Developing strategies for "Zero Hunger"- Angel Wings

Uthuma Lebbe Muhammed Rijah
rijah@slgti.ac.lk
Santhujan Vijeyakumar
Thilina Uvindasiri
Anuruddha Rathnayake
Isuru Weerakoon
Department of Graduate Studies and Research
Sri Lanka Institute of Information and Technology

Abstract

Sustainable Development Goal 2 (SDG2) "end hunger, achieve food security and improved nutrition, and promote sustainable agriculture" must be given priority for a country to achieve its overall sustainable development objectives. SDG2 is intrinsically linked to all 17 SDG goals, globally adopted in 2022 by countries now in the process of nationalizing them. The SDG 2, Zero Hunger, seeks to simultaneously address global environmental sustainability and food security challenges. The Sri Lanka has also declared 2022 as the Year of Alleviating Poverty. We must consider how much food is wasted globally each year. These are consumable foods that may be easily distributed or donated to individuals in need. Every year, over 1.3 billion tons of food are lost or wasted. That equates to almost one-third of all food produced for human use worldwide. 30% are grains, 40-50% are root crops, fruits, and vegetables, 20% are oil seeds, meat and dairy, and 35% are fish. Sri Lanka is 65th out of 116 countries in Global Hunger Index [9]. Among all the districts in Sri Lanka, Colombo, Mulativu, Kegalle and Rathnapura exceeds 52% in percentage of food insecurity in people which means there are more people in these districts who are not getting enough food compared other areas in the country. The project Angel aligns with unicef's SDG-2 which they are targeted to end world hunger in 2030. The project deliverable will be an android mobile app which directly involves catering to the hunger needs for people who are in need. The app will consist of the capabilities of donating excess food, donating dry rations, requesting for cooked food or rations, collect or delivery of cooked food, excess food or rations.

Introduction

Humanity is always pushing the boundaries of new discoveries, studies, and technologies. There is one issue that hasn't been resolved despite current tools and technologies: hunger. Hunger and poverty are closely related, and there are a variety of social, political, demographic, and cultural variables at play. People who live in poverty frequently experience food insecurity in their homes, engage in inappropriate care practices, reside in unsafe environments with poor access to clean water, sanitary conditions, and hygiene, as well as limited access to or availability of health care and educational opportunities, all of which are factors in hunger.

There is more than enough food produced in the world to feed everyone on the planet. As many as 829 million people worldwide go to bed hungry each night [7]. Small farmers, herders, and fishermen produce about 70 percent of the global food supply [7], yet they are especially vulnerable to food insecurity, poverty and hunger are most acute among rural populations. Conflict is a cause and consequence of hunger. In 2020, conflict was the primary driver of hunger for 99.1 million people in 23 countries [7]. An estimated 14 million children under the age of five worldwide suffer from severe acute malnutrition, also known as severe wasting, yet only 25 percent of acutely malnourished children have access to lifesaving treatment [11]. Asia has 525.6 million hungry people, Sub-Saharan Africa 214 million, Latin America and Caribbean 37 million [10]. 60% of the world's hungry people are women. Every 10 seconds a child dies from hunger related diseases [11].

At the other side of the coin, Excess food seems to the be the issue. 1.9 billion people, more than a quarter of the world's population, are overweight, 672 million of these people are obese, 3.4 million people die each year due to overweight related diseases, The world produces enough food to feed 7 billion population, but uneven distribution makes 1 billion people undernourished and 2 billion people suffer hidden hunger.

With that being said, do we really think how much food we waste every year around the globe. Those are the consumable food that we could easily distribute or given to people in need. Let's look at the numbers. Approximately 1.3 billion tons of food is lost or wasted every year [12]. That is about one third of all the food produced for human consumption in

the world. Among that, 30% cereals, 40-50% for root crops, fruits and vegetables, 20%for oil seeds, meat and dairy, 35% fish [10].

An investor can invest his money in different portfolios to balance the losses, from market crashes, an engineer uses modern scaling techniques to reduce the load on single servers and prevent the server from crashing. What do they both have in common? Balance. Some households or events suffer from food wastage and then we there's hunger and poverty. The best solution to world hunger is to create balance. If the food wastage from one party is transferred to other party "world hunger" will be an ancient word.

The project Angel, aligns with unicef's SDG-2which they are targeted to end the world hunger in 2030[13]. The project deliverable will be an android mobile app which directly involves in catering the hunger needs for people who are in need. The app will consist of the capabilities of donating excess food, donating dry rations, requesting for cooked food or rations, collect or delivery of cooked food, excess food or rations. There are two types of stakeholders in the Angel project. The direct stakeholders and the indirect stakeholders. The direct stakeholders will be the people who are involved in CSR projects related to hunger mitigation projects, individuals or groups who are willing to donate cooked food, rations, water etc. and the individuals or groups who are willing to contribute by picking up donated food/rations and deliver to locations to people in need. The indirect stakeholders will be the ones who are benefitting from this project, such as homeless people, families with low income and possibly rural schools.

Sri Lanka is 65th out of 116 countries in Global Hunger Index [9]. Among all the districts in Sri Lanka, Colombo, Mulative, Kegalle and Rathnapura exceeds 52% in percentage of food insecurity in people which means there are more people in these districts who are not getting enough food compared other areas in the country [14].

With the continuous impacts of easter attack and Covid pandemic, it has Increased monthly expenditure on consumer products, fuel and rent where food affordability is much less in the country for majority of people.

Therefore, this project takes Colombo district as the designated platform, as Colombo is a perfect test bed in Sri Lanka to do a POC due to its high computer literacy as well as

hunger affected people samples and stakeholders involved in mitigating that are commonly available.

Literature Review

Industrial agriculture globally endangers vital ecological processes that are necessary for agricultural production, while 815 million people are undernourished and many more are malnourished [1]. In order to jointly address the difficulties of global environmental sustainability and food security, the second Sustainable Development Goal (SDG 2), Zero Hunger, was established. Researchers performed an integrated evaluation of the literature based on three disciplinary viewpoints that are essential for realizing the fields of political economics and policy science, nutrition and public health, and ecology and agricultural sciences. There is a wealth of literature in each area that summarizes the current understanding of the best strategies to attain food security while preserving the long-term viability of food systems. next use the paths we outlined initially to final analysis to perform an extensive assessment of literature in each of these areas that reference SDG 2.In this study, it is argued that the road to reaching the Zero Hunger target should focus on place-based, flexible, and participatory solutions that concurrently address local institutional capacity, agroecosystem diversification and ecological management, and the standard of diets in the area.so when researchers examine food systems, they typically do not link these dimensions. The topics of governance were more frequently discussed by social scientists. The emphasis on governance is in line with social movements and ideals from a broader civil society, such food sovereignty. Given the known difficulties in balancing ecological sustainability and food and nutrition security, as well as the near total lack of progress on implementation, there is a need for public discourse that actively questions the origins and legitimacy of industrial food systems that are dominated by business. This might facilitate SDG 2's integration of human health, democratic systems, and as a unifying framework for food security and ecosystems sustainability.

In this study, "The global cost of reaching a world without hunger: Investment costs and policy action opportunities" [2]. Hunger based researchers are characterized using the Food and Agriculture Organization's notion of undernourishment. A marginal abatement

cost curve was created to determine a combination of least-cost investment alternatives with the best potential for reducing hunger. The best available evidence-based literature, including model- and large-scale intervention studies, is used to choose which of twenty-two possible strategies to examine for reducing undernourishment. According to the prediction of hunger in 2030 made in 2020, taking into account COVID-19's impacts, it would take yearly investments of between US$ 39 and US$ 50 billion to end hunger by 2030. This would help 840 to 909 million people. Low-cost approaches with a substantial potential to reduce hunger include investing in agricultural R&D, agricultural extension services, ICT-based agricultural information systems, small-scale irrigation expansion in Africa, and female literacy improvement. Not only is it necessary to stop losing time, but it's also important to phase investments well in order to eradicate hunger by 2030. Investments with longer-term effects should be made earlier in the decade to profit from them before 2030. To quickly provide social safety and nutrition programs to the hungry, particularly those negatively impacted by COVID-19, a balanced strategy is required.

In this research "Projecting food demand in 2030: Can Uganda attain the zero-hunger goal?" [3]. A precarious food security situation implies that many countries in the Global South may not achieve the United Nations Sustainable Development Goal 2 (SDG2) of zero hunger by 2030. We focus on the case of Uganda and explore food demand and food security implications for 2030, where 33% (15 million) of the population of 44 million are poor. Matooke (cooking bananas), cassava, and (sweet) potatoes are traditional foods in Uganda; however, the consumption of maize, wheat, and rice has been rising with increases in income and urbanization. Using the Living Standards Measurement Study (LSMS) datasets of Uganda, this study estimated the demand for matooke, cassava and potatoes, maize/coarse grains, wheat and rice, vegetables, and meat and fish in 2030. Our findings confirm that with increases in income and demographic changes, the demand for these food items will increase drastically. To attain SDG2 of zero hunger, as well as food and nutrition security, this study calls for further investments in Uganda's agricultural sector to enhance domestic production capacity to meet the growing demand for food.

Uncertainty surrounding food security suggests that many Global South nations may not be able to comply with Sustainable Development Goal 2 (SDG2), which calls for eradicating hunger by 2030. Focusing on the situation in Uganda, where 33% (15 million)

of the country's 44 million people live in poverty, we examine the consequences of food demand and food security for 2030. In Uganda, traditional meals include matooke (cooking bananas), cassava, and (sweet) potatoes; but, with growing incomes and urbanization, maize, wheat, and rice consumption have been rising. This study calculated the demand for matooke, cassava and potatoes, maize/coarse grains, wheat and rice, vegetables, meat, and fish in 2030 using the Living Standards Measurement Study (LSMS) datasets of Uganda. This study looked at the anticipated food need and buying habits in Uganda in 2030. With rising per capita GDP and population, Uganda's consumption of the six major food categories will significantly rise. In order to secure an appropriate food supply and an acceptable income for agricultural households in Uganda while maintaining planetary boundaries, it is crucial to invest more in agricultural production in order to achieve the SDG2 of ending hunger by 2030.

In the study "Hunger and environmental goals for Asia: Synergies and trade-offs among the SDGs" [4]. It discusses the difficulty of finding a connection between the SDGs with a focus on SDG goal 2.3, "Doubling production and Incomes." The tradeoffs and synergies between SDG 2.3 and the other SDG objectives are thoroughly evaluated with regard to South Asia. For increasing the positive links and reducing the negative linkages with SDG 2.3, high return interventions and policies are presented. Getting agricultural and environmental agendas in sync has been a struggle for the global community for the last 50 years. While pursuing efforts for environmental conservation run the danger of postponing future progress on reducing global hunger, progress on hunger reduction has come at the expense of environmental damage. Due to the lack of context-specific data and poorly defined measures for tracking and assessing externalities, it has been difficult to identify chances for optimizing synergy between hunger and environmental goals. Additionally, sectoral silos in the design of food, agricultural, and environmental policy make it difficult to find synergies and reduce tradeoffs. One should anticipate tradeoffs to be kept to a minimum even in cases where SDG operationalization is carried out independently and at the sector level if each objective can be met while limiting negative externalities. For overall success, a legislative environment that offers the incentives for implementing improved practices, such as the elimination of agricultural subsidies which support resource-inefficient and environmentally damaging practices, is essential. The

extent of the negative externalities of doubling agricultural output and the steps taken to achieve a more sustainable future may be determined using a "True Cost Accounting" approach. Finally, to create the greatest possible synergy across SDGs, intersectoral policy convergence and coordination across ministries, development agencies, and ground level organizations is required.

Corporations, organizers, and other food related industries are crucial in supplying communities with food and eliminating malnutrition and hunger [5]. Under effective supervision and protections, business units may have a severe influence on the local food security of the areas where they operate and where their supply chain is located. Agriculture lands are not being utilized to their fullest potential due to a rise in land grabs and improved money-making company initiatives. Restricting access to agricultural inputs including seeds, water supply, education, and financing can have a severe impact on communities. Two-thirds of the planet's population may be assisted in addressing hunger and achieving growth in the economy by using ethical supply chain strategies that respect environmental rights and encourage smallholder farmers. The elimination of hunger can help businesses since it opens up previously untapped consumers. Additionally, it is believed that current malnutrition rates might be as high as 11% of annual national GDP. Companies may take the lead in the development of technology and methods to reduce food waste from their initial to final operations, ensuring greater food supply for communities all over the world. This will help address the major global food waste problem. By raising earnings and access to nutrition in rural and developing countries, eliminating hunger and boosting agricultural revenues may directly contribute to the advancement of Goals 1, 3 and 8. Leading companies promote sustainable agricultural methods to reduce these hazards.

In order to better understand how SDG2 may be achieved and how it relates to other SDGs, particularly those pertaining to environmental sustainability, this study gives an overview of current results from the global modeling literature [6]. The inherent difficulties in producing enough food that is adequate, nourishing, sustaining, and sustainable, the synergies between SDG2 and other sustainability dimensions, the trade-offs between SDG2 and environmental goals, and the transition to sustainable pathways are some of

the primary routes. The main suggested actions and study results are explained in the table below.

EAT-Lancet Commission (Willet et al., 2019)	Food and Land Use Coalition (FOLU, 2019)	CGIAR CCAFS (Steiner et al., 2020)	Global Panel on Agriculture and Food Systems for Nutrition (2020)
"Five strategies for a Great Food Transformation"	*"Ten critical transitions"*	*"Actions to transforms food systems"*	*"Priority policy actions to transition food systems towards sustainable healthy diets"* *
1. seek international and national commitments to shift towards healthy diets	1. healthy diets	1. no ag land expansion into high carbon land	1a. rebalance agricultural subsidies
2. reorient agricultural priorities from producing large quantities of food to producing healthy food	2. productive and regenerative agriculture	2. support development of climate-resilient and low emissions practices	1b. rebalance agricultural R&D
3. sustainably intensify food production, generating high-quality output	3. protecting and restoring nature	3. support prosperity through rural reinvigoration	1c. promote production of a wide range of nutrient-rich food
4. strong and coordinated governance of land and oceans	4. healthy and productive ocean	4. early warning and safety nets	2a. coopt levers of trade
5. Halve food loss and waste, in line with global SDGs	5. diversifying protein chain	5. help farmers make better choice	2b. cut food loss and waste
	6. reducing food losses and waste	6. shift to heathy and sustainable diets	2c. support job growth across the food system
	7. local loops and linkages	7. reduce food losses and waste	2d. support technology and financial innovation along food supply chains
	8. digital revolution	8. implement policy and institutional change for transformations	3a. implement safety nets
	9. stronger rural livelihoods	9. unlock billions in sustainable finance	3b. promote pro-poor growth
	10. gender and demography	10. drive social change to more sustainable decisions	3c. reduce costs through tech and innovation
		11. transform innovation systems	3d. adjust tax and subsidies on key foods
			4a. define principles of engagement between public and private sector
			4b. upgrade dietary guidelines and promote enhanced knowledge about implication of dietary choices
			4c. better regulate advertising and marketing
			4d. implement behavioral nudges via carefully designed taxes and subsidies

Figure 1 obtained data

Existing solutions

The concept of food sharing and donation has been existing since ancient times. The problem with the existing solutions is they connect the donator with organizations, this brings hesitations to a lot of donators because they do not really know the receiving end of the cycle. Some of the present solutions in Sri Lanka are

RobinHood Society, Operates only in Colombo and Batticaloa. No digital solution. Have to handover the goods to their address. Social media and website for information [15].

WGSA (We Give Stuff Away): Have to handover the goods to their address. Social media only for information [15].

The Soup Bowl: Have to handover the goods to their address. Social media only for information [15].

Jana Suwa Bala, Have to handover the goods to their address. Social media only for information [15].

Pluse.lk, Primary target/goal is different. Have to handover the goods to their address. Social media and website for information [15].

The solutions that are currently in use and offer comparable services around the world are Too Good To Go, Olio, Karma, Foodcloud, Nowaste, Nosh, Kitche [16].
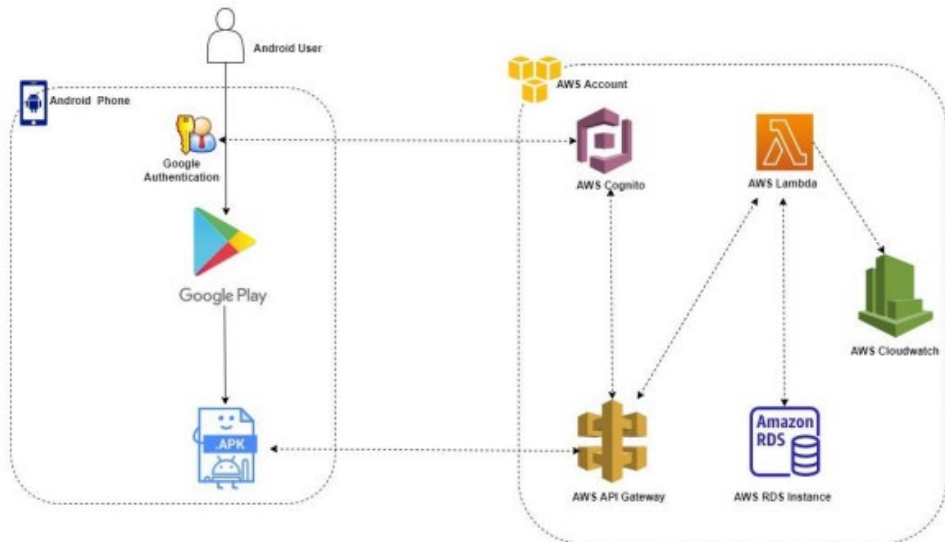
Methodology
Architecture Diagram

Figure 2 Angel Wings Architecture Diagram

The android will be developed in a way that the user will have to log in using their google account logged in in the android mobile. Once the user account is created, app home page will show four main functionalities which are.

1. Donation of excess food

2. Donation of Dry rations

3. Donation of cooked food

4. Request donations

5. Contributing by Delivery

The first function which allows the user to donate the excess food in their parties, alms giving or any other event will be enabled with many options. If you have any event where there is excess food which you are willing to donate, you can mark it in the application along with the list of food, quantities, packaging, and ability to deliver yourself and expiry date. The second function will be more or less the same functionality, but for dry rations who are willing to donate a certain number of dry rations to anyone who is in need. The third options are also more or less the same functionality, but for cooked food such as sandwiches, rice packets etc. The fourth functionality will be for the users who are registered as the CSR coordinators where they are enabled to request donations of any category along with the number of pax/families, last date to donate, the need of the donation (dry ration or cooked food), ability to pick up and the location. This way the people who are willing to donate will be able to see the requests and contact them through the application for their contributions for the cause.

It is intended to use the android technology along with AWS trending services for delivery, hosting, and data storage purposes. Basically, the aws services such as cognito, RDS, API Gateway and Cloudwach will be used for authentication integration, data storage, application linking to internet and logging purposes respectively

Research Gap

Researchers that have been performed regarding food donation concept and its mainly focused on possible solutions and represent only a small area of issues or different purposes. However, none of those researchers in has been able to launch a web application successfully as a solution. All of them are just a systematic review regarding the problem and its solution. Most of them were talked about the, statics, features and challenges.

Existing comparable services local and internationally but none of the apps in worldwide has the ability to bridge between donors and contributors. None of the solutions in SL, have an android app that caters the need. The project Angel, aligns with unicef's SDG-2 which they are targeted to end the world hunger in 2030. The app will be bridging the gap

between the donors and contributors along with the indirect stake holders/beneficiaries. If a group/individuals have excess food. The project deliverable will be an android mobile app which directly involves in catering the hunger needs for people who are in need. Donate Dry rations page allow user to specify the type of delivery required.
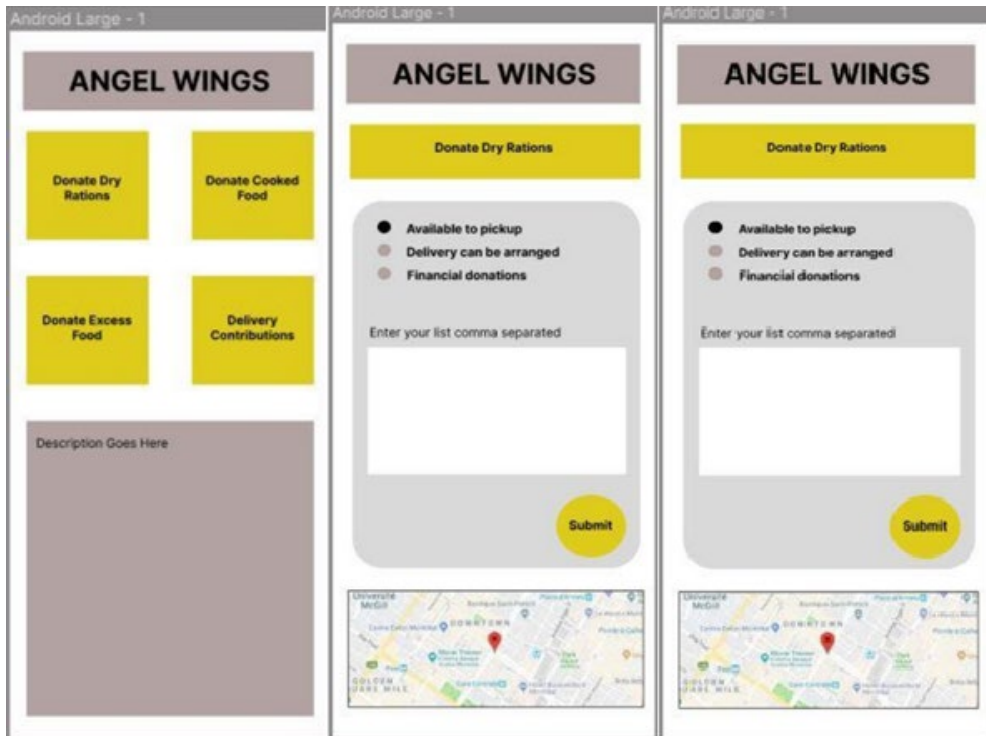
Results and Discussions

Figure 3 Home page and donation page

The applications reliability and error proof are maintained by performing manual unit test for every unit. Each unit covers a cover a part of the functionality. For example, When the user logs into or opens the application, home page will be the first screen. The home page act as a navigation panel to allow user to select the type of service required. The components in home page such as buttons and text input fields are considered under a single umbrella, scenario ID. The scenario id will contain multiple test cases to test each

atomic unit of the application. The unit test case results are as shown in the figure 5. The figure 5 shows the steps taken to accomplish each test cases, Pre-requisite and steps are registered for each unit of the application. Figure 4 displays the test scenario and its description. Figure 6 displays the Requirements Traceability Matrix (RTM) using the RTM. Figure 6 shows that every unit test cases have no errors and proves to the reliable and have been tested for every possible scenario where it could result in a bug after deployment.

Test Scenerio Angel wings application					
Module	Secnerio_id	Secnerio_name	Secnerio_description	Reference document	Requirement_id
Angle wings Application	ACCESS_COMMON_FLOOR_01	Validate the accessablity to common floor	Validating the fields in the 'home page'	R1	R_01
Angle wings Application	FUNCTION_COMPONENTS_02	Validate the Home page components with valid data	Validate the Home page components with valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_03	Validate the Home page with in-valid data	Validate the Home page with in-valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_04	Validate the donate cooked food page with valid data	Validate the donate cooked food page with valid data	R1	R_01
Angle wings Application	FUNCTION_COMPONENTS_05	Validate the donate cooked food page with in-valid data	Validate the donate cooked food page with in-valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_06	Validate the donate excess food page with valid data	Validate the donate excess food page with valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_07	Validate the donate excess food page with in-valid data	Validate the donate excess food page with in-valid data	R1	R_01
Angle wings Application	FUNCTION_COMPONENTS_08	Validate the delivery contribution page with valid data	Validate the delivery contribution page with valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_09	Validate the delivery contribution page with in-valid data	Validate the delivery contribution page with in-valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_10	Validate the admin panel property with valid data	Validate the delivery contribution page with valid data	R1	R_02
Angle wings Application	FUNCTION_COMPONENTS_11	Validate the admin panel property with in-valid data	Validate the delivery contribution page with in-valid data	R1	R_02

Figure 4 Test Scenario

Test Scenerio_id	Test Case_id	Test Case Description	Pre-requisite	Test Data Parameters		Steps to execute	Test data	Expected Result	Actual Result	Test Result
ACCESS_COMMON_FLOOR_01	ACCESS_COMMON_FLOOR_01_TC_01	Verify the common floor accessablity	User should have proper internet		1	Open the application	Android device	the application 'angel wings ' should open	chrome browser opened	pass
			Common Floor application should be asscessible		2	Access to common floor (home page)		Common Floor application website should open	Common Floor application website is opened	
FUNCTION_COMPONENTS_02	FUNCTION_COMPONENTS_01_TC_01	Verify Donate dry ration: button	User should have proper internet		1	Open the application	Android device	the application 'angel wings ' should open	chrome browser opened	pass
			Common Floor application should be asscessible		2	Access to common floor (home page)		Common Floor application website should	Common Floor application website is	
					3	select Donate dry ration: button		should be Navigated to donate dry ration page.	Navigated to donate dry ration page.	
FUNCTION_COMPONENTS_02	FUNCTION_COMPONENTS_01_TC_02	Verify the fields	User should have proper internet		1	Open the application	Android device	the application 'angel wings ' should open	chrome browser opened	pass
			Common Floor application should be asscessible		2	Access to common floor (home page)		Common Floor application website should	Common Floor application website is	
				String msg = 'need some help with moving the food containers from pick	3	Enter your description in Description goes here : Text Box.		Description goes here : Text Box data should be sent to the other party	Description goes here : Text Box data is sent to the other party	

Figure 5 Test cases

Requiren	Test Scenario_ID	Test Case_ID	Test Result	Defect_ID
R_01	ACCESS_COMMON_FLOOR_01	ACCESS_COMMON_FLOOR_01_TC_01	Pass	
R_02	FUNCTION_COMPONENTS_02	FUNCTION_COMPONENTS_02_TC_01	Pass	
		FUNCTION_COMPONENTS_02_TC_02	Pass	
		FUNCTION_COMPONENTS_02_TC_03	Pass	
		FUNCTION_COMPONENTS_02_TC_04	Pass	
		FUNCTION_COMPONENTS_02_TC_05	Pass	
		FUNCTION_COMPONENTS_02_TC_06	Pass	
R_02	FUNCTION_COMPONENTS_03	FUNCTION_COMPONENTS_03_TC_01	Pass	
		FUNCTION_COMPONENTS_03_TC_02	Pass	
		FUNCTION_COMPONENTS_03_TC_03	Pass	
		FUNCTION_COMPONENTS_03_TC_04	Pass	
		FUNCTION_COMPONENTS_03_TC_05	Pass	
		FUNCTION_COMPONENTS_03_TC_06	Pass	
R_02	FUNCTION_COMPONENTS_04	FUNCTION_COMPONENTS_04_TC_01	Pass	
		FUNCTION_COMPONENTS_04_TC_02	Pass	
		FUNCTION_COMPONENTS_04_TC_03	Pass	
		FUNCTION_COMPONENTS_04_TC_04	Pass	
		FUNCTION_COMPONENTS_04_TC_05	Pass	
		FUNCTION_COMPONENTS_04_TC_06	Pass	
R_02	FUNCTION_COMPONENTS_05	FUNCTION_COMPONENTS_05_TC_01	Pass	
		FUNCTION_COMPONENTS_05_TC_02	Pass	
		FUNCTION_COMPONENTS_05_TC_03	Pass	
		FUNCTION_COMPONENTS_05_TC_04	Pass	
		FUNCTION_COMPONENTS_05_TC_05	Pass	
		FUNCTION_COMPONENTS_05_TC_06	Pass	
		FUNCTION_COMPONENTS_05_TC_07	Pass	
R_02	FUNCTION_COMPONENTS_06	FUNCTION_COMPONENTS_06_TC_01	Pass	
		FUNCTION_COMPONENTS_06_TC_02	Pass	
		FUNCTION_COMPONENTS_06_TC_03	Pass	
		FUNCTION_COMPONENTS_06_TC_04	Pass	
		FUNCTION_COMPONENTS_06_TC_05	Pass	
R_02	FUNCTION_COMPONENTS_07	FUNCTION_COMPONENTS_07_TC_01	Pass	
		FUNCTION_COMPONENTS_07_TC_02	Pass	
		FUNCTION_COMPONENTS_07_TC_03	Pass	
		FUNCTION_COMPONENTS_07_TC_04	Pass	
		FUNCTION_COMPONENTS_07_TC_05	Pass	
R_02	FUNCTION_COMPONENTS_08	FUNCTION_COMPONENTS_08_TC_01	Pass	
		FUNCTION_COMPONENTS_08_TC_02	Pass	
		FUNCTION_COMPONENTS_08_TC_03	Pass	
		FUNCTION_COMPONENTS_08_TC_04	Pass	
R_02	FUNCTION_COMPONENTS_09	FUNCTION_COMPONENTS_09_TC_01	Pass	
		FUNCTION_COMPONENTS_09_TC_02	Pass	
		FUNCTION_COMPONENTS_09_TC_03	Pass	
		FUNCTION_COMPONENTS_09_TC_04	Pass	
R_02	FUNCTION_COMPONENTS_10	FUNCTION_COMPONENTS_10_TC_01	Pass	
		FUNCTION_COMPONENTS_10_TC_02	Pass	
		FUNCTION_COMPONENTS_10_TC_03	Pass	
		FUNCTION_COMPONENTS_10_TC_04	Pass	
R_02	FUNCTION_COMPONENTS_11	FUNCTION_COMPONENTS_11_TC_01	Pass	
		FUNCTION_COMPONENTS_11_TC_02	Pass	
		FUNCTION_COMPONENTS_11_TC_03	Pass	
		FUNCTION_COMPONENTS_11_TC_04	Pass	

Figure 6 Requirements Traceability Matrix

Conclusion

The project angel wings have started targeting towards ending world hunger by 2030, aligning with UNICEF's SDG-2. The project was carried out for several months including heavy analysis, research and implementation with the newest technologies currently used in the IT industry, resulting in an android app. The android app bridges the gap between the direct and indirect stakeholders involved in hunger ending project in Sri Lanka, by connecting many communities, individuals, societies, and people who are in need together where this kind of solution in Sri Lanka nor internationally at this moment.

The project deliverable, the android app can have different user levels for admin users and donors/delivery partners. An admin simply has elevated access to view, edit, update and delete records that have been registered. The other users can donate excess food, dry

rations or contribute by delivering the marked donations to the end locations after registrations. We are targeting the city of Colombo to do our POC when this goes live, and the main reason is Colombo stands top in the Sri Lanka Hunger Index according to the Asian Development Bank database.

We sincerely are hoping to serve the nation as a charity through this app targeting to contribute to the hunger ending cause initiated by UNICEF even by a little, and we are certain we definitely will make an impact towards the positive results.

References

[1] J. Blesh, L. Hoey, A. Jones, H. Friedmann and I. Perfecto, "Development pathways toward "zero hunger"", World Development, vol. 118, pp. 1-14, 2019. Available: 10.1016/j.worlddev.2019.02.004.

[2] B. Chichaibelu, M. Bekchanov, J. von Braun and M. Torero, "The global cost of reaching a world without hunger: Investment costs and policy action opportunities", Food Policy, vol. 104, p. 102151, 2021. Available: 10.1016/j.foodpol.2021.102151.

[3] K. Mottaleb, F. Fatah, G. Kruseman and O. Erenstein, "Projecting food demand in 2030: Can Uganda attain the zero hunger goal?", Sustainable Production and Consumption, vol. 28, pp. 1140-1163, 2021. Available: 10.1016/j.spc.2021.07.027.

[4] P. Pingali and M. Plavšić, "Hunger and environmental goals for Asia: Synergies and trade-offs among the SDGs", Environmental Challenges, vol. 7, p. 100491, 2022. Available: 10.1016/j.envc.2022.100491.

[5] "SDG Blueprint | SDG 02", Blueprint.unglobalcompact.org, 2022. [Online]. Available: https://blueprint.unglobalcompact.org/sdgs/sdg02/#narrative. [Accessed: 17- Aug- 2022].

[6] "Achieving Zero Hunger by 2030: A Review of Quantitative Assessments of Synergies and Trade-offs amongst the UN Sustainable Development Goals | Knowledge for policy", Knowledge4policy.ec.europa.eu, 2022. [Online]. Available:

https://knowledge4policy.ec.europa.eu/publication/achieving-zero-hunger-2030-review-quantitative-assessments-synergies-trade-offs-amongst_en. [Accessed: 17- Aug- 2022].

[7]"Achieving Zero Hunger by 2030: A Review of Quantitative Assessments of Synergies and Trade-offs amongst the UN Sustainable Development Goals | Knowledge for policy", Knowledge4policy.ec.europa.eu, 2022. [Online]. Available: https://knowledge4policy.ec.europa.eu/publication/achieving-zero-hunger-2030-review-quantitative-assessments-synergies-trade-offs-amongst_en. [Accessed: 17- Aug- 2022].

[8]"UN Report: Global hunger numbers rose to as many as 828 million in 2021", Who.int, 2022. [Online]. Available: https://www.who.int/news/item/06-07-2022-un-report--global-hunger-numbers-rose-to-as-many-as-828-million-in-2021. [Accessed: 17- Aug- 2022].

[9]"Sri Lanka", Global Hunger Index (GHI) - peer-reviewed annual publication designed to comprehensively measure and track hunger at the global, regional, and country levels, 2022. [Online]. Available: https://www.globalhungerindex.org/sri-lanka.html. [Accessed: 17- Aug- 2022].

[10]"10 Facts About Child Hunger in the World", World Food Program USA, 2022. [Online]. Available: https://www.wfpusa.org/articles/10-facts-child-hunger/. [Accessed: 17- Aug- 2022].

[11]"Child Mortality - UNICEF DATA", UNICEF DATA, 2022. [Online]. Available: https://data.unicef.org/topic/child-survival/under-five-mortality/. [Accessed: 18- Aug- 2022].

[12]"5 facts about food waste and hunger | World Food Programme", Wfp.org, 2022. [Online]. Available: https://www.wfp.org/stories/5-facts-about-food-waste-and-hunger. [Accessed: 18- Aug- 2022].

[13]"SDG Goal 2: Zero Hunger - UNICEF DATA", UNICEF DATA, 2022. [Online]. Available: https://data.unicef.org/sdgs/goal-2-zero-hunger/. [Accessed: 19- Aug- 2022].

[14] N. Deyshappriya, "An Empirical Analysis on Food Insecurity in Sri Lanka", Empirical Economic Review, vol. 2, no. 2, pp. 81-105, 2019. Available: 10.29145/eer/22/020105.

[15]"Where to Donate Your Leftover Food in Sri Lanka", kolomthota, 2022. [Online]. Available:https://kolomthota.com/pulse-lk/where-to-donate-your-leftover-food-in-sri-lanka/. [Accessed: 19- Aug- 2022].

[16] Oddbox.co.uk, 2022. [Online]. Available: https://www.oddbox.co.uk/blog/7-apps-that-are-helping-reduce-food-waste. [Accessed: 19- Aug- 2022].