

Between Dream and Reality:
Analysis of a Participatory Design Project

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XIJIA (ANNIE) LI
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Approved:

Stephen Wheeler, Chair

Jonathan London

Kurt Kornbluth

Committee in Charge

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Abstract

In this thesis I analyze a participatory design project that was conducted in Sacramento to design a vegetable wash station for a small-scale farm, with collaboration between the International Rescue Committee (IRC), UC Davis D-Lab and refugee farmers. The main purpose of my study is to understand challenges of participatory design projects with marginalized people in a developed country. My method is participant observation in which I actively participated in the project as a student team member. I reviewed design methods which had been applied during the process and analyzed challenges for refugee farmers, the student team and the IRC. Separating dream from reality, these challenges made the project fail to achieve initial goals. I conclude that a participatory design approach can be improved through shared understanding of participation roles and power distribution, appreciation for all participants' knowledge and time, conflict resolution, and flexibility by all parties. For participating individuals and organizations, it is essential to establish a strong relationship with end-users in order to develop products that satisfy their needs as well as empower disadvantaged people. Furthermore, for researchers and organization managers, it is fundamental to be equipped with critical thinking skills, introspection, organizational solidarity, customized outreach practices targeting to different participants, and adaptive tactics in response to funding uncertainties.

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Chapter 1: Introduction

While in a traditional design process, designers work predominantly alone or in an internal team, participatory design is an approach in which all stakeholders (e.g. end-users, researchers, designers, and developers) are actively involved in the design process (Dell’Era & Landoni, 2014). Influenced by the exhilarating days of social, political and civil right movements in the 1960s and 1970s and demands that people who are affected by a decision or an event should have opportunities to influence it (Hussain et al., 2012), methods for involving potential end-users as co-designers in development were introduced and pioneered in Europe in 1970s and especially in Scandinavia (Greenbaum & Kyng, 1991). Since then, participatory design has spread to many other parts of the world and become an established field of practice and research (Dalsgaard, 2012).

There are many benefits of participatory design approach. Generally, it helps with “clarification of goals, formulation of needs, initiating partnerships with different stakeholders, establishing mutual learning processes between participants, and managing stepwise implementation based on comprehensive evaluations” (Simonsen & Hertzum, 2012). Specifically, for participating individuals, through the integration of different thoughts, skills, resources and responsibilities in a development process, latent needs can be investigated and a fully co-creative process developed in which innovative ideas are generated at all levels (Sanders, 2002). In other words, participatory design becomes not only a process of integrating knowledge, but also an education and development of new knowledge (Holtzblatt, 1993). As for outcome of the design, it is more likely to be

successful when different voices are heard, understood and heeded in the design process (Robertson & Simonsen, 2012).

In particular, participatory design is often seen as having advantages in grassroots work with communities because disadvantaged groups, who are often marginalized and neglected, are invited to participate during several stages throughout the development process and their needs can be better understood (Arce, 2004). The strength of this approach is that it cuts across traditional boundaries between different professionals and cultures (Sanoff, 2007). However, this crosscutting nature can also become a challenge because differences in socio-cultural value systems make it hard for participants to share similar underlying knowledge to be able to participate at the same level. For example, people from cultures that have much stronger social hierarchal structures are not likely to share the same understanding of participation with people from societies that encourage democracy and equality, because “lower ranking members in a hierarchical society are not expected, though not formally prohibited, to publicly and openly express opinions” (Winschiers-Theophilus et al., 2010). Moreover, common participatory methods based on western communication structures with assumptions emerging from developed countries are incompatible in developing countries with cultural attitudes that vary across education and income level (Puri et al., 2004; Winschiers-Theophilus, 2006; Yasuoka & Sakurai, 2012). This incompatibility adds to the commonly-recognized difficulty of finding users willing to collaborate and preparing appropriate ways of involving and engaging them in participatory design activities (Robertson & Simonsen, 2012; Sanders et al., 2010).

Many researchers report the challenges to conduct participatory design projects in developing countries with different socio-cultural and socio-economic environments,

because of cultural biases and assumptions inherent in these methods (Clemmensen, 2011; Iivari & Iivari, 2011; Winschiers-Theophilus et al., 2010). Yet few studies address the challenges of doing participatory design projects in developed countries but with end-users coming from developing countries with different socio-cultural value systems. How can such a participatory design project be done with a collaboration between a nonprofit organization, a college student team and a university-based program? How are participatory design methods adapted to this scenario? What challenges do different participants face when being involved in the process? What preparations should managers and facilitators have when trying to achieve high project outcomes while being constrained by cultural differences and organizational challenges?

To address these questions, I present a project in which participatory design techniques were used in Sacramento, California to design a vegetable wash station for a 5-acre farm that enable refugees to grow produce to feed themselves as well as gain income by selling produce to local restaurants. There were three main stakeholders in this project: the International Refugee Committee (IRC) as managers; the student team (I use “we” in the thesis to refer to them) as researchers, designers and facilitators; and refugee farmers as end-users. As a member of the student team, I collaborate with the IRC staff, other students and refugee farmers to conduct a series of participatory design activities and report this project by using participant observation method. Based on the analysis, I present this thesis to inform scholars and practitioners on how to conduct participatory design projects that serve marginalized people in a developed country setting and how to prepare for dealing with possible challenges from different perspectives.

In Chapter 1, I introduce this project in details and specify my research components. In Chapter 2 and 3, I explain my methodology and describe the process of this project. I identify four main categories of factors that made this project fail to obtain initial goals:

- Deficiencies in the participatory design approach
- The situations of the refugee farmers
- The inexperience of the student team
- Limitations within the IRC organization

In the second part of this thesis, I describe the project's challenges and analyze their causes (Chapter 4) and provide recommendations (Chapter 5) in each of these categories. Finally, in Chapter 6, I conclude highlights and implications for future practices and studies.

1.1 Context and Background

The IRC is a nonprofit organization that “responds to the world’s worst humanitarian crises and helps people whose lives and livelihoods are shattered by conflict and disaster to survive, recover, and gain control of their future” (The IRC website, 2016). The IRC conducts its work at more than 40 countries and 29 US cities. Specifically, in Sacramento, CA, one of the programs is the New Roots, which offers small-scale farming opportunities for refugees who come from Bhutan. Those refugees are ethnically Napoli, but lived in Bhutan for generations and they keep their original culture and speak Napoli. They came to the States before they were forced to move from Bhutan to refugee camps in Nepal.

New Roots program has established a five-acre farm in West Sacramento and the farm land is divided into 50' x 50' plots, which are assigned to refugees as family units to grow produce. Given the land, refugees can plan and harvest on their own, which leads to nutritious food for their families. Additionally, the IRC collects their produce and sell it to

local restaurants to make extra income for those refugee farmers. As a part of the farm infrastructure, a vegetable wash station was needed to wash and clean produce after harvesting until it can be stored in the cold room and then transported to restaurants. This project was important and closely relevant to the New Roots program because it was an essential component of the IRC farm and also a start of the development of the program.

I was involved in this project because I took a class at D-Lab, which is a program at UC Davis that offers project-based courses and provides students opportunities to have hands-on experience through team working on a project that interests them most, with two or three teammates through the quarter. The goal of D-Lab is to build a global network of innovators to design and disseminate technologies that potentially and meaningfully improve the lives of people living in poverty (D-Lab website, 2016). This mission has been pursued through cooperation between D-Lab and different institutions as well as individuals, and the IRC was one of their collaborators. This collaboration was beneficial to both sides by offering D-Lab students chances to take on a real-world project and providing the IRC insights and inputs from college students. However, the cooperation didn't involve any financial sponsorship for this project, which was only funded from the IRC internal budget at the time we started our work.

The refugees had been waiting for the project to happen for almost two years since they had first heard about the New Roots program. They had been surveyed and interviewed by the IRC staff during that time. However, the slow process and delayed implementation of this project had made them lose interest and stop participating. As a consultant team, this was a precondition that we had to accept when we started our work on this project.

1.2 The Needs of Refugees

Having survived for years against incredible odds, many refugees are forced to flee conflict and persecution. They come to a destination country and step off the airplane with next to nothing. They continue struggling in poverty, speaking a different language, adapting to a new culture, securing a stable job and permanent housing. Especially for refugees who resettle in high-income countries, they often endure great physical and mental challenges during displacement and suffer continuing hardships after arrival (Fazel et al., 2012).

In a qualitative study, Amnesty International researchers conduct semi-structured interviews with 229 refugees settled in Greece individually or in groups, and find that some of their needs are either neglected or underappreciated (Amnesty International, 2016). Their needs vary from basic to higher ones, with basic ones are often recognized by policy makers and social service workers, while some higher-level needs don't receive enough attention. It should be acknowledged that some dilemmas follow when higher needs are not satisfied. For example, depression and stress-related symptoms are commonly found in refugees even though food and shelters are provided, particularly for refugees who have felt the bridge between cultures to be filled with formidable challenges with economic, social, and psychological obstacles (Markovic & Manderson, 2000; Nicassio, 1985). In turn, resettlement workers have encountered equally demanding challenges in developing and implementing services that meet diverse needs of refugees (Williams & Westermeyer, 1983). Since satisfying only basic level of needs doesn't fully solve their problems, resettlement should be a process that helps refugees gradually reestablish a feeling of control over their life (Colic-Peisker & Tibury, 2003).

Being aware of the challenges that refugees have encountered and the importance of meeting their diverse needs, the New Roots program set its goals as to help refugees establish ties to the strange land, obtain new skills, nourish themselves and their neighbors through urban farming and micro-enterprise training. Instead of providing refugees fish, this program prepares them to fish by training refugees through workshops, reinforcing their family network and other mechanisms of social supports by giving the land to plant and harvest, and facilitating their acculturation by providing opportunities of interacting with people from the IRC, schools, local restaurants and etc.

1.3 The Call for Saving Water

California is the U.S center of agricultural production (Cohen, 2002) and agriculture is an important sector in California's economy because the agriculture sector accounts for 2% of the state's GDP and employs around 3% of its total workforce (Danielle, 2015). It should be recognized that agriculture is the largest consumer of water (Cohen, 2002) and currently California is facing one of the most severe droughts on record. For the fifth consecutive year drought continues in many areas of the state, with limited drinking water supplies, diminished water for agriculture and habitat, and reducing level of groundwater (Kostyrko, 2016). It is urgent and indispensable to save water in every possible way. In 2016 California Governor Jerry Brown proclaimed, "Drought is becoming a regular occurrence and water conservation must be a part of our everyday life" (Office of Governor Edmund G. Brown, 2016).

Ironically, water rates in Sacramento are very low, with a gallon of water costing less than one penny (Sacramento County Water Agency, 2016). However, because of the urgency to save water and an executive order requiring this, the IRC was motivated to

incorporate water-saving technologies into the vegetable wash station when it proposed the project. The organization expected that optimizing water use could significantly reduce farm production costs and make agricultural enterprises financially and environmentally sustainable. In addition, since the IRC wanted to provide refugees opportunities to learn knowledge and skills about sustainable farming, the educational value of water-saving technologies would serve as a good example for the training. Finally, IRC expected that the demonstration value of such technologies would potentially assist it in getting more funding by demonstrating a sustainable component of the farm.

1.4 Initial Project Goals and My Research Purposes

In response to a variety of needs from refugees and the call for saving water, the general objective of this project was to apply participatory design methods to design a vegetable wash station incorporating water-saving technologies, during which refugees would be given opportunities to learn sustainable farming and interact with other people. Initially specific goals of this project included:

1. To help refugee farmers to learn about the principles of water efficiency, sustainability and green farming; to develop skills that can prepare them to secure a stable job and become independent individuals in the future.
2. To release their acculturative and resettlement stress by providing them opportunities to work with other refugees and people from different backgrounds; reinforce their family network and other mechanisms of social supports, facilitate their acculturation to tie to this strange land while maintain their own heritage.

3. To ensure refugees' needs for the vegetable wash station are considered and the final product is user-friendly and functioned well by integrating their knowledge and experience in the design, prototype, evaluation and construction stages.

4. To implement sustainable farming strategies and be environmental-friendly by saving water on the wash station, with another expectation that this demonstration value would assist with future funding applications.

5. To establish a steady working relationship with refugees as a foundation of engagement for other projects in the New Roots program and future expansion of the IRC's work in Sacramento.

Besides working as a member of the student team for this project, I, as an individual researcher, conducted my own research. The purposes of my study were:

1. To present a participatory design project that was conducted in a developed country but targeted to end-users who came from developing countries, with different socio-cultural values and socio-economic system.

2. To analyze multidisciplinary collaborations between different participants including a nonprofit organization, a college student team and a university-based program; to inform challenges and provide recommendations for researchers and practitioners.

3. To encourage more future studies on participatory design that conducts in developed countries with end-users who are marginalized people, such as refugees, people with color, low-income people and etc.

Chapter 2: Methodology

2.1 Participant Observation

While we applied a participatory design approach as a team, I individually wrote this paper to document and evaluate the project by using participant observation methodology. Participant observation is a qualitative method where researchers act as primary instruments for data collection and analysis (Creswell, 2003). This method requires researchers to participate in a project, during which observers gather data through observations, conversations with other participants as well as informal interviews with key participants (Jorgensen, 1989). By taking field notes, photographic images and some other ways, researchers document and record the process through recording of activities, conversations and experience (Van Maanen, 1995).

Participation observation is a premium method for investigation, documentation and evaluation and it is exceptional for studying processes, interactions among people, organizations and events (Jorgensen, 1989), because through participation it is possible to observe and gather information that is often inaccessible from a nonparticipating external observer (Iacono et al., 2009). As an active participant, I have had direct access to not only the observable environment and results, but also experiences, thoughts, feelings and activities of participants. In addition, since I was one of the participants that influenced this project, my own experience was also a source of data that could be collected. Having actively and fully participated, I am confident that the data I collected is genuine and first-hand without distortion.

There are two main problems in project analysis and evaluation. First, evaluation of some projects tends to be conducted only by outsiders, without asking about participants'

own insights (McDuff, 2001). This gap in perspectives is a source of tension and distrust between participants and organizers, and emphasis of the analysis and recommendations for improvement can be misplaced without reference to such empirical understanding. Second, with too much attention to quantitative aspects of outcomes, qualitative data is often neglected or underappreciated (Bamberger et al., 2010). For instance, when evaluating outcomes of a community event, feedback from participants on how they feel about the activity and how it might impact their life are more meaningful and important than the number of visitors who attend the event. However, from my past experiences, evaluators often count numbers and I assume one of the reasons is that it's difficult to collect data only at the end of an event, because of non-repeatability and non-consistency of the event as well as time constraints.

Participant observation can be a solution to the two problems mentioned above. Having been involved in a project, researchers who analyze and evaluate the project are no more outsiders but active insider. With a whole process to engage other participants, researchers can take their experiences, insights, feelings and perspectives. Moreover, participant observation is a method designed for gathering qualitative data and especially this data is recorded on a daily basis with a fresh memory, therefore much authentic data can be collected and time can be saved, compared with just collecting data at the end of a project.

2.2 Participatory Design Methods

While I introduced the definition, history, benefits and challenges of participatory design in the introduction section, I will discuss its application in this section by providing some standard methods to explain how participatory design is conducted. There are three

basic stages in a participatory design research, with methods fallen into each stage (Spinuzzi, 2005) and I will explain them in a way that fits this project.

- Stage 1: Initial exploration of work

Stakeholders such as researchers, designers, managers take efforts to recruit end-users to involve in the design project. After gaining end-users' willingness to collaborate, all participants meet and familiarize themselves with the project goals and the ways how they work together, at the same time, they discuss project procedures, timelines, teamwork and other aspects of a project. Methods used in this stage draw from ethnographic methods such as observations, interviews, walkthroughs and organizational visits, with observations and interviews are used most often (Wall & Mosher, 1994).

- Stage 2: Discovery processes

This is where all participants engagingly interact to frame and analyze the project, during which they understand perspectives from each stakeholder and needs of end-users, and prioritize design attributes, before moving on to further analysis and brainstorming ideas. Selection of design proposals is based on the evaluative matrix with specific design criteria. Methods used during this stage include organizational toolkits (Bødker et al., 1987; Ehn & Sjögren 1991; Tudor et al., 1993), future workshops (Bertelsen, 1996; Bødker et al., 1993), and workflow models and interpretation sessions (Beyer & Holtzblatt, 1998).

- Stage 3: Prototyping

In this stage, designers and end-users iteratively shape artifacts that transfer from the conceptual design envisioned in stage 2. By this iterative co-exploration, design concepts can be improved and developed to be better applied in the field. Prototyping can be conducted on site or in a lab by involving more users. Techniques used for prototyping are

mockups (Bødker et al., 1987; Ehn, 1989; Ehn & Kyng 1991), cooperative prototyping (Bødker & Grønbæk, 1991; Grønbæk & Mogensen, 1994), and paper prototyping (Novick, 2000).

These methods are based on three main assumptions: equality, open discussion and commitments for participation (Yasuoka & Sakurai, 2012), which emerging from a utopia that in workspaces and communities that are democratic, participants who are highly literate have consistent interest to participate in a setting where there is a reasonable technological infrastructure present (Puri et al., 2004). However, it is unrealistic to make any of these assumptions in a real-world context and those methods have to be adapted to a specific project depending on the situation. Hence, when we conducted this participatory design project, we selectively chose these methods to apply.

2.3 Project Sites and Participants

As I used participant observation as my research method, all the sites I have been to and all the people I have talked to, while I was working on the project, have become subjects of my investigation. Combining these subjects gives me a full range of information and data, which would otherwise be neglected if participant observation was not used.

Main research sites include the D-Lab classroom, the Student Farm Shop at UC Davis, and the IRC farm at West Sacramento. The D-Lab classroom was where our team learned theories and case studies, brainstormed design ideas, updated the project with mentors, as well as a meeting place for our team. The Student Farm Shop was a nontraditional classroom, where we prototyped our design proposals. The shop contained tools essential for prototyping and we received instructions from D-Lab mentors to guarantee safety use of tools.

The IRC leased the 5-acre land located at the West Sacramento specifically to establish a farm for the New Roots program. And at the time when we stepped into this project, the farm was still an open land and our work was contributing to the farm construction. This farm land was divided into many 50'x50' plots (photo 1) and the units would be assigned to refugees by families. The IRC farm had already secured two 20'x8' converted shipping containers, as structures for the cold storage. A vegetable wash station would be built between the two containers and the wash station should fit into the space size of 20'x19' (photo 2).

Photo 1. Overlook of the IRC farm



Photo 2. Location of the vegetable wash station



This project involved various participants: the IRC staff who proposed and managed this project, the D-Lab student team constituted by students from multi disciplines, the D-Lab mentors that included researchers from the university and practitioners from various fields, and refugee farmers as end-users of the vegetable wash station.

Three main IRC staff that we worked with were the New Roots program manager, the program coordinator and the translator. The program coordinator was our contact person

in the IRC because he managed this project directly. He answered our questions, met with us for project updates and gave us feedback. He had worked on the farm every morning till 1 pm since March, supervising projects on the farm and farming with refugees. The program manager did not work with us directly and only when it came to the issues related to funding and time, he joined the conversation by talking with the coordinator. He also reviewed our project report and gave us feedback by emails or phone calls. The translator helped communications between refugees and us, because for most refugees they don't understand or speak English while others' English proficiency is low. The translator often farmed with refugees and every time when we visited the farm, he was there to help us talking with refugees.

Two instructors in the D-Lab class gave our student team advice on how to approach problems, make progress and adapt to the change. Through the quarter, we met in the class twice a week and updated our project with the D-Lab instructors and planned our next steps based on their feedback. Besides weekly report, we gave two presentations to a panel of experts, who came from different fields such as design, farming and engineering. Thanks to participants from D-Lab, we had received helpful guidance and mentoring. Besides, D-Lab prepared each team \$200 to spend on prototyping and provided students tools and instructions for the prototyping.

There were two graduate students and two undergraduate students in the student team. One graduate student came from International Agriculture Development (IAD) and I came from Community Development, with two undergraduate students from economics and design major respectively. Because of our different background, we complemented each other well when working as a team. The work was distributed based on everyone's

qualifications and strengths. For example, the IAD graduate student was good at coordinating and design drawing, therefore she was responsible for turning design ideas into drawings and coordinating with different groups. I was good at reporting, outreach, project management and financing, so my responsibility was to report the project to D-Lab mentors and the IRC staff, outreach to refugee farmers, as well as manage the project and funding. The economics student had already interned for the IRC, so she communicated with the IRC staff by asking questions and receiving their feedback, and she also helped with project financing. The design student was an expert at using tools and constructing, so he took the most responsibility in prototyping. In addition, the other graduate student and I worked together and wrote two proposals to apply for funding from UC Davis Blum Center.

Last but not the least, refugee farmers were expected to be involved by participating activities and communicating frequently with the IRC staff and the student team. Through diverse interactions, a co-learning environment could be developed to encourage their input by ensuring that they understand their roles as not only end users of the design product but also active participants during the design process. However, considering the special precondition that refugee farmers lost interest because of the long waiting, other participants agreed that some work need to be done on our own in the beginning to encourage their re-collaboration. This agreement was based on the expectation that the willingness of refugee famers to participate could be reactivated after they recognized the start and quick progress of this project.

2.4 My Position in This Project

Having had four-years study experience in environmental science, I was interested in doing a project that relates to protecting environment and saving natural resources. For

example, when I was an undergraduate student, I worked on a research project to study aquatic systems with the aim of cleaning water. When I first heard about this project, the water-saving component of this project attracted my attention. The current severe drought condition of California added to the importance of saving water and made this project more intriguing to me. When the IRC staff and the student team decided to introduce participatory design approach in order to benefit refugees better, I connected it to my personal experience. I was born in China and lived there until I was 23 and came to the United States, experiencing for the first-time travel abroad without knowing anyone. I had a hard time during the transitional period with difficulties from many aspects. Therefore, when talking about challenges that those refugees encountered, I understood how bad their feelings could be. At the same time, I was also aware that their situations were worse than mine and I truly wanted to help them with my work. Because of these interrelated theoretical and personal layers, I became enthusiastic about this project and expected that my participation could contribute to the goal of saving water as well as serving refugees.

The fact that many stakeholders participated in this project has made it important but challenging to deal with my positionality. On one hand, I was one team member and took responsibilities to coordinate and conduct outreach. On the other hand, I was a student researcher using participant observation method to record this project and write a thesis. One concern associated with coordination and outreach was communication; for an international student who has been here for only two years, cultural and language differences may become challenges. However, there were also some opportunities because of international perspectives that I could bring to the project.

Chapter 3: Reviews of the Project Process

3.1 Initial Stages and Designs

After understanding the participatory design methods and the precondition that we needed to do work on our own first to encourage refugee farmers' collaboration (see Chapter 2.3), we started the four-lens analysis, which was a pre-design analysis on technical, social, environmental and financial components in a project.

Technical standards require design ideas be innovative to improve water-use efficiency, while the conceptual design can be prototyped and validated within D-Lab. Adjustments were accepted to make it more feasible to be put into practice, with available resources that D-Lab and the New Roots farm could offer. From the social perspective, technologies should be understood and the structured wash station should be functioned well by refugee farmers. The design process should benefit the refugee community by educating them about sustainable farming strategies, strengthening their social interactions and producing successful final product. As for environmental aspect, water-saving characteristics of the wash station should contribute to the mission of the IRC farm to be sustainable and environmental friendly. Finally, as one of the biggest concerns in any project, finance was essential to be considered. The IRC had a \$2,000 budget available for this project and this amount of money could only afford material cost for the basic structure and may not even enough for that, let alone community engagement and technology implementation. Because of this, we wrote proposals targeted to these two components to apply for funding from UC Davis Blum Center.

After project framing and analysis, we started designing water-saving technologies. We did research on the water flow in a standard vegetable wash station to explore where

water comes and goes, in order to determine in which step we could reuse water. There were 3 steps: the first step was to remove dirt, earth and organic matter from produce in a water tank; the second step was a disinfection process to kill bacteria by using chlorine bleach, and the final step was to rinse produce (Fig. 1). Based on the water flow mode, we brainstormed many possible technologies to save water (see Appendix I). When we had the brainstorming, not only did we think about recycling water within the three steps, but also water flowing into and out of the system. For example, some technologies that can help decreasing amount of faucet water into the veggie-cleaning process and some technologies that can dispose of water after it has been recycled in the system to prevent environmental pollution.

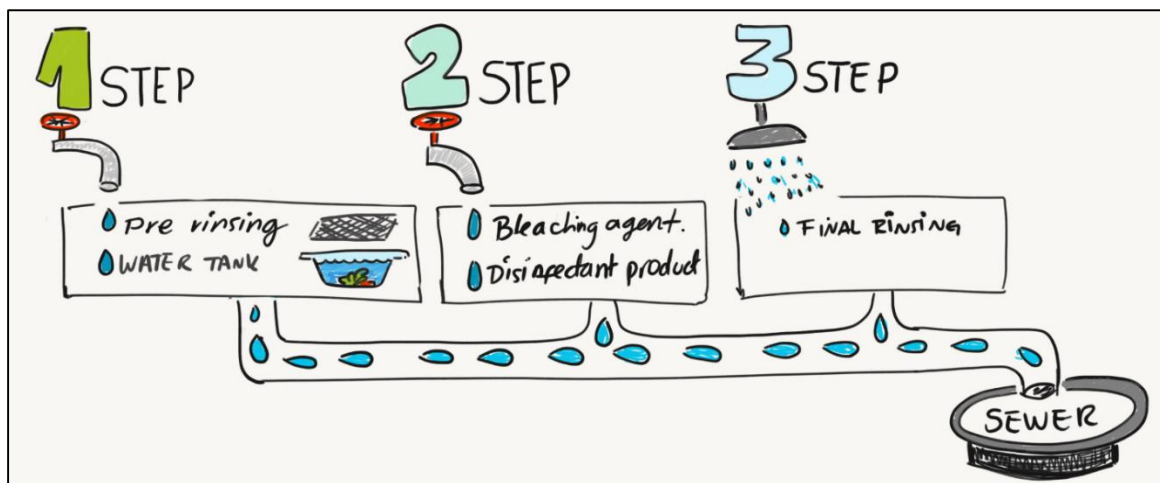


Fig. 1 Water Flow in a Vegetable Wash Station

Afterwards, we came up with an evaluative matrix with specific design criteria (table I), with the aim to select suitable ones from many technologies in our brainstorming. We drew these criteria from the wash station attributes and labelled them as qualitative or quantitative or both. Accordingly, we identified testing procedures with target value and metric one by one. This comprehensive table provided us step-by-step guidance to evaluate

our brainstormed ideas and helped us to choose technologies that could be applied in this project.

Table I. Evaluative Matrix

Criteria		Qualitative/ Quantitative	Testing Procedure	Target Value	Metric
Water-saving		Quantitative	Compare a vegetable wash station with specific technology with traditional one without any water-saving technology, calculate how much water can be saved	Save > 20%	percentage
Comfortable to use		Quantitative	Scale	<30	lbs.
		Qualitative	Focus group reporting on ability to pick it up with ease	4/5	People think it's "light" based on the function
Easy to build		Quantitative	Simple steps to assemble product	Take less than 5 hours to build, with 5 amateurs	Number of parts required, steps of construction process and time required for construction
Cost	Construction cost	Quantitative	Utilize as many resources as we already have and purchase other parts to build product. Because of the free labor that we have, construction cost almost equals to material cost	One technology cost < 300	\$
Efficient	Function cost	Quantitative	Maintenance cost associated with use	Annual cost < 300	\$
Transparent technologies		Qualitative	Have unfamiliar users to work with prototype and see if he/she understands how it functions	4/5	Accessible to people coming from various fields with different skills
Durable		Quantitative	Life span of every part	≈ 5	Years

By using the evaluative matrix, we identified four technologies and they were a rainwater harvest, a mulch basin, a tank-basket filter and an activated bio-charcoal filter. The first two were inspired by existing technologies and the other two were designed by us. A rainwater harvest could save fresh water by capturing, infiltrating and utilizing rainwater as a supplemental source to wash vegetables (Krishna et al., 2005). Comparatively, a mulch basin could reuse water flowing out of the system, and it was easier and cheaper to build. A mulch was a material spread on top of the soil to conserve moisture and a basin was the container to contain greywater. This practice drained out of greywater without sewer to irrigate landscape, to improve soil structure by increasing its water-holding capacity, and to save fresh water and purify wastewater without energy or chemicals, but through the biological action in the top 5 inches of the soil (Ludwig, 2006). A tank-basket filter could reuse water within the system by recycling water during the first step. By putting a basket of veggies to pre-wash and leaving the earth, dirt and organic matter on the screen, the water could be used more times by cleaning the screen (Fig 2). The last technology was an activated bio-charcoal filter, which also saved water within the system by recycling water from the final rinsing step and using it for disinfection step. Water from rinsing step was not very dirty and with a further bio-charcoal cleaning process, it could become clean enough for the second step (Fig. 3).

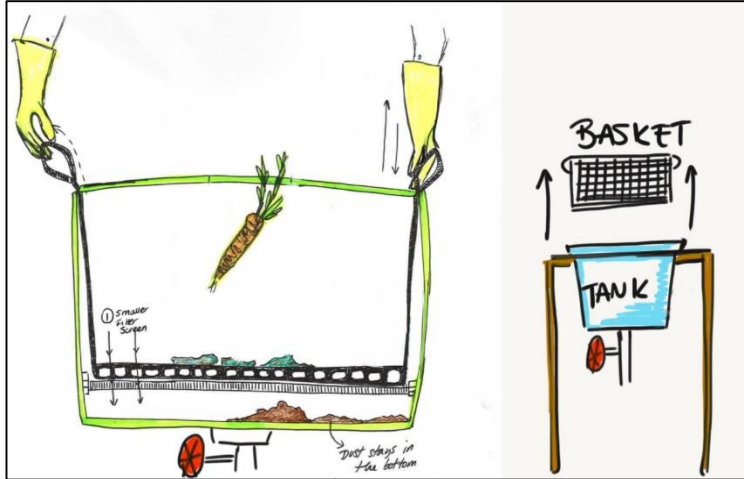


Fig 2. Tank-Basket Filter Model

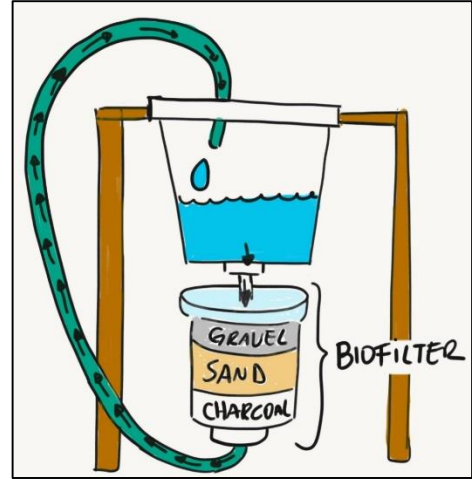


Fig. 3 Bio-charcoal Filter Model

We conducted these processes, which included project framing, brainstorming and technology identification, through collaborative work with the IRC staff and D-Lab mentors as well as informal conversations with refugee farmers. We presented the vision of the vegetable wash station with four technologies applied (Fig. 4) in D-Lab class and we were excited to move on to prototyping this conceptual design.

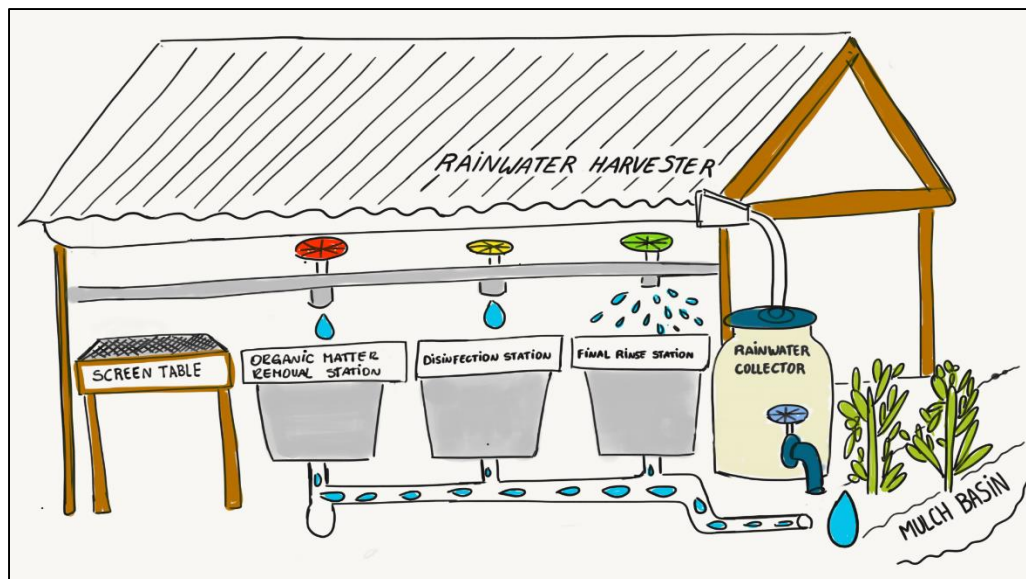


Fig.4 Vegetable Wash Station with Four Water-saving Technologies

3.2 Twists and Turns

However, putting ideas into practice is far more complicated than proposing them. Our first twist came when we went to the UC Davis Student Farm to identify the most suitable screen size for a tank-basket filter. When we visited the field, we realized that farms do not use much water washing vegetables after all. The Student Farm was 20 acres, 4 times size of the IRC farm, but it normally used only one big tank of water per harvesting day. From the size of the water tank, we found out that only about 15 gallons of water was needed per day (see Appendix II). Even for harvesting day with a heavier load, they only used two tanks of water. This conclusion was based on the fact of harvesting all year round for the past few years, in a 20-acre farm with rich production and heavy harvesting. We realized that less water would be used in the IRC farm, which was only 5 acres with planting was just in the beginning stage. In other words, saving water was not the real need of this project, because any water-saving designs would overcomplicate the system while achieving little.

Our response was very quick: we found out the primary incentive of proposing water-saving concept was because it contributed to the goals of the IRC farm to be sustainable and educational, and we recognized saving water was not the only way to achieve these goals. As a result, we shifted the technology goal to be environmental friendly and we designed a non-bleach system for the wash station (Fig. 5). This system could disinfect vegetables without bleach, which has been found to pose a significant risk to environment (Beach, 2015). We presented this change in the D-Lab class and received positive feedback from D-Lab instructors as well as a panel of experts.

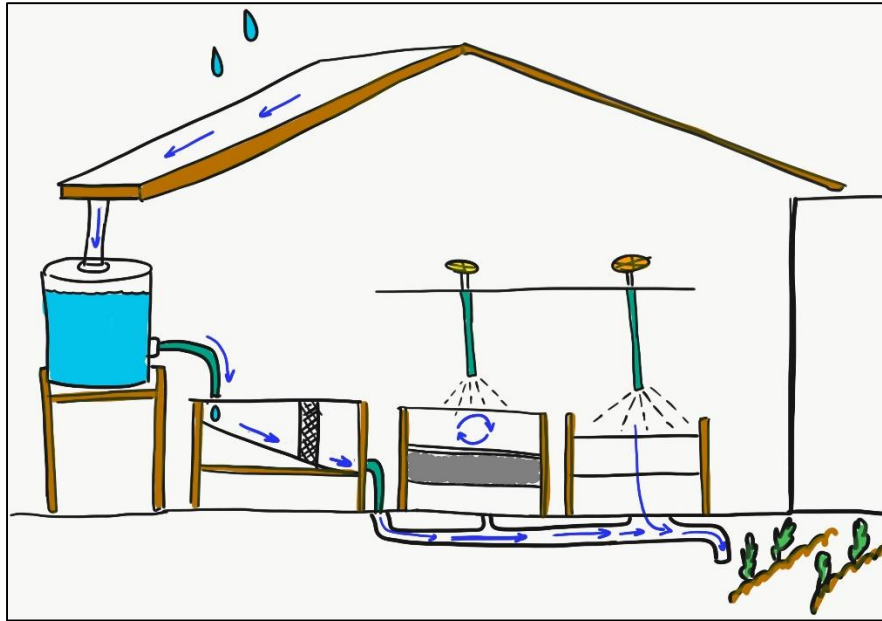


Fig. 5 Non-bleach Wash Station System

When we updated this finding with our client, the second twist came. During that meeting, we presented a list of design attributes to the IRC staff and let them prioritize it. Their priorities (from the most to the least important) were that the wash station be easy and fast to use, low cost (including construction and function cost), with high demonstration value, and finally water-efficient and low environmental impact. We were surprised because this sequence of priorities became inconsistent with the initial project goals (see Chapter 1.4). However, we had to think over alternatives to push this project forward.

Since saving water or being environmental-friendly were not important anymore, we tried to think from the big scale—layout design, to achieve their “new” priority of being easy and fast for farmers to use. Based on research about layout design and conversations with some refugee farmers, we proposed two drafts of layout designs (Fig.6). In the designs, necessary components of a standard wash station (e.g. tank, dry rack, sort and

pack table) were connected as a whole system and were organized in a way which would lead to a quick workflow. Other than that, we included a “waiting table” for people’s convenience and another “record table” to weigh produce and keep record, which was beneficial for the micro-business on the farm. More importantly, with respect to users’ diverse needs, we included a rest area. This rest area, with folding chairs and a hand-washing station, would provide people chances to clean hands, eat and drink to refresh them during work, sit down and connect with other people. Moreover, we prepared a step-by-step manual for construction of the field hand-washing station, which could be built in 10 easy steps for under \$20 (Schermann & Randerson, 2011).

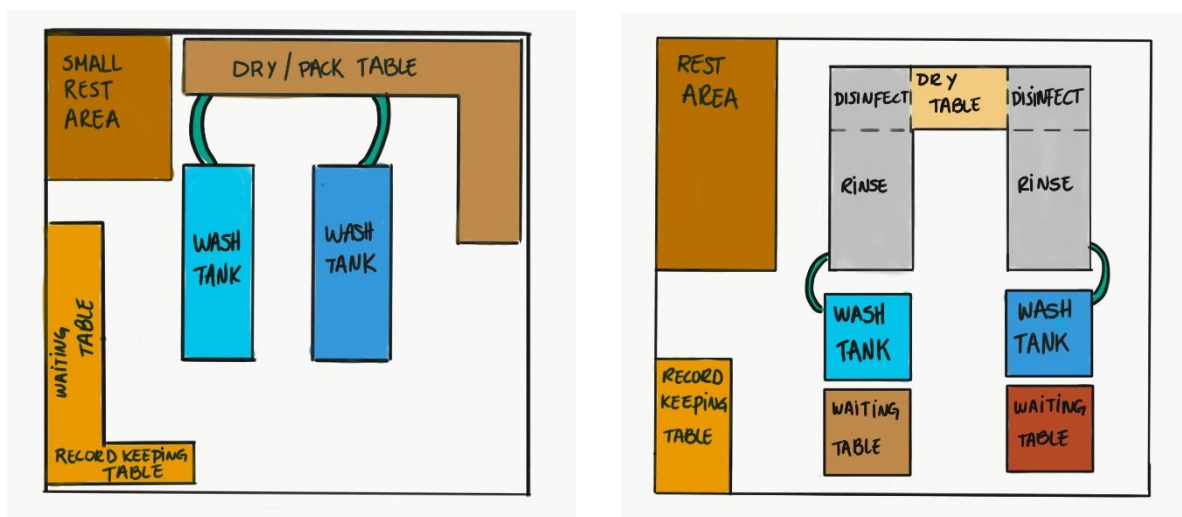


Fig. 6 Top view of layout design I and II

With the new design drafts, we met with the IRC program coordinator and introduced him the layout design concepts. In the meanwhile, we reminded him it was the time to involve refugee farmers formally and let them give opinions in terms of the final design decisions. For the design drafts, while he accepted the idea of building a hand-washing station on site (and it’s a sanitary requirement for a vegetable wash station), the proposals could not be applied because it would be expensive to include many components in the

layout. As for the engagement, he told me the IRC didn't have a plan for it because of the time limitation.

At that point, this project had changed considerably, from a dream plan to a passive progress constrained by money and time. As participants in the play, we understand the difficulties for the IRC to do a participatory design and we worked harder with persistence. With the fact that the wash station followed a more conventional design, we created the layout design with an easy and convenient structure, which was called I-shape design (Fig 7). In the middle of the structure, there were 2 three compartment utility sinks, surrounded by dry rack, sort and pack tables. The stainless steel sinks matched three steps of the water flow and they could finish all the cleaning duties. A customized built-in dry rack system was designed to hold vegetables before and after washing. The I-shape design allowed for maximized workspace for people to wash produce at the same time and also could be constructed at a low cost that the IRC could afford. The IRC staff approved this design proposal and we moved to next step of prototyping.

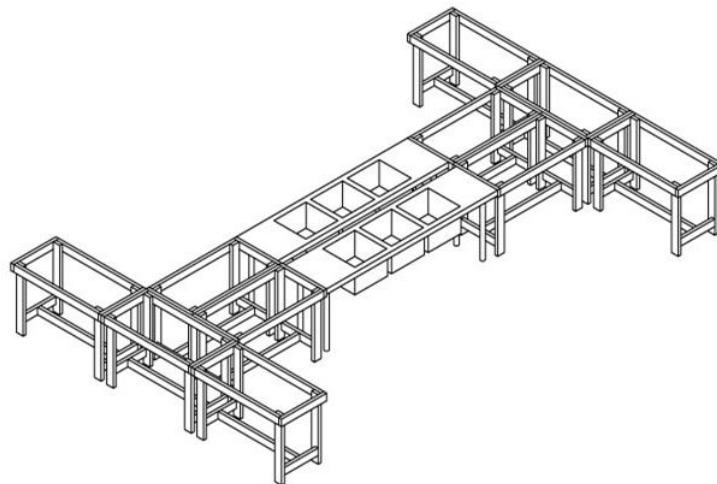


Fig.7 I-shape Layout Design

3.3 Prototype of Dry Racks with Two Materials

It's very convenient to buy sinks from stores at a reasonable price (photo 3) and the variable for our design was material of the dry racks and tables. From research we found out they could be built with either PVC or wood (Grundberg, 2011; Hadad, 2015), depending on different needs. Therefore, we chose to prototype dry racks using both materials and evaluate their strength and weakness. We bought materials from ACE and Home Depot and conducted prototyping at the Student Farm Shop, under the supervision and guidance of D-Lab instructors.

Photo 3. Stainless Steel Three Compartment Commercial Sink



In order to control variables to evaluate materials only, the structure of both dry racks was the same (Photos 4). When we constructed the prototypes, we recorded the construction process to be a reference for future field construction. We also kept track of the cost: the total cost of materials were \$163, with PVC table cost \$74 and wood table cost \$66.

Photos 4. Prototypes of Dry Racks



Using a series of criteria about the materials, we made a decision matrix to evaluate our prototypes (Table II). The first row of the table was criteria about function and quality of materials, and decision-makers may add more criteria or delete some that were not important to them. Each criterion would be weighed on a scale of 1-5, with 5 meant the most important and 1 meant the least important. Weight was presented in the second row, and these numbers should be written with consent from different stakeholders who would make the decision together. The last two rows were the subjects being evaluated. We rated 1 if a subject won the other one under a criterion and 0 if lost, or gave both subjects 1 if the

differences under one criterion were small. Then we multiplied this rating by the weight and finally added all the numbers together to make it as total benefits, which were in the green patterns in Table II. From the example shown here, wood was slightly better than PVC.

We provided this approach to the IRC staff to help them understand how a decision could be made in a scientific way and this tool turned out to be very helpful for them to identify what should be built and which material should be used. They finally chose wood to build the structure.

Table II. Decision Matrix

Criteria	Water Resistance	Sanitation	Stability	Cost	Durability	Weight Support	Total benefit
Weight (1-5)	2	3	4	4	1	5	
PVC	1 × 2	1 × 3	1 × 4	1 × 4	0 × 1	0 × 5	13
Wood	0 × 3	0 × 3	1 × 4	1 × 4	1 × 1	1 × 5	14

3.4 Construction of the Field Vegetable Wash Station

After design, research and prototype processes, through collaboration between the student team, the IRC staff, D-Lab mentors and refugee farmers, we came up with a design plan and moved into the construction stage. By that time, we also heard from UC Blum Center that we had received the funding, which was spent on the last phrase of this project. One student team member and many refugee farmers were involved in the final process to help build the structure over the summer.

The field construction went well (see Appendix III) and the vegetable wash station was fully built with sinks and tables (Photo 5). The screens on the dry rack were stainless steel because they were food-grade, long-lasting and resistant to rust. Sinks were plumbed and the PVC pipes were used to drain out water to irrigate the landscape, as we maintained one technique of a mulch basin.

This participatory design project lasted for about 6 months and was done with an affordable and functional vegetable wash station for the IRC farm.

Photo 5. Constructed Vegetable Wash Station



Chapter 4: Reflection on the Project

Taking a retrospective view of the project, I found out a variety of strengths that contributed to both developments of participating individuals and outcomes of this project. The first strength of this project was the high-level goals, with a comprehensive consideration to satisfy refugees' diverse needs from the humanity concern and to save water from the environmental concern. This consideration, which established the tone of this project, was based on in-depth learning about refugees and environment, and it made the project as amazing and ambitious as "a dream plan". While goals were not often achieved fully at the end, this high standard set at the beginning could motivate people to participate and stimulate potentials of participants.

Second, the cross-border collaboration provided this project extensive inputs from various participants. This engaging collaboration resulted in the combination and supplement of different knowledge and qualifications, which strengthened this project. For example, as for the student team, we were passionate about this project and we took initiatives to have weekly in-group meetings and meetings with the IRC staff as well as weekly visit to refugee farmers. We took efforts to have thorough research on technologies and layout, though most of them were not applied eventually. We worked persistently to solve problems when confronted with challenges. As for the D-Lab mentors, they were helpful and responsible for teaching us design tools (e.g. four-lens analysis in project farming, evaluative matrix and decision matrix) and supervising the prototyping at the Student Farm Shop for our safety. They also invited practitioners and experts from other fields to review our presentations to enrich the pool of inputs. As for refugee farmers, they supported our work by talking with us when we reached out to them and they also helped

with the field construction. Regarding the IRC staff, their willingness to support and responsive working style motivated our teamwork and made this collaboration engaging.

Finally, our attention to finance was a strength that worth to keep. We included construction cost and function cost in our evaluative matrix at the beginning and we recorded our expense in details when we did the prototyping. Moreover, as volunteers, two graduate students including me had spent extensive efforts and time to write proposals to apply for the funding from the Blum Center. This work was neither a requirement from the D-Lab class nor a request from the IRC staff. It was rewarding that our diligent work led to additional funding for this project and we continued being volunteers after that.

4.1 Challenges of Participatory Design Approach

From a general perspective, there are some challenges within the participatory design approach itself. Like I mentioned earlier in this thesis, challenges were found in previous studies: not same level understanding of participation because of difference in socio-cultural value system, incompatibility of participatory design methods in developing countries, difficulty of finding users willing to collaborate and maintain the participation (Chapter 1), and feasibility of three assumptions (e.g. equality, open discussion and participation commitment) under this approach in a real-world context (Chapter 2.2). There are also some identified ones from other studies: challenges of obtaining appropriate conditions for implementation; managing stepwise processes; coordinating a multitude of stakeholders; synthesizing multiple streams of knowledge; and conducting realistic prototyping (Dalsgaard, 2012; Simonsen & Hertzum, 2012). However, some challenges emerged from this project specifically and I will take a deeper look at each one.

- Participation difficulties

Many articles explain “participation” as a concept related to “mutual learning”. For example, Robertson and Simonsen (2012) identify “participation” in participatory design as to investigate, understand, develop and support mutual learning during the process, and other studies claim that iterative and two-way learning between participants should be stressed in any philosophy of participation (Chase et al., 2004; Lynam et al., 2007; Johnson et al., 2004). While the mutual learning can explain participation, it is just a component or purpose of participation and I argue that a requisite for any participation is the relationship building.

Relationship to refugees

At one study in South Africa, India, and Mozambique, Puri et al. (2004) have to take different approaches to foster participation. In this project, we should have done more to encourage refugees’ participation. At the very beginning, refugees were interested and engaged to help the IRC staff propose this project. As it took two years for the project actually got started and they lost their interest, the IRC staff and we didn’t expect them to participate and just moved this project forward on our own. However, we could still apply some strategies to try to involve them, rather than only assumed that they would not participate willingly without trying. Besides, the time that participants voluntarily invest in the process needs to be highly valued (Reed, 2008), so does their knowledge. Those refugees were farmers back in their own countries and they have farming experience, just like Sanders (2006) argues, “all people are creative, but they need to have the opportunity to immerse themselves in thinking about the problem, to learn about the creative process, and be given the tools with which to express ideas”. Nevertheless, in this project, refugee farmers were not given many chances to be educated about how to participate in the

design and prototyping processes, because of the time and funding constraints. The long waiting along with time and knowledge being underappreciated, had altogether hindered the building of trust and relationship to refugees.

Relationship between the student team and the IRC staff

The IRC staff and we worked closely and had weekly meetings, however, when they had changed their priorities of building the wash station, they should have informed us in time since this change was substantial and influenced almost all stages, with focusing on sustainability versus simplicity of a system was a huge difference. This absence of trust is known to be harmful for a participatory design project (Reed, 2008), especially in a close working relationship like this project.

In conclusion, participation inherently lies in the foundation of respect, value and trust between all involved people, regardless of culture, language and background. While differences in culture and values could explain participation difficulty, I took a further step and found out it was those innermost qualities within human that matter more. That is to say, participation is not simply mutual learning on knowledge, skills or design perspectives, moreover, it is a shared understanding of respecting and trusting each other as the fundamental part of the collaboration.

- Conflict

Conflict is a challenge for any participatory project. Though in one participatory design in Scandinavia, conflicts and contradictions are regarded as resources in design (Gregory, 2003), many other people still try to survive from conflicts in order to be efficient and effective in the long run (Bødker, 1996; Kensing & Blomberg, 1998). In this project, while we had overlapping perspectives for building the wash station, our focuses and interests

were conflicting. Through this process, the IRC was more concerned about the cost, refugee farmers were more interested in an accessible and functional system, while students as the designers of this wash station, were more passionate about applying technologies to make it environmental friendly and sustainable. This conflict resulted from different background and position that every participant had and this conflict remained to impact the decision-making processes.

- Power dynamics

One of the characteristics in participatory design is the ambition that users should take part in all types of decisions and be given a voice and the power to participate in the decision-making (Bratteteig & Wagner, 2012), which means in this case the IRC should share their decision-making power with students and more importantly with end-users, and students and refugees should accept to share the power and take corresponding responsibilities. However, like Bjerknes and Bratteteig (1988) acknowledged at an early time, it can be both difficult to give away power and accept the power. When the IRC staff explained they could not involve refugee farmers formally at that time because of serious time constraints, or when they refused our recommendations because of limited funding resources, they may did not want to give away the decision power to other stakeholders. On the other hand, refugee farmers did not feel comfortable and confident to take the power to give opinions, as it was shown in many conversations with them. As a result, the power dynamics in this project was rigid because the IRC took the lead in making decisions.

- Adaptability and Flexibility

Lastly, as “surprises” could happen in any project with any experienced practitioners, being adaptable and flexible is essential. Gonsalves et al. (2005) point out that a

researcher's capacity of adaptability and flexibility influence how a research project will actually be done. Like Yasuoka and Sakurai (2012) attribute adaptability to their success in introducing the participatory design approach to a socio-culturally different society, I conclude that our adaptability and flexibility help this project proceed after many twists. However, it is a challenge for students, who act as facilitators, designers and researchers during the process, to be adaptable, upon other indispensable qualities such as skills and experience with community participation and understanding the social dimension of the project, with limited resources and serious time constraints.

4.2 Passive Participation from Refugee Farmers

Key principles of the participatory design approach include an active involvement of users and clear understanding of their needs (Maguire, 2001). Nevertheless, in this project, the refugee farmers, who were end users of the wash station, did not participate actively in the process. Those refugees were friendly and nice people as well as hard workers, but what made them become passive participants in this process? Besides the objective aspect that they lost interest to participate because of the long waiting, I will analyze this challenge in a socio-psychological lens.

As the project progressed, refugees started to check in and planted on their land, but still, they were reluctant to talk with us. Sometimes when we approached them with the translator, they would talk with us for a while, but it seldom lasted long enough before we could get into many questions about designs. This reluctance to communicate was associated with the language difference. In a simple interpretation, not sharing the same language made it inconvenient to talk and discouraged communication. But when taking an in-depth analysis, I found out a series of cause-and-effect behind it.

A study reports that limited English proficiency has had a negative impact on people's ability of communication (Cristancho et al., 2008). Likewise, in another study, 67 participants unanimously describe the primary problem affecting their communication is the language difficulty (Watkins et al., 2012). For people who don't understand or speak English, when being put into an English-speaking context, they tend to have a sense of anxiety, even for those who are quite sociable with their mother language, because they are feeling lost in control of the communicative situation with a different language (Horwitz et al., 1986). Even worse, this foreign language anxiety may result to communication apprehension, which is conceptualized as "an individual's level of fear or anxiety associated with either real or anticipated communication with another person or persons" (McCroskey, 1977). The inability to understand others and being understood may also cause them to have negative self-perceptions (MacIntyre & Gardner, 1989). Because of these reasons, refugees' limited efficiency in English made them unwilling to talk with us who speak a foreign language, even with help of the translator.

I mentioned that refugee farmers did not feel confident to take the power to give their voice (Chapter 4.1), and they were not feeling comfortable to talk about something they were not familiar with, such as designs. While it is true that cultural and class difference could explain this (Winschiers-Theophilus et al., 2010), I assume that another important subjective factor is that they do not feel they are effective to share their voice. One quote from a refugee's speaking "I don't even know how to decide my life; how can I decide other things" supported my assumption. This is a behavior of low self-esteem, which is "a very unpleasant state that is associated with depression and the feelings that they are ineffective and not in control of their lives" (Baumeister et al., 2003).

My further study on causes of their low self-esteem is aimed at helping readers to know and understand refugees more fully. At an early time, Harter (1993, 1999) observes that external evaluations and changes in the environment such as immigrating to a new country can influence one's self-esteem. Ritsner et al. (2001) explain it is the loss of professional status and social prestige that prompts low self-esteem in immigrants. However, the situation for refugees in this project was worse: those refugees previously didn't possess social prestige and then were settled in the United States, a high-income developed country. This large discrepancy between their life conditions versus those of people in the new country may decrease their self-esteem even more. Other researchers have identified discrimination and stress as causes of low self-esteem (Diaz et al., 2001; Rivas-Drake et al., 2008). Extensive work has demonstrated discrimination negatively affects self-esteem among minority groups across the regions over the time (Greene et al., 2006; Swim et al., 2001; Verkuyten, 1998). Similar to discrimination, stress is another cause of low self-esteem. For refugees, those stresses come from racism-related stress ((Lee, 2005; Liang & Fassinger, 2008), acculturative stress (Gil et al., 1994), resettlement stress such as unemployment and language difficulties (Beiser & Hou, 2006), ethnic identification (Noh et al., 1999) or even post-traumatic stress (Silove et al., 1998). More or less, refugees who we interacted have experienced some stress and potentially discrimination to some degree, and those factors have led to their low self-esteem.

Because of all these struggles that refugees have to encounter, they interact with people who share similar identities with them, in order to release their stress and feel comfortable (Schweitzer et al., 2006). This tendency to interact with their own groups was also observed in our project. However, it was getting better as the project progressed.

4.3 Mistaken Assumptions from the Student Team

We have taken multiple roles as being designers, facilitators as well as researchers in this project. However, all these roles were built on our primary roles as being students and being limited to it. When taking a retrospect, I found that our challenges can conclude as one big challenge, that is, to adapt and apply the student role to a specific project that happened in a real world.

We just took what was written in the project statement from the IRC staff and regarded it as a truth that water-saving was needed in the vegetable wash station, without deliberation, and then much of the efforts were spent and wasted. It can be seen as a loss of critical thinking to accept what has been told, rather than question, doubt and challenge it, because the core of critical thinking is questioning knowledge and information (Browne & Keeley, 2007). The theory of conformity from Social Psychology can be used as an explanation of the lacking of questioning. Conformity is identified as changing one's behavior due to the real or imagined influence of others (Aarts & Dijksterhuis, 2003; Kiesler & Kiesler, 1969), and people are socialized to obey authority figures who they perceive as legitimate and powerful (Blass, 2000; Staub, 1989). When school teachers or project clients are presented, they are seen as powerful figures from students, who therefore are less likely to doubt what they say. Besides, limitation of education system might also accounts for the deficit of critical thinking. Flanagan (2016) presents evidence to argue the failure of school in developing critical thinking in students, where she points out a reason about consumer orientation since 1980s. Influenced by consumerism, students view themselves as consumers and they regard grades as the product they purchase and put extreme weight on it. When requirements for students are getting higher and higher,

they are forced to memorize rather than understand, analyze and apply knowledge.

Similarly in this project, when given the information, we took it as truth and proceeded the information without enough analytical thinking.

Even after some initial research, we found out no water-saving technologies were applied to current vegetable wash station, we interpreted it as people don't have awareness or motivation to save water or people don't have the techniques even though they want to. As a student, I realize how often we use this mindset, consciously or subconsciously, to explain things in a way that confirms our previous findings, rather than step back to check if we were wrong before. For example, at that moment, we never thought it was because the wash station doesn't need much water and it was unnecessary to recycle water on it. Instead, we just undoubtedly believed that saving water was needed and we selectively searched for evidence to support our belief. Moreover, from the fact that no one mentioned to visit field until we had to, I realize that students in our team don't have the habit to get knowledge from the field. Having been used to learning from books, we should always be aware of the gap between knowledge and practice, especially work on a field project.

4.4 Uncertainties from the Organization IRC

As being mentioned several times in this thesis, there was a long delay between the time when this project was proposed and the time when it got started. One reason for this delay was because the New Roots program was a new program for the IRC branch in Sacramento region. It may take them longer time to prepare since the IRC didn't have much experience in the farming program. However, a more important reason was that the human resources and material resources that could support this program were very scarce. We

sensed this resource-scarcity from our initial conversation with the IRC staff, and that's why we applied for the Blum Center funding, for a key buffering tactic for organizations to overcome economic difficulties is to pursue additional funding (Mosley et al., 2012). The result of this application should have been released by mid-April 2016, but because of some issues in the Blum Center, we had not heard anything till May. When the IRC staff changed their design priorities, we shouldn't have felt surprised if we connected their change with this delay. The unexpected longer waiting for the application result made this project trapped in a situation where it had to keep moving forward while not enough secured funding was allocated. Under such pressure, the IRC had to sacrifice their sustainability goal. Likewise, this pressure could also explain why the IRC liked the layout designs but turned down the proposals and why they did not plan to involve refugees formally when they were reminded by us.

The delay of the project implementation, the change of priorities and the lowering of initial goals, can be traced into the nature of nonprofit organizations and how they function. Fundamentally differ from for-profit organizations, which are founded to generate income and maximize profit for entrepreneurs and their employees, the existence of nonprofit organizations is to serve society's needs, either humanitarian or environmental needs. Because of that difference, for-profit organizations earn income and credit arrangements to finance their operations, while nonprofits rely almost entirely on grants and donations from government entities, individuals and other organizations (Green, n.d.). This dependence on external funding sources makes nonprofits of all types vulnerable, especially during this period of weak economy. A national survey reports that government agencies at all levels are cutting funding and almost 40 percent of nonprofits

have experienced a decline of funding support from the local and state government while nearly 50 percent have reported a decrease from the federal government (Pettijohn et al., 2013). This funding uncertainty is especially worrisome for human service nonprofits, which the IRC belongs to, because of its privatization of social services and the impact to many vulnerable individuals and families (Allard, 2009; Smith, 2002).

Our student team had the permission and support of the IRC to carry out activities, but this project was done quite independently in the organization. Though it was said that we could get access to all the resources in the IRC, we didn't know where those available resources were after finishing the project, because no one else (besides the three IRC staff that we worked with) happened to interact with us. If this project is embedded into the development strategy of the whole organization and if the IRC recognizes the value of refugee participation and that better relationships with them can be derived from such approaches, then adequate resources and support can be available and accessible for the participatory activities, then the solidarity, unity and cooperation that an organization should have had can be developed in the IRC.

All these challenges and analysis are provided here to explain why the IRC had initial higher goals but ended up with lower execution. Uncertainties were generated from the nature of nonprofit organizations, current funding crisis, serious time constraints and an absence of organizational integrality. All these have become organizational challenges that not solely the IRC has to face but also many other nonprofits.

Chapter 5: Recommendations for Future

Based on analysis of challenges from the participatory approach and different participants in Chapter 4, recommendations are provided in this chapter, with the aim to present a reference to people who will be involving in a participatory design project in the future. Drawing from my personal experience on this project and literature review, I hope these recommendations would be helpful for both researchers and practitioners.

5.1 Implementing Participatory Design Approaches

Field study shows that it is rewarding to do a participatory design project with marginalized people (Winschiers-Theophilus et al., 2010). However, I argue that for participatory design projects to be successful, participants and organizations in charge of the development process must be aware of the possible challenges in the approaches and be prepared to deal with them.

Since respect, value and trust constitute the foundation of collaboration, facilitators should recognize the importance of building healthy and trustful relationships between different stakeholders. Especially, it is essential to build a relationship with end-users and it should be acknowledged that it takes a long time to build a strong relationship that will help participatory activities to get deep insights into user needs and perspectives. Before approaching them, having profound knowledge of their culture and society is crucial to show respect to people and organize activities in a culturally appropriate way. Facilitators should, therefore, set aside enough time to learn about the local culture and use this knowledge when engaging with participants (Hussain et al., 2012). Hiring employees or recruiting volunteers who come from that culture as intermediaries also help, whenever possible. I suggest that building trust with them by visiting and talking with them over

time, in order to know them better. While gaining information from them, researchers should give out information by introducing them the project and benefits for them if they participate. After the prior actions, the key to convincing users and other stakeholders to take part and keep participating is to find suitable ways that are customized by different selected participants.

In order to value end-users' time and perspectives, it is a must to clarify the project's goals with them and update them with the project schedule. If there are circumstances resulting to any change or any delay in the project, always inform them about it and ask for their understandings and support. Valuing end-users' knowledge and equipping them with the tools to be able to take a more active role are also crucial. This can be achieved by providing training to teach them principles of design activities, products and services. For example, if a design product is related to sustainability, sustainable strategies should be taught.

Power inequality within groups is a barrier to a meaningful engagement and it is indispensable to consider how inequalities in education, background and social status can be overcome to enable stakeholders to participate on a level playing field (Reed, 2008). Hence, after all stakeholders come on the board with their willingness to participate, it is imperative for them to understand how much power in terms of the decision-making will be given to each side, and ensure all people understand their own responsibilities, by common consent.

It is crucial that different stakeholders' voices are heard and included in the design process, but it should not be assumed that integrating all types of perspectives and making them presenting in the final design could ever happen. Recognizing potential conflicts at an

early stage of a project (Bødker, 1996), and being flexible and adapting participatory design methods to the current situation and context in a practical way are always necessary.

5.2 Helping Refugees with Strategies

As English language and communication difficulties underpin many other struggles and challenges facing refugees, an essential part of resettlement should be language proficiency, which both directly and indirectly affects refugees through increasing self-esteem, reducing social isolation and enhancing their well-being. Therefore, when organizations, especially refugee-oriented organizations such as the IRC develop their programs and projects, they should recognize the importance of language and deliberately take efforts to reduce the negative impacts that language barriers may bring. Such efforts include recruiting more interpreters, providing English language training and proposing associated language-help programs to complement main participatory projects.

Moreover, refugees, as a sensitive group accompanied with many struggles, should be treated with love, respect, patience and encouragement in a culturally appropriate way. When approaching them, individuals and organizations should always take refugees' perspectives, ensure a project is beneficial for them and clarify benefits to them when seeking for their collaborations. The working style should also be adapted to refugees' capacities and assure them feel comfortable. For example, one observation from this project was that compared to coming up with ideas or making decisions, refugees were more comfortable to do what they are told to do. Refugees participated more in constructing the wash station when only following the manual and guidance was needed. It

should be noted, before trainings are allocated to develop their abilities to participate actively, it takes time for refugees to get adapt to the approach and learn the principles.

More importantly, when organizations propose participatory projects engaging with disadvantaged groups such as refugees, and when researchers undertake such projects, the aim should not be limited to “fixing” a current problem, but also to build and develop capacity of end-users. In other word, the goal of participatory design projects should not be to just develop tangible solutions but also yield intangible results such as empowerment of marginalized people (Hussain et al., 2012). In this sense, researchers should strive for empowering refugees and potentially other stakeholders, contributing to expanding capacities of all participants in projects, and enabling people who are currently disadvantaged to obtain happiness and independence in the future.

5.3 Students as Introspective Practitioners

Consistent with co-learning feature in a participatory design, students who undertake such project from clients, should be prepared to educate clients if they are wrong. At the beginning, students should take initiatives to examine the project carefully with critical thinking, by questioning on project goals to rationalize they have practical meanings and analyzing project methodology to ensure its feasibility and capability to achieve goals, instead of being passive to do what has been told. It is recommended that students take the responsibility to facilitate the process and encourage as many as stakeholders to join to assure project is on the right direction and every stakeholder has equivalent understanding of the project before starting. This application would be also very helpful for the implementation of the project, because it can accelerate the progress as well as guarantee expected outcomes.

Students should be aware of the limitation of knowledge from books as well as the gap between knowledge and practice. When working on a project happened in reality, students should have courage to come out of the comfort zone and be ready to go to the field and talk to people out there at any time through the whole process of the project. By this way, knowledge learned from books can be reinforced and complemented by practice, and experience can be obtained in a practical way.

Last but not least, always keep open to different possibilities and step back to check previous assumptions to see if they are right. Things change as the project proceed and assumptions that were right in the past can become wrong at the present, let alone those originally and inherently incorrect ones. Some mistakes can be hard to notice yet can be detrimental later, therefore it's imperative to always request other participants' perspectives and suggestions to help with the error-checking. Specifically, an evaluation plan is recommended to use to keep track of the project and provide records for future's reference.

5.4 Nonprofits as Sagacious Managers

Based on a fundamental understanding of nonprofit organizations as inherently funding-dependent, nonprofit managers who propose and develop a participatory design project should balance available resources and outcome expectations and come up with alternative plans with adaptive strategies to control the flow of resources so that the project can at least achieve its primary objective.

From resource dependency theory, nonprofits should develop and enhance their abilities to acquire and maintain scarce resources controlled by institutions in external environments, and develop strategies to gain both control over environments and favor

with stakeholders (Pfeffer & Salancik, 1978). Political economy approaches stress two types of resources: political resources and economic resources and they suggest nonprofits to pay attention to them (Wamsley & Zald, 1973). While both of these two theories encourage nonprofits to expand capacities to seek more funding sources, it is of equally importance for nonprofits to respond to a changing environment, where economic downturn and financial uncertainty have become the status quo. Researchers have long argued that organizations should use adaptive tactic to respond to the changing environment (Baum & Singh, 1996; Pfeffer & Salancik, 1978). Galaskiewicz and Bielefeld (1998) have introduced five adaptive tactics that could be applied to human service nonprofits such as the IRC, they are (1) adding new programs, (2) discontinuing existing programs or reducing staff, (3) starting joint pro-grams, (4) increasing earned income, and (5) starting or expanding advocacy involvement. However, when it comes to the implementation, nonprofit managers should make decisions depending on their organizational structure, management and finance. For example, larger nonprofits are more flexible in choosing tactics that provide better control over their revenues while smaller ones don't have equal flexibility in the available choices (Mosley et al., 2012). As a result, nonprofits should take efforts to explore, develop and structure a system of funding management that fit themselves and keep modifying and improving along the process.

Nonprofits would benefit from acknowledging the value of participatory approaches that involve and engage people they are committed to serve. Support from all levels of one organization is necessary for ensuring the necessary resources, both time and money, are allocated for the project and associated activities. This internal cooperation does not only benefit one specific project, but also improves organization performance as well as boots

employees' well-being (Campion et al., 1993; Cohen & Ledford 1994; White et al., 2003), which in return would enhance nonprofits' competency in funding markets. The organizational solidarity can be strategically developed through HRM (human resource management) practices such as collective learning, project management and leadership development (Matuska & Landowska, 2015). However, transferring moral and philosophy in the whole nonprofit organization does not happen overnight. The ease of the transition depends on how hierarchical the organization is and whether its employees especially high-ranking ones value internal cooperation.

Chapter 6: Conclusion

Because relatively little research has studied participatory designs in western countries with end-users as marginalized people, I actively participated in this project using participant observation method, with the aim to present how participatory design methods could be applied and transferred into this setting, and to inform scholars and practitioners what possible challenges are and how to prepare for dealing with them.

Drawing from my field notes, I presented the thorough process of this participatory project with design methods, including four-lens analysis in project framing, brainstorming, evaluative matrix, decision matrix and prototyping. Started from dream and ended in reality, this project failed to achieve its initial high goals, because of some specific obstacles. Based on my concrete experience and analysis, I derived four categories to analyze challenges and provide recommendations in each category (see Table III).

This table would help practitioners who will be involved in a similar participatory design project in the future to understand what possible challenges are expected and prepare a more efficient process with better outcomes. However, my research is just a first step in understanding challenges to undertaking participatory design projects in a developed country with marginalized people context and this table is not an exhaustive list that presents all possible obstacles. More participatory design research is encouraged to uncover barriers as well as to identify, develop and improve strategies to overcome challenges.

Table III. Challenges and Recommendations

Category	Challenges	Recommendations
The participatory design approach	<ul style="list-style-type: none"> • Participation difficulties resulted from a lack of trust, time and knowledge being underappreciated • Different background and position of participants leads to conflicting focuses and interests • Rigid power dynamics • Unexpected twists and turns require adaptability and flexibility from all participants 	<ul style="list-style-type: none"> • Respect and trust as the fundamental part of the collaboration, regardless of culture, language and background • To build a strong and trustful relationship; to show respect by learning about refugees' culture and society and regular visiting • To clarify project goals and update schedules to value people's time; to equip refugees with tools to value their knowledge • To inform participants how much power will be giving at the beginning
Refugee farmers	<ul style="list-style-type: none"> • Reluctance to talk because of the language difference and communication barrier • Discomfort to share opinions because of low self-esteem • Constant struggles because of stresses and discrimination 	<ul style="list-style-type: none"> • To recruit more interpreters or volunteers; to provide English training and programs • To treat refugees with love and patience: adapting working style to their capacities and taking their perspectives • To empower refugees by enabling currently disadvantaged people to become independent in the future
The student team	<ul style="list-style-type: none"> • Take project statements as truth without critical thinking • Stick to previous beliefs rather than step back to check error • No field visit earlier 	<ul style="list-style-type: none"> • To examine project carefully to ensure feasibility and capability • To be open to different possibilities and check previous assumptions regularly • To be aware of the gap between knowledge and practice; to go to field as much as possible
The organization IRC	<ul style="list-style-type: none"> • Resource-dependent nature of nonprofits and current economic downturn • Absence of supports from other departments in the organization 	<ul style="list-style-type: none"> • To expand capacities to seek more funding sources while use adaptive tactics to respond funding uncertainties • To develop organizational solidarity through HRM (human resource management) practices • To have feasible project goals by balancing available resources and outcome expectations

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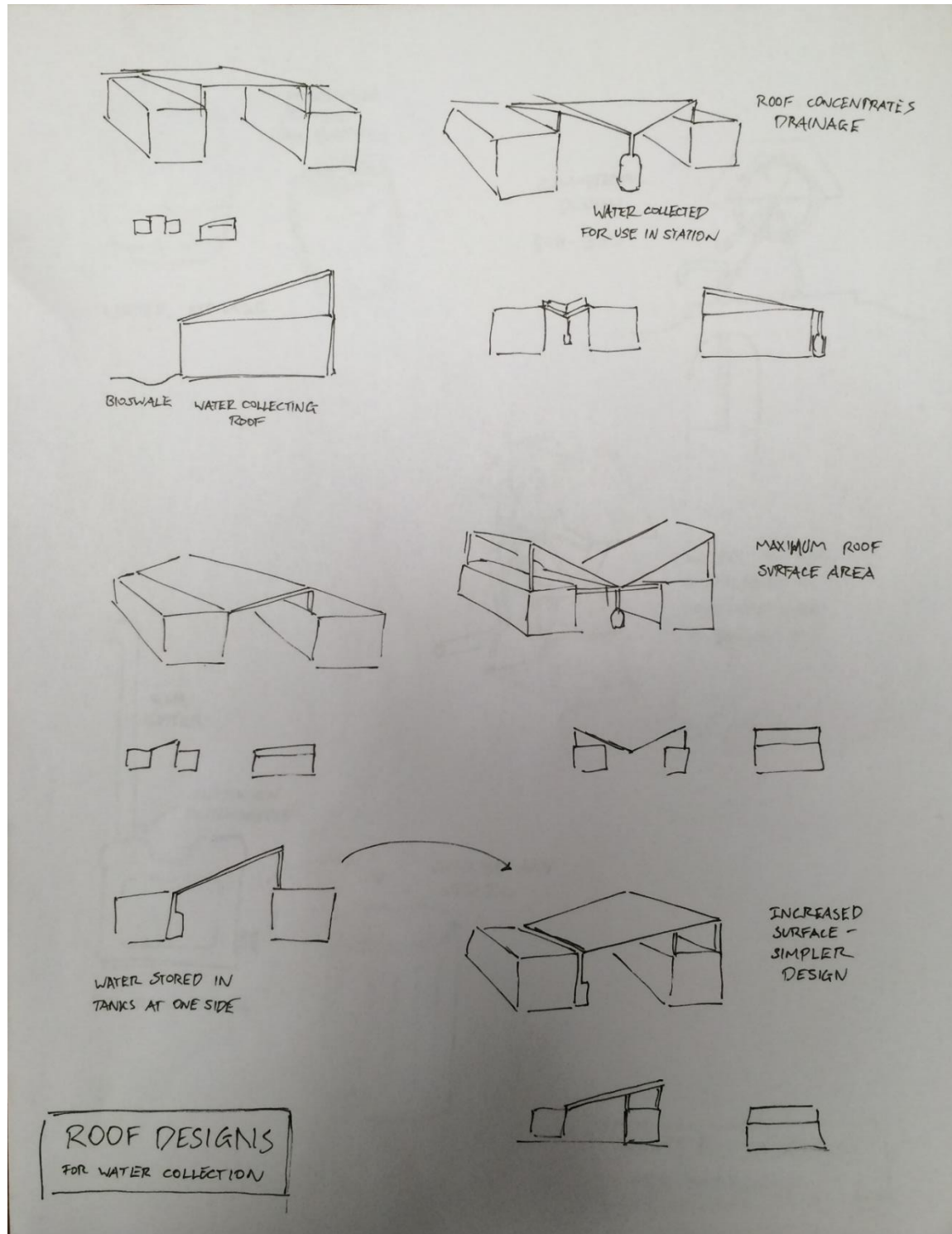
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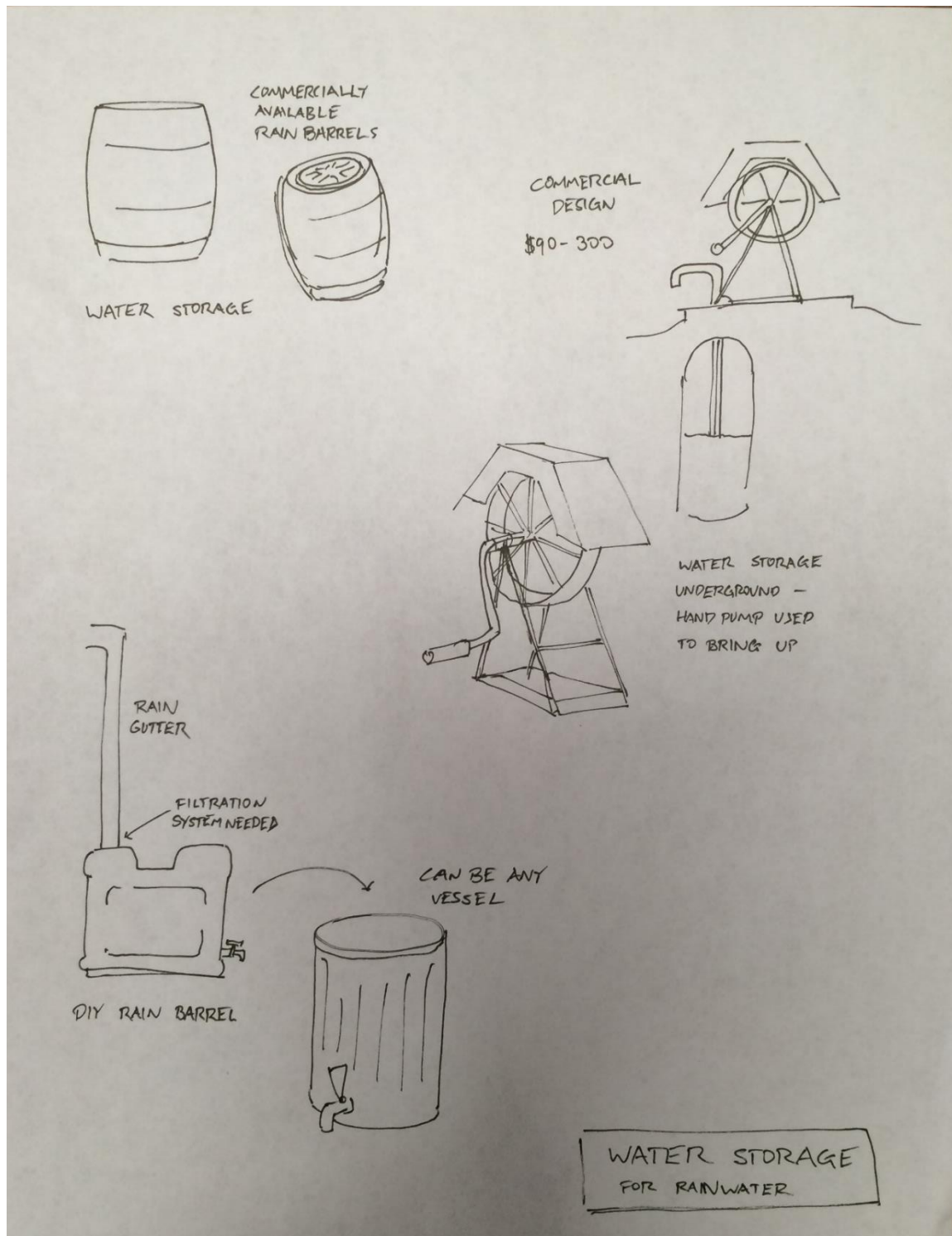
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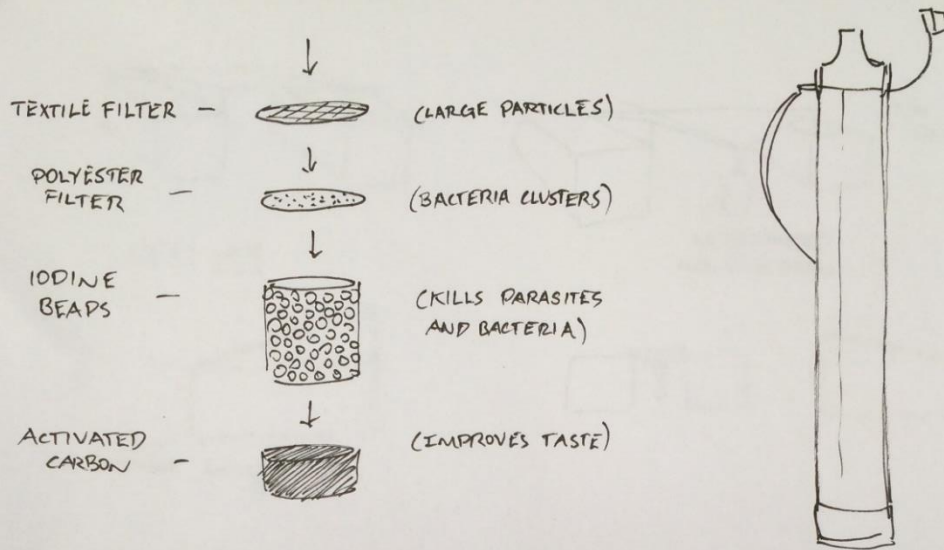
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Appendix

Appendix I: Brainstorming Drafts



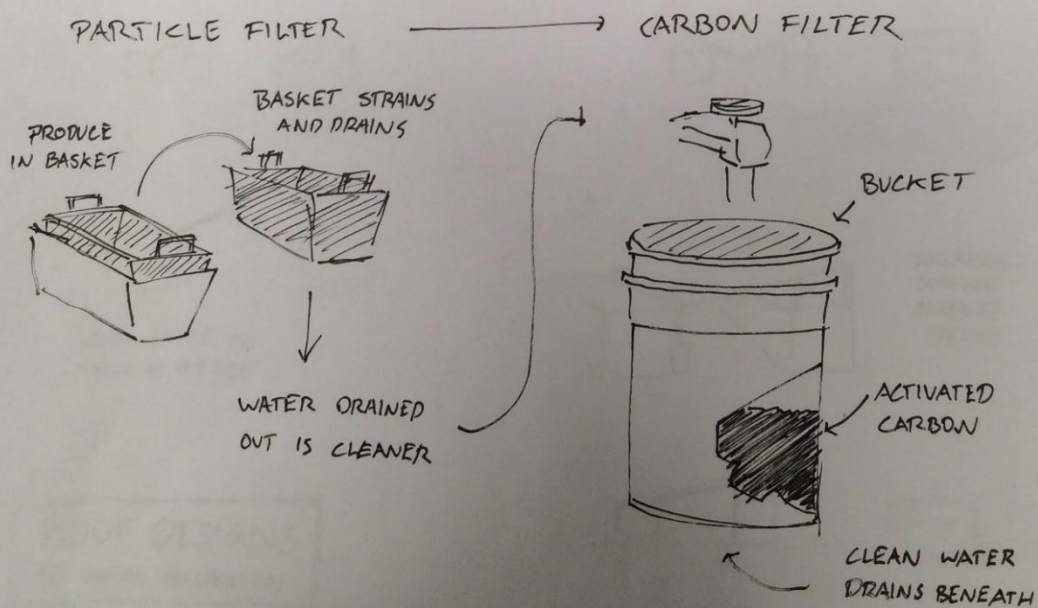




INSPIRATION: LIFESTRAW

- MULTISTEP PROCESS
- DIFFERENT CONTAMINATES FILTERED
- DOES NOT REMOVE HEAVY METALS

WATER FILTER



Appendix II. Photo of water tank at the UC Davis Student Farm



Appendix III. Photos of the Field Vegetable Wash Station Construction



