design was developed through an inside-out approach, with everything following the process of dates production in order to create a building that is functional and comfortable for the users in every step of production. The aim was also to create a sustainable design using passive design techniques, especially because of the absence of regular electricity.
The building design tried to be consistent to the process of dates production:

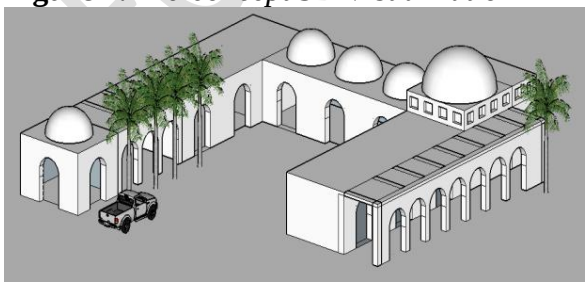


Stages of Design

Stage 1

When we first started the design, we knew from Freija that their buildings usually have palm leaves roofs, and they only started building with vaults and domes recently. For the dates pack-house to be licensed, we cannot have the palm trees leaves roofing since it would be porous. Compliance to environmental requirements is recently becoming more important (El-adawy, et al., 2019).
We visited El-Heiz to discuss the design with the people there. We did not want to have a solid design with us, but rather something visual to build discussions on. Rather than drawing plans, we just modeled a u-shaped building with the spaces following each other in the order of the dates production process. We had the changing room and toilets on the south. We also had a pathway followed by an external wall for insulation of the southern façade. We had a courtyard in the middle to be used as a break space, it was also the access point for the surrounding rooms to avoid going through the rooms to enter other rooms. We had domes and clear story windows in some rooms to make them cooler and to accentuate them.

Figure 4. *Pre-concept 3D Visualization*



We had a conversation with the people of El-Heiz at the cafeteria; the people included land owners who are date producers, workers, and others. In this workshop, there was 25-30 locals attending. We showed the locals the digital

model, and in the following stages we used to print out the plans to sketch on. When discussing the design with the people, we asked them on how we can divide each room. The workers also asked for a prayer room. The conversation sometimes turned into a discussion between the locals themselves. We finally gathered the information we needed about the process and the needs for the spaces. We came back with sketches and notes to redesign.

Figure 5. *Design Workshop with the Locals*

Stage 2

This was the stage when we started thinking of the building design in details of each space, using the information we got from the locals. The design process included discussions in class, interviews with professional architects all backed up with the information from the locals. The space for each room was based on the seating needed and the number of people.

The U-shaped building idea was changed to a closed loop to have an entrance lobby that leads to the courtyard or the workers preparation room or toilets. In this design, all working rooms were accessible from the courtyard. Also, each room had connecting doors to the following one, so that if the workers are packing the dates then labeling them, they can directly move them from one room to the other. The protrusions in the building design were to ensure air inlets to maximize airflow. We discussed this design in class through a series of internal iterative edits focusing on fixing the area of each space and windows locations. The discussion involved all class members-not only architects. This interdisciplinary approach to designing was very useful as it made us revisit the design considering technical aspects and financial aspects. While experimenting on the form, domes, vaults, and flat roofs were used.

Figure 6. *3D Model-Stage 2*

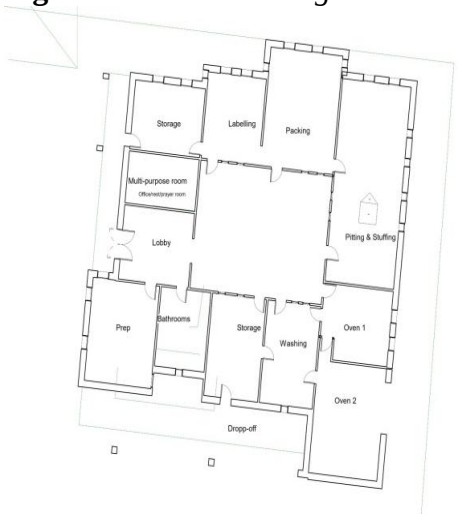


Figure 7. *Plan-Stage 2*

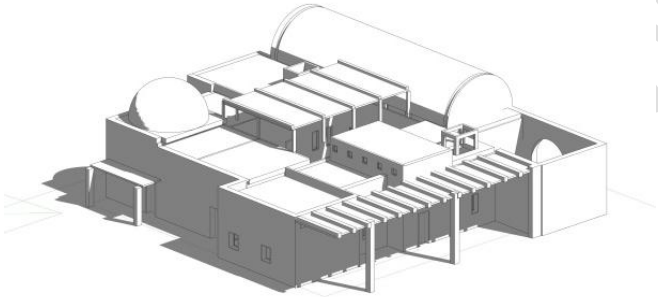


Figure 8. *Dates Pack-house Plan in Stage 2*

Stage 3

By this time, the financial team was done with all the calculations. According to the budget, we had to redesign the pack-house to be half of the area that was designed. It started again from there: the locals' feedback and the new constraints.

At this stage, the focus was to develop the design, and to make sure any design requirements for the pack-house license were met. The intention was to make the design compliable to the Global-GAP certification as well. For the hygiene of the pack-house, it is required to have it at least one meter above the ground level. Also, the bathrooms have to be separate from the main working areas.

In the new design, the building form was broken up to maximize air flow, and the orientation of the building was facing the prevailing wind direction, with each room directed towards the wind. The separate spaces were chosen to be the

preparation room and toilets to comply with the Global-GAP requirements. The location of the toilets was such that the wind does not blow any odors to the pack-house rooms. Also, the new design maximized the potential of future expansion.

Thinking of both, unifying an architectural language and maximizing air flow, the design was changed to have vaults at different heights-inspired by Hassan Fathy's architecture, with openings that can let air and daylight inside. The separate workers preparation room was designed to be covered with a dome. The courtyard would be shaded with palm leaves so that it could be used as a break space in the sunny hot weather. Since we had to reduce the areas, we removed the multi-purpose unit, with the courtyard acting as an alternative space for prayer or any break activity.

Figure 9. *Dates Pack-house Plan in Stage 3*

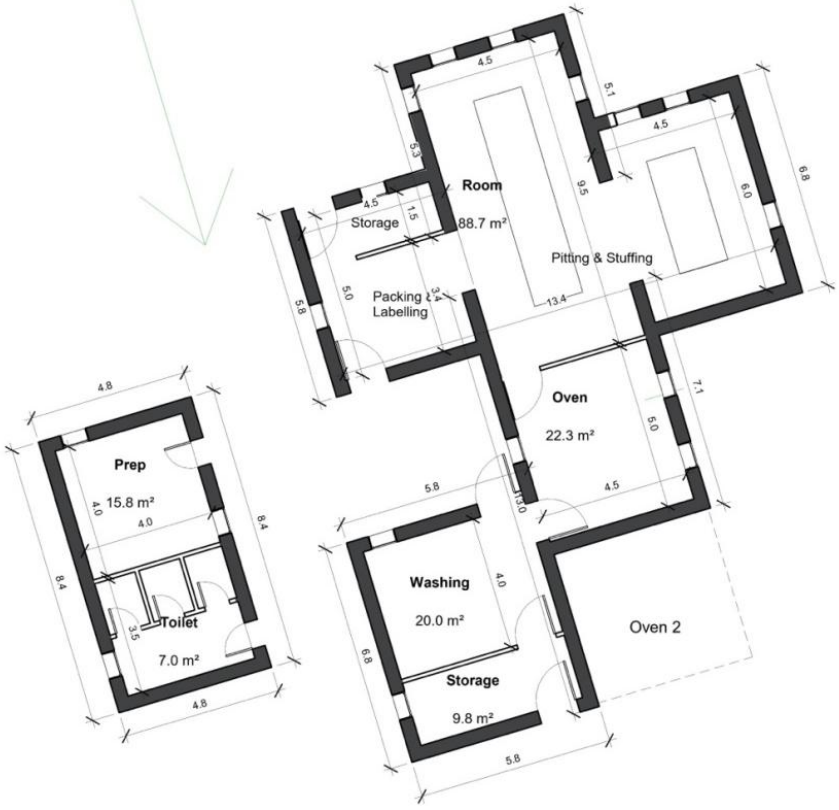


Figure 10. *Dates Pack-house Elevation in Stage 3*

Construction

Figure 11. *Dates Pack- house Under Construction in December 2018*

Even though delays in construction were expected, the construction process took several months more than what was planned. At first the workers said the building did not need a foundation, but after consulting several engineers, Tina asked the workers to build a foundation. The construction of the foundation and walls was done by a local builder who had a team of 8 workers working with him. The way the workers build was through outlining the floor plan on the actual location on site using bricks. The foundation was built out of limestone blocks, and it costed 95,000 Egyptian pounds. Since the building was not finished in the

harvesting season (September-November), the dates were bought by Batran and Tina from the local date providers and stored till the pack-house was ready.

Sustainability of the Dates Pack-House

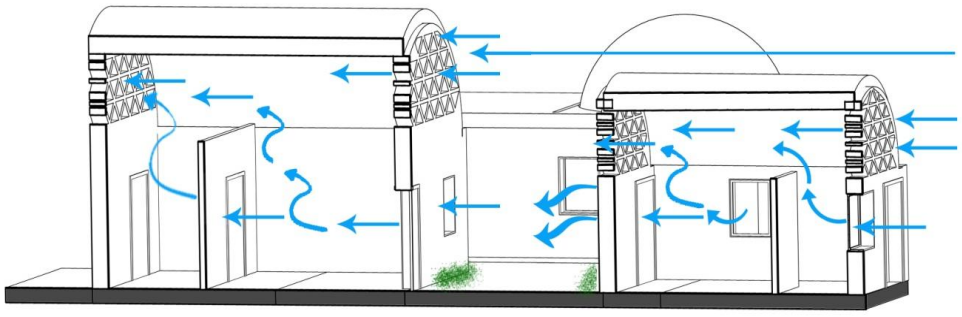
The sustainability analysis is a triple bottom line analysis in which the environmental sustainability of the architectural design output was analyzed, as well as the social and economic sustainability of the project. With this triple bottom line analysis, the whole sustainability of the project is discussed.

Environmental Sustainability

Design

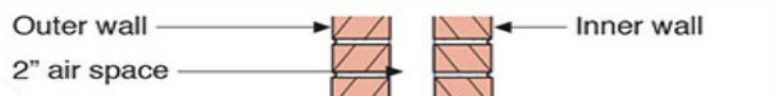
The orientation of the building was facing the prevailing wind direction. The building design attempts to maximize the flow of air through the form of the building and the court in the middle, to maximize natural cooling. Furthermore, all the roofs of the working spaces were vaulted. These should help keep the indoor spaces cooler as well. The initial dates storage area was located on the southern facade. Also, it was decided to shade the court with palm leaves. The locations of the windows were based on studies of air flow as well as the function and movement of the users inside. The rooms had different heights to enable having clerestory windows or openings in the vaults fronts in all spaces. All of these considerations were made in order to keep the building naturally cool as much as possible.

Figure 12. *Natural Ventilation Study*



In the design of the pack-house, passive design techniques were used to maximize natural ventilation and cooling. Also, all the exterior walls of the building are double walls with air cavity in between.

Figure 13. *Detail of a Wall Section*



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Building Materials

One of the ways to reduce energy content is the building materials' selection (Rachwan, et al., 2016). The materials chosen for building the dates pack-house was natural stone. This is because stones were available close to El-Heiz, therefore it will not be long transportation distances. Also, having the walls made out of natural stone will improve insulation of the building. Since we cannot depend on consistent electricity, we tried to keep the building naturally lit and cooled as much as possible.

Despite these good reasons that justify using natural stone, they were still not used during implementation due to the following reasons:

1- For the dates pack-house to obtain a license in the future it must comply to health standards, the inside of the walls should be ceramic or an equally sealed material. Natural stones have the problem of having cracks in between them that allow rats and ants to pass through. To apply ceramic tiles on natural stones from the inside means using a lot of cement, which is not a good option either.
2- Another reason for not choosing natural stones was that they were an expensive option, and the project had a limited budget.
3- Only specific builders know how to build using natural stones, and these builders are outsiders not from the area.

With these reasons, it was decided by the investors to use white brick walls that the locals currently import from Minya. Surprisingly, the locals supported this option; they wanted to feel like they have a real factory, not like the cracked textured buildings they are used to.

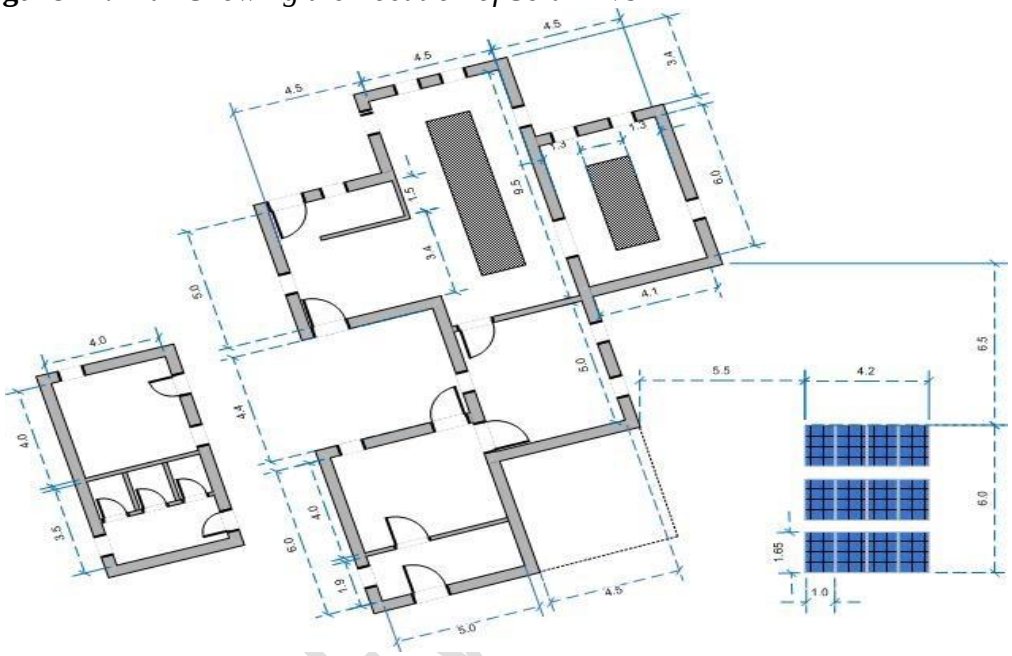
Waste Generation

The target is to have less than one ton of waste per year emerging from the pack-house, and to develop a waste management program for that. Waste will be separated at disposal in the pack-house, and plastic waste will be sold which will also slightly increase the cash in. There will be zero food waste, even the seeds of the dates after pitting will be used as soil fertilizers in the future. In the sorting stage, all the removed dates are used for making *agwa* (date paste). People of El-Heiz usually sell the *agwa* after the dates season.

Solar PVs

With the challenge on site of having no supply from the electricity grid, and with the local generator only working for a few hours daily, there were solar PVS designed to provide energy for at least 6 hours after sunset with the lowest cost possible.

Figure 14. *Plan Showing the Location of Solar PVs*



Social Sustainability

Employment

The project employed young men for working in the construction process. It is estimated to employ around thirty workers for the first phase of dates production. Every year, the amount of dates that will be processed will increase, with the increase in the expertise of the people working, more dates can be processed, and more people will be employed. This gives people of El-Heiz additional work opportunities.

Participation

People of El-Heiz not only attended workshops when we asked them to, but they were extremely welcoming. Even though women never go outside, the men invited us to visit them at home, and the women were active in the discussions as well. The motive for participation is very important. There were no monetary benefits for participating in the design process, yet the locals participated because

they believed in the benefit of the project to them. There were also diverse participants in the process: young men who will be workers in the pack-house, older farmers who will be dates producers, and women, so the sample reflected the various segments of the community.

Sense of Ownership

The fact that the date producers and the workers share in the profit with the investors, along with the fact that the building was designed with the locals and built by them, gave them a sense of ownership. The locals have been taking photos of each other in front of the building. Earlier, several of the locals offered to help in anything needed during construction, before knowing that they can get paid for working with a daily fee. Also, during the interviews, they mentioned words like "our dates are very clean", "we have the best dates". The workers were proud of their dates, and looked forward to do the process again on a bigger scale.

Women Involvement

Women were involved throughout the participatory design process through focus groups in the house courtyards. Women will also be involved in the dates production process of the pack-house. Women specifically work on sorting, washing, and drying. Working in the pack-house will give women their own source of income, even if they work from home, similar to what they did in the pilot project.

Economic Sustainability

Structure

Tina and Batran are the funders for the project with Batran's company 'The Desert Caravan' the official owner. Batran rented the land from the local owners for 49-59 years which started in 2018. This is what they agreed on, but the contract is still not signed. This ownership through long-term renting of the land is because Batran and Tina needed a piece of land to initiate the project, the locals wanted to have the project so they wanted to offer a land, but they still wanted to keep the land for the future generations, so they did not want to sell it. People of El-Heiz have the sense of ownership of the project, because 50% of the profits goes to them, and because they have not only witnessed the building come up the way they wanted it to be, but some of them even helped throughout the construction process.

Operations

When the team checked the market in the time of the pilot project (2017), the prices of similar Siwan dates in the market were between fifty and a hundred Egyptian pounds per kilo. In the pilot project, the plain dates were sold for ninety

pounds per kilo, which was very expensive, yet it was sold because it had better packaging, the dates were very clean and accurately sorted, and the roasted taste was unique.

Normally, the farmers make seven pounds per kilo when they sell the dates in bulk form. When packed they can sell it for fifty pounds. The farmers' income represents 14% share of the final price at fifty pounds per kilo and a 7% share at the hundred pounds per kilo. In the pilot project, the farmers made 21 pounds per kilo for the plain unpitted dates, instead of 7 pounds, without paying for any of the post-harvest costs.

As for the workers, in the pilot project, Batran asked about the wages. It ranged from 80 to 120 Egyptian pounds per day. He used the highest number (120 EGP), divided it by the regular 8 working hours, to come up with an hourly rate for the workers of 15 Egyptian pounds. Workers who came for 8 working hours per day were paid 120 Egyptian pounds which included almost an hour and fifteen minutes to an hour and a half lunch and prayer breaks. Any extra hour was paid with the hourly rate. In the interviews, a couple of the workers mentioned -without being asked about this- that they were satisfied with the pay in the pilot project. Men and women will have similar hourly rates, just like what happened in the pilot project.

In the pilot project, dates were bought from 4 farmers, the following year (2018), dates were bought from 6 farmers. This encouraged all farmers in the village to start adding plastic bags around their dates on the palm trees, because they learned that this will protect their dates, reduce their losses, and because they knew that every year more farmers will be able to process their dates in the pack-house. Gradual expansion is expected to continue in the project till the whole village can process their dates. Profit is shared between the investors, date providers and workers: 50%, 40% and 10% respectively. The investors also buy the dates from the dates providers in the beginning of the process with the intention of eliminating any risk on the locals.

Future Expansion

It was agreed with the locals to use profits in the future for expanding the pack-house to increase its capacity and increase production.

Emergent Themes

The Expert Role Rotates throughout the Process

When the construction process was starting, the builders just wanted to build without a foundation, like they usually do. At first, Tina accepted, but the researcher explained that the foundation is essential for the building to stand and be structurally sound. There were massive arguments around this with Tina; the workers said that was how they always built and they knew what they were doing. To me and the engineering class members explaining differential settlement and how the wind over time can lead to cracks in the building was quite a challenge. In the end, after Tina consulted several architects and structural engineers, she asked the workers to do the foundation.

This shows how each of the participants, the builders, architect, and investor, come into the process with their set of information and their way of doing things. The process allowed for an authentic exchange to happen, yet the decision had to be taken by the person in charge of funding.

In an interview with one of the dates providers, he literally mentioned that the foundation of the building is very important, that he was so glad we made a foundation because builders there do not do that, and the soil usually settles after some time.

The process has been a loop of sharing information among each of the participants. In the situation of whether to build a foundation or not, the role of the expert was played by the architect. Whereas in the design process itself, the exterior of the building was an architecture decision, but everything about the interior was coming from the knowledge of the locals. The locals were the experts who knew each and every step of the dates production process. They were the ones setting the design criteria, deciding on the proportions of each room and the sequence of the rooms. The locals were the experts teaching everyone about the dates production process. When it came to the exterior of the building it was not an area of interest of them so they gladly relinquished decisions on it to the architect.

In the construction phase, the local builder learned to build a foundation for the first time. Everyone has been learning something, and the way the process went was not through a group of experts implementing a project in a village, but professionals working in partnership with the locals in a village with the role of the expert rotating between them according to who had the knowledge needed for every situation or decision. The relationship of trust that was clearly present between the research team and the locals had a lot to do with the acceptance of the various parties of that revolving roles. There was no intimidation when one of the participants influenced more the decision in one of the stages, as one may expect from parties that are so diversely different.

Local Perception of a Building

There were several discussions with the locals about the design of the building. Discussions included both the exterior and the interior design of the building. The locals' usual comment on the exterior of the building was that "it is nice". When hearing the design suggestions of having vaults and domes they said that they like them. They did not mind the building materials, they just wanted something clean from the inside. When we got to the inside of the building, the conversations got very controversial. They asked for a prayer space, smoking zone, and had spatial requirements for the functional rooms. They explained to us in great detail the steps of the functions they do for dates production so that we follow them in the design. They also discussed possibilities for future expansion. They requested an indoor oven and a space for an outdoor one because they use two types of ovens. However, they rarely commented on the aesthetic factors of the building. Their comments seemed to focus more on what makes them most comfortable. A building to them is what shapes their movement from within, and what is both functional and comfortable. Facade design is of much less priority to them, that they left most decisions to professionals to decide while only mentioning that they generally like vaults and domes and that they wanted a building material that helps keep the inside clean, which were requirements that still related to the inside of the spaces.

This change in the level of participation between both topics exterior and interior design, indicates that where the interior is concerned, the locals believed they were the experts, and they knew how it should be and we should work accordingly. Whereas for the exterior, they left it to us, it did not seem to be as important to them. A building to them is more about how well the spaces served their functional needs rather than how it looked.

Priorities of the Architects Change According to the Context

In the professional life, the priorities of the architects change according to the context of the project. For example, if the client for the pack-house was a professional company, the design would have gone by the book, getting all the systematic steps of the dates production process and studying all the design standards to build the design upon. However, in the case of El-Heiz pack-house project, the focus was on the traditions of the people, on local dates production, and on the culture of work division between men outside and women inside the houses. Designing for a large pack-house that could take both men and women for example would have been useless, so it was essential to understand the culture. While hygienic standards should have been studied from the very beginning as well, they were the second step after understanding the local way of doing the process. As architects we altered our normal process of starting with the standards, because the context offered what were clearly far more important constraints that had to be understood and resolved. The context of each project sets the priorities for the architects.

Concluding Discussion

The Architect as a Participant Observer: Experience and Lessons learned

The way architects design buildings is different from how the locals do it. At El-Heiz, the process is very simple, several design decisions are taken on site while building. This is different from the professional architectural process of producing a full set of construction documents before embarking on construction. When different mindsets work collectively, they meet somewhere in between. Throughout the participatory design process, the researcher got immersed in the world of the locals as the process pulled me in. While on the other side, the locals explored more the architectural way of designing through modeling and design workshops. This formed a new relationship that stands in between the rules of the architect and the spontaneity of the locals. The researcher did not produce detailed construction drawings, but we had schematic plans and elevations printed and discussed with the workers, then they started construction from there. There were things that were not discussed such as the connection between vaults with each other, and the windows sill heights and details. This left space for the locals to take decisions on site and apply their traditions and preferences. Even though there were assumptions on what the workers will do in these non-discussed small details, assuming the builders will do things in a specific way was not accurate, because local builders have their own standards, and often that may mean that the standards vary according to builder. It is important to realize that people have their different traditions even when it comes to construction. Architects have their traditions and local builders have theirs. This process brought both traditions into interplay

Also, there were some infractions from the design in the construction process. This overscored the feeling of ownership that the locals must have developed to the building throughout the process, which will inevitably have its impact on the overall sustainability of the project.

This special relationship that developed with the locals and having a hands-on experience being a participant observer was very enlightening and transforming. Participant observers have to allow other participants to act freely, even if they are criticizing their own input without being defensive. Throughout the participatory design process of the pack-house with the locals, I learned to be a facilitator enabling the locals to design for themselves. I learned to listen and open up to the fact that non-professionals may know better, or even more, about the design requirements than I did. Practicing to be observing without interfering in the discussions and without acting as the expert is very challenging when the discussions are in your area of expertise. Being a participant observer involves the challenges of balancing between when to participate and when to only observe, of controlling your biases, and of understanding that you are affecting the process, since you are one of its participants. During the design workshops of the pack-house, there were times when I participated with my input in design, and there

were other times when I was observing the discussions between the locals while they were discussing what they wanted focusing on taking notes. This observation was important and it helped in interpreting their needs and identifying patterns of behavior and preferences among the people.

The role of the expert changes throughout a participatory design process, depending on who has the most knowledge and experience in each situation. Therefore, participation is sharing of knowledge as defined by Dayle and Schively Slotterback (2009). In the project of El-Heiz, if we have considered ourselves the sole experts in the process, there would not have been this mutual learning in which we learned about the local ways of dates production and the local needs in a building design, and the locals learned about hygienic considerations for their dates, ways to increase their production, and constructing building foundations. This rotating role of the expert enabled us to maintain the ancient local ways of dates production with its health benefits due to roasting instead of dates' fumigation. In the pilot project, the locals were not just following the rules (such as covering palm trees with plastic bags or washing their hands before working on the dates), but they understood the advantages of what they were doing, and as some of them mentioned in the interviews, they started teaching what they learned to other farmers, which is a sustainability aspect in itself. Moreover, this rotation of the role of the expert made the participation process a real engagement one in which the locals had power as well as the professionals. This was an important factor for the sustainability of the project, because if the building was not designed through a process that integrated and respected the locals' traditions, they may not develop ownership and hence may not sustain the project in the future. What the people were experts at along with their local traditions affected the priorities of the professional team working on the project. This is why the interior of the building was prioritized over the exterior, and why focusing on social issues like women employment in the pack-house came before implementing the hygienic standards in the design. The architect’s priorities changed according to the context and its forces.

Even though the locals as my clients did not require specific drawings or visuals, nevertheless visualization of the design proved to be of extreme significance in the process. Through a normal conversation with the locals, they only set basic needs, but when integrating a 3D model and a plan of the pack-house in the discussion, they started giving detailed requirements such as reducing the number of connecting doors to maximize work counters and having more openings in specific rooms.

Sustainability Potentials of the Project

The dates pack-house has the potential of future expansion, that will enable more farmers to process their dates which will increase the revenues of the pack-house and will also lead to more workers being employed. Yet, in order to fully address the future sustainability of the project, its risks have to be identified.

The first risk lies in the possible problems that can hinder the licensing of the pack-house, which is essential for selling the dates. If some activities are to happen by the women outside the pack-house, this may require building an external unit nearby the houses where women can work in since working at homes may not be hygienically acceptable. Such a new unit will inevitably have an impact on the project economics. If women will only do the initial rounds of sorting, they can work at homes. There is also the possibility of having separate working hours for women in the pack-house, which is pending the acceptance of the community. However, having women working in the pack-house separately lowers the workforce, unless it is at times when men are harvesting. This uncertainty of the operations and task divisions along with any other obstacle the project might face can hinder the licensing process upon which selling is dependent.

Another important risk to assess is related to the sustainable management of the pack-house. Selling produced dates is done by the investors, whose time dedication to the project may vary in different stages of their lives. The distribution of the dates is what guarantees the sustainability of the project, since this is the expertise the locals lack. For the project to have operational sustainability, the locals have to practice being their own leaders. The step of selling the packed dates to supermarkets should include representatives from the locals with the investors.

The fact that the local people are not risk takers in the process is another risk in itself. The plan is that the investors buy the dates from the farmers, then the local workers work on producing the dates with wages, then when the dates are sold the farmers and workers get their percentages of the profits. According to the investors, the reason why farmers are paid in the beginning is to ensure they have their fixed income similar to selling to traders, while being able to process their dates and sell them in the market for more income, without exposing them to the risk of losing. While having a profit share boosts the sense of ownership and motivates the locals. Not sharing any risks might do the opposite. It also leaves the question of whether people will do this on their own when the investors are no longer paying the farmers in the beginning of the process unanswerable. This puts the sustainability of the project at risk.

The project is also prone to the risk of scaling up. The stakeholders of the project are all new to the market of dates. The locals are experts in dates processing, but they do not know about distribution systems. The investors are academicians who are considered new to the market as well. While the pilot project showed positive results, selling in large quantities will definitely be challenging.

The Complexities of Implementing Sustainability in the Local Context

This experience of the dates pack-house project shows how in real life projects, we do not have that level of control over everything; it is not as simple as it may be portrayed in the academic perspective. Designing a project that theoretically fulfils being environmentally, economically, and socially sustainable,

does not ensure its long term overall sustainability. We have to look at the bigger picture of the sustainability question because in practice, the sum of the parts does not add to the whole, and satisfying each category's requirements does not equate to overall sustainability. As Giovannoni & Fabietti explained, while sustainability means balancing between the environmental, social, and economic aspects, their co-existence result in complexities and require challenging trade-offs (Giovannoni & Fabietti, 2013).

Sustainability cannot be brought down to three intertwining pillars only. The relationship between the pillars is multi-layered and complex. Since a sustainable project has to stand the test of time, the time factor carries with it potential risks that may break a project that is environmentally, socially and economically sustainable. What is theoretically sustainable does not mean it practically is. Practically, there should be a projection of time with the risk it carries as a dimension in the equation. Time throws certain risks that are essential to be studied, and that cannot be classified the way sustainability was classified to environmental, economic, and social, but are dependent on each project and its case. In some situations, taking a decision that is not the best sustainable option under one of the pillars, can add up to the overall sustainability of the project. For example, in the case of selecting the building material of the pack-house, initially natural rocks were chosen for better environmental sustainability. However, the decision was diverted to white limestone bricks because bricks would not require massive amounts of cement to add the tiles finish required in the interior for licensing, they are more affordable, local young workers currently build with white limestone bricks so they would be building the project themselves.

This is where participation comes in; hands on experience in a project helps in building decisions that are not only theoretically sustainable, but practically as well. Participation also helps to explore the potential risks to prepare the project to face them while being sustainable.

Link between participation and sustainable development

A project that is sustainably designed theoretically, does not mean it will be practically sustainable. The factor of reality loosens the facts we know from academics. Designing through participation enables us to put the risks in consideration, which vary from one project to another, and can never be understood without being immersed in the process and understanding the people, place, and time. It was through participation that more factors came into the decision making process for a sustainable project. There were several incidents that proved that participation of the locals in the design process is an important factor for the sustainability of the pack-house. Understanding the traditions of the locals and that women can only work at home was very important, because otherwise we would have designed a larger space to take both men and women, which is something that the locals will never accept. Another thing was learning about the dates production process in order to design a building that they can actually use for its intended function. Throughout discussion, we also knew that

we have to find an alternative to building an underground cooling room since the military will not allow it in this area, and the investors built a fridge instead. These were all important information that if we have missed, would have hindered the sustainability of the project. Understanding the context from the locals helps outside professionals to design sustainable projects. "Resident-driven" projects, are more likely to succeed, because it involves the knowledge of the users who know the most about their environment (Sanoff, 2000).

Final Remarks

In conclusion, while academic categorizing of sustainability helps set a framework to address designing a sustainable project, it is important to understand that in reality, these pillars will collide, not only with themselves, but with other factors that come into the equation. This makes the decision making process more complex, especially that in reality we do not have the level of control we think we might have. It is only through being part of a project and having a hands-on experience that one can absorb reality and fully understand the complexity of sustainability. When working on a sustainable project, it is false to assume that being professionals makes us the experts. We do not know better than the locals we are designing for, but we know differently. This is why a participatory approach can be taken in which the role of the expert rotates, knowledge is shared, and the hidden risks of the project across time can be identified and prepared for, in order for the project to be a real sustainable one that withstands the test of time.

Limitations and Recommendation

The only limitation in this project is the fact that I was part of the participatory design process; I documented my as everyone's opinion and reaction throughout the project in order to prevent creating a biased image.

As a recommendation for the research, a complete sustainability of the dates pack-house after operations will be very beneficial, while comparing any changes that the users make to the project after implementation to the intended design.

As a general recommendation for those working in the fields of architecture and development, the times and means of communication with the users are very important. Time of communication should be as early as possible throughout the design process, to understand the users' needs early enough and create a building that people will actually use. Regarding means of communication, it is important to have the participants as powerful as the professionals. When designing a community based commercial facility, understanding the way the locals make their own products and the fact that they know their production process the most are very important. Last but not least, the time factor has to be considered along with the three pillars of sustainability, because no project can be sustainable without analyzing the risks associated with it, that might not theoretically be under the

umbrella of any of the pillars but are risks that emerge from the context of each project.

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