DAAN

CONNECTING CONCEPTS AND PAVING A FOOD SECURE PHILIPPINES

LIST OF ACRONYMS

AFID	Agriculture and Fisheries Information Division
ANZSOG	Australia and New Zealand School of Government
APF	Asia Pacific Foundation (of Canada)
API	Application Programming Interface
APP	Application (Smartphone)
ARTA	Anti-Red Tape Authority
ASEAN	Association of Southeast Asian Nations
CIA	Central Intelligence Agency
DA	Department of Agriculture
DICT	Department of Information and Communications Technology
DILG	Department of the Interior and Local Government
DOE	Department of Energy
EDB:	Economic Development Board
ESCAP	Economic and Social Commission for Asia and the Pacific
EVOSS	Energy Virtual One Stop Shop
FAO	Food Authority Organization
GDP	Gross Domestic Product
GNR	Global Nutrition Report
GovTech	Government Technology Agency
IATF	Inter-Agency Task Force
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
LGU	Local Government Unit
MMDA	Metropolitan Manila Development Authority
MPA	Maritime and Port Authority (of Singapore)
NCR	National Capital Region
NGA	National Government Agency
OFW	Overseas Filipino Worker
PNA	Philippine News Agency
PNP	Philippine National Police
PSA	Philippine Statistical Authority
SDG	Sustainable Development Goal
SFA	Singapore Food Authority
SFFs	Small Farmers and Fisherfolk
TWG	Technical Working Group
UAP	Urban Agriculture Program
UI	User Interface
UN	United Nations
UNICEF	United Nations Children's Fund
UX	User Experience
WEF	World Economic Forum
WFP	World Food Programme
WHO	World Health Organization

CURRENCY CONVERSION

PHP 55 = CHF 1

CONTENTS

ABSTRACT

Food insecurity and malnutrition are ongoing crises evidenced by the widening gap to achieve Sustainable Development Goal (SDG) 2: Zero Hunger, and are predicted to worsen due to the onset of COVID-19. Achieving food security is an outcome of the food system, which is impacted by and contributes to shaping climate systems, ecosystems, and socio-economic systems; hence, food security significantly impacts society's vulnerabilities and risk to future crises. In highly urbanized areas such as the National Capital Region (NCR) of the Philippines and the city-state of Singapore, logistics plays a major role in achieving food security, and in the sustainable development of both rural and urban areas. This project proposes a solution to the crises of food insecurity and malnutrition in the NCR through "DAAN". Daan is the Filipino word that could mean "road", "way", or the verb "pass". Just like roads that pave ways for people to explore and go from one destination to another, our project explores and connects the concepts of food security, nutrition, governance, logistics, and digital transformation to address the hunger crises exacerbated by COVID-19. This project draws from Singapore's strategies in maintaining food system resilience amidst a pandemic, and the Philippine government's historical trend of ambitious but slow digital transformation to propose DAAN: a smartphone application that utilizes Bluetooth based authentication to speed up the checkpoint passing process and keep track of food stock flows. DAAN digitizes the Philippines' "Food Pass" to promote systemic coordination, efficient logistics, and data driven planning to reduce food waste and food prices. Ultimately, DAAN aims to contribute to achieving SDG 2 by enhancing food system resiliency for food security and proper nutrition, which would decrease the vulnerabilities and risk to future crises of NCR.

Keywords: Food security, nutrition, digital transformation, logistics, Singapore, Philippines, NCR, multi-level governance, smartphone application, zero hunger

ABOUT THE TEAM

Brigitte is passionate about sustainability issues such as food, energy and water security, and believes that human agency, development, education, and empowerment are key to sustainable lifestyles and futures. She has worked as a teacher, business development officer for a solar company, and capacity development associate for the UNDP. Her current research in the University of Saskatchewan focuses on the social value of community renewable energy systems. She is an advocate for quality education for all, women empowerment, and companion animal welfare.

Arlene is currently pursuing an International Master of Business Administration (IMBA) at National Chengchi University, Taiwan. After graduating from Ateneo de Manila University with a Bachelor of Science in Management of Applied Chemistry, she started her career as a procurement professional, working in various industries ranging from a small-to-medium enterprises to a multinational company, to deliver cost savings through process efficiencies. Her interest in creating sustainable businesses led her to pursue her MBA. Her research interest is on procurement's pivotal role in sustainable business models.

Inez graduated from the Singapore Management University with a degree in Information Systems and Corporate Communications. Her passion in information technology spurred her to embark on the Geneva Challenge as she seeks to bring digital solutions to help the greater community. Inez is currently pursuing her International Masters of Business Administration at the National Chengchi University as she continues to learn how to ensure that projects embarked on are of value that can bring impact to others.

INTRODUCTION

The central role of food in human development and economic growth has long been understood and acknowledged (Misselhorn et al., 2012; Sen, 1983, 1993). However, the climatic, ecological, and socio-economic dimensions of food systems are constantly under gradual emerging pressures like urbanization (Satterthwaite et al., 2010), and sudden shocks and disruptions like the COVID-19 pandemic (O'Hara & Toussaint, 2021). In addition, the cascading effects of sustained and sudden pressures on food systems perpetuate deeply; whether by reducing the capabilities of individuals to pursue livelihoods for economic well-being (FAO, 2014; Sen, 1983, 1993) or by causing disproportionately negative health impacts due to strained public health infrastructures (GNR, 2020) and increased vulnerabilities, as evidenced during the pandemic (Mertens & Peñalvo, 2021). Hence, understanding vulnerabilities in food systems, and directing capacities at ensuring accessible and affordable nutritious food through resilient food systems are imperative (UNDP, 2016, 2019, 2020).

Considering the diverse dimensions of food systems and their vulnerabilities that multiply the risks to individuals and societies, it is evident that current and future approaches to the governance and management of food systems should be informed by a systemic understanding of its complexities (Maxwell & Slater, 2003; Sonnino et al., 2019). As Sen (1983) demonstrated through his pioneering work, disruptions in food systems and incidences of widespread hunger are predominantly a fallout of mismanaged governing structures and markets focused on a narrow selection of the multiple dimensions of the food system.

A Metro Manila resident carrying food items home. (Source: CNN Philippines, 2021)

Given the complex and systemic nature of food security, this project looks at digital transformation as an equally encompassing concept to propose an innovation to the crises of food insecurity and malnutrition in the National Capital Region (NCR) of the Philippines. According to Bican & Brem (2020), digital technologies have the potential to catalyze systemic change and to orchestrate a digital transformation, which they define as the outcome of digital interplay that is contingent on internal organization and external cooperation, and requires the acceptance of profound change and implications. In addition, a review by Hrustek (2020) suggests that a digitally transformed agricultural sector could cope with complex economic, social and environmental challenges. Drawing from these, we propose DAAN as a mobile application that digitizes the Philippine government's "Food Pass" to strengthen the country's food system resiliency, and contribute to the country's ambitious digital transformation strategies.

This project focuses on NCR as the innovation beneficiary because it is the most populated region in the Philippines, and the only megacity in a lower-middle income country that is at high risk of more than three types of natural disasters[1] worldwide (UN, 2018a, 2018b). In addition, with parts of the region near the coastline, it is constantly threatened by sea-level rise and intensified natural disasters caused by climate change (Porio, 2011). Furthermore, over three million of NCR's inhabitants lived below the poverty line in 2018 (PSA, 2021). Hence, NCR contains an extremely dense population that is vulnerable to crises caused by natural disasters, climate change, rapid urbanization, inequalities, and other social problems; and could benefit tremendously from interventions for crises management.

Commuters rush along the busy streets of Manila's Divisoria Market. (Source: CNN Philippines, 2021)

A table at the Los Piletones soup kitchen at Buenos Aires, Argentina. (Source: NBC News, 2018)

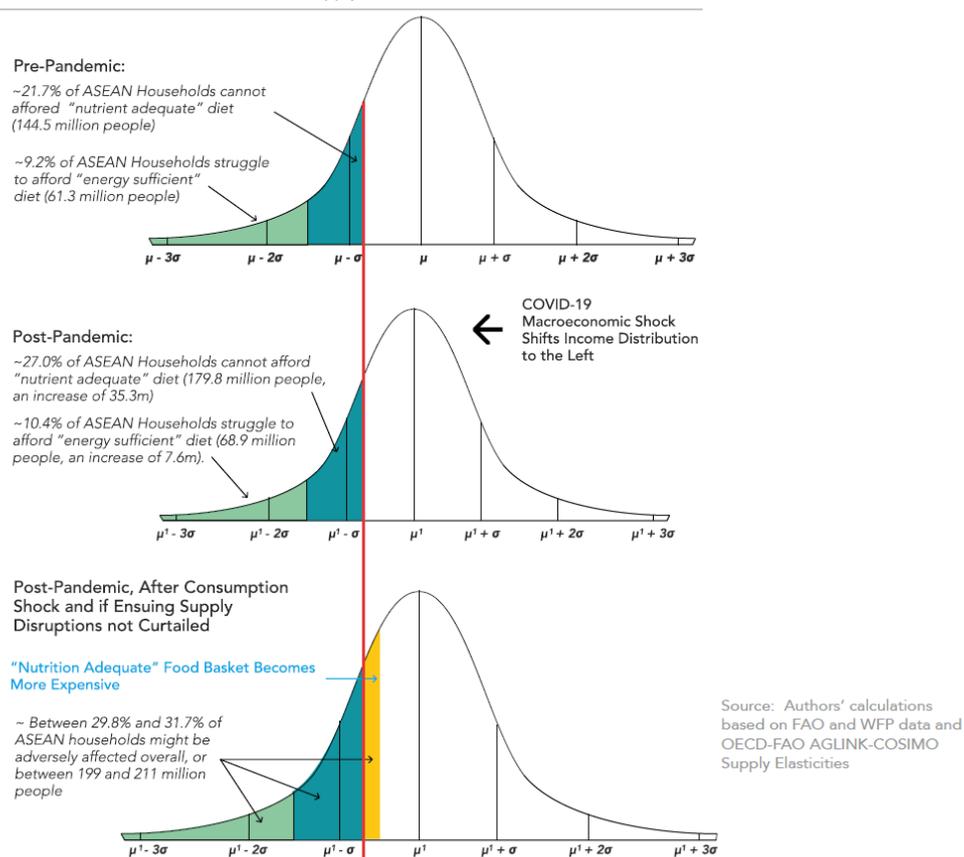## Section 1: Food insecurity and malnutrition as development challenges

The Food and Agriculture Organization (FAO) of the United Nations (UN) defines food security as the situation where "all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). Achieving food security is part of the Sustainable Development Goals (SDGs) as SDG 2: Zero Hunger (UN, 2021b). However, since 2014, the global population suffering from food insecurity has been increasing; in 2019, 2 billion people—which accounts for approximately 26% of the world's population—suffered from food insecurity due to income or resource limitations (UN, 2021a). This is predicted to worsen with the onset of the COVID-19 pandemic in 2020 (APF of Canada, 2021; FAO et al., 2020). SDG 2 also aims to eliminate malnutrition, which is highly impacted by food security. Households that are severely or moderately food insecure have a much higher chances of experiencing malnutrition than those who are food secure and could afford and access nutritious food (APF of Canada, 2021; FAO et al., 2020).

FAO et al. (2020) explains that lower income countries consume more staples such as cereals, roots, tubers and plantains compared to higher income countries that consume more nutrient-rich food such as fruits, vegetables, meat, fish and dairy products. This is because the price of staples is more stable, and can be 10 times cheaper than nutrient-rich foods (APF of Canada, 2021). According to the Asia Pacific

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[1]Natural disasters include typhoons, floods, droughts, earthquakes, landslides and volcanic eruptions. Megacity is defined as a city with more than 10 million people (UN, 2018a).

Figure 1: Ramifications if COVID-19 Induced Supply Shocks are not Curtailed

Ramifications if COVID-19 Induced Supply Shocks are not Curtailed

Pre-Pandemic:

~21.7% of ASEAN Households cannot afford "nutrient adequate" diet (144.5 million people)

~9.2% of ASEAN Households struggle to afford "energy sufficient" diet (61.3 million people)

Post-Pandemic:

~27.0% of ASEAN Households cannot afford "nutrient adequate" diet (179.8 million people, an increase of 35.3m)

~10.4% of ASEAN Households struggle to afford "energy sufficient" diet (68.9 million people, an increase of 7.6m).

COVID-19 Macroeconomic Shock Shifts Income Distribution to the Left

Post-Pandemic, After Consumption Shock and if Ensuing Supply Disruptions not Curtailed

"Nutrition Adequate" Food Basket Becomes More Expensive

~ Between 29.8% and 31.7% of ASEAN households might be adversely affected overall, or between 199 and 211 million people

Source: Authors' calculations based on FAO and WFP data and OECD-FAO AGLINK-COSIMO Supply Elasticities

Foundation of Canada (APF) (2021), 21.7% of the population in the Association of Southeast Asian Nations (ASEAN) could not afford "nutrient adequate" diets before the onset of COVID-19. This is estimated to rise to 27% or by 35.5 million people after the onset of COVID-19, due to an approximate 7% decrease in peoples' income (APF of Canada, 2021) (Figure 1).

From a conceptual standpoint, malnutrition prevents people from attaining good health, and limits their capability to live a life that they would value; this prevents human development and fosters poverty (Sen, 1993). From a development economics perspective, malnutrition and food insecurity are barriers to development because the capacities of unhealthy people to work are limited, and would adversely affect a country's gross domestic product (GDP) (FAO, 2014; Timmer, 2005). In addition, malnutrition increases the vulnerabilities of people to illnesses, which could strain public health facilities (GNR, 2020). This is especially true during the COVID-19 pandemic where countries with higher incidence of malnutrition had increased rates of fatal COVID-19 (Mertens & Peñalvo, 2021). Ultimately, malnutrition diminishes people's capacity to live well, and the impedes society's sustainable development (FAO, 2014; Sen, 1983).

Table 1: Comparison of NCR and Singapore

	Singapore	NCR
Geographic Subregion	Southeast Asia	Southeast Asia
Country's income group	High-income	Lower-middle-income
Population density as of 2018 (number of people per km^2)	8,053	21,099
Annual rate of population growth from 2018-2030 (%)	0.8%	1.9%
Global Food Security Index Southeast Asia rank| global rank	1st | 19th	7th | 73rd

*Data from (The Economist, 2021; UN, 2018a, 2018b)

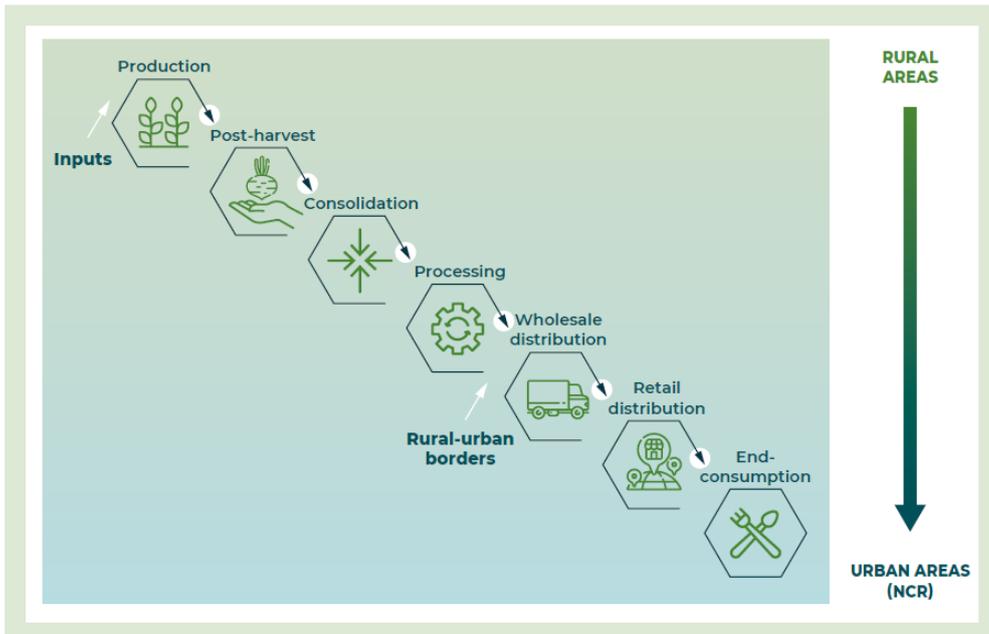# Section 2: Comparing food security and nutrition in the Philippines and Singapore

To highlight food insecurity and malnutrition in the NCR, this section presents statistics and narrates how these problems were exacerbated with the onset of COVID-19. In addition, to understand the extent of the problem, the status of food security in Singapore is presented as a benchmark for gap analysis (Parasuraman et al., 1985). Singapore was chosen as the benchmark demonstrating the ideal level of food security because its Global Food Security Index ranks 1st in Southeast Asia, and 19th worldwide (Table 1) (The Economist, 2021). Its dependence on neighboring territories for food supply is also comparable to NCR's situation. However, it must be noted that Singapore is classified as a high-income country, while the NCR is in a lower-middle-income country, and is much more densely populated with a faster annual population growth rate than Singapore (UN, 2018a, 2018b).

2.1 Food Security and Nutrition in NCR

NCR is comprised of 17 cities that are autonomously governed by different Local Government Units (LGUs), who are regulated by the Department of the Interior and Local Governments (DILG) (Boquet, 2017b; DILG, 2021). Another important regulating agency within NCR is the Metropolitan Manila Development Authority (MMDA), which is mandated to craft and implement integrated development plans related to transport decongestion, climate change, waste management, and disaster prevention for the benefit of the cities under its jurisdiction (An Act Creating the MMDA, 1994). These government agencies play an important role in policy making and regulating socio-economic activities that could address or exacerbate food insecurity (Mbow et al., 2019; World Bank, 2020).

Like most cities, NCR is dependent on its neighboring peri-urban and urban provinces for food (FAO, 2021; Iaquinta & Drescher, 2002). This fosters an urban-rural interdependency that promotes

shared resources and growth (Akkoyunlu, 2015), but also contributes to the indirect vulnerability of the megacity (Gotangco et al., 2017). The food supply chain of NCR involves seven main processes (Figure 2), with wholesale distribution as the process that creates the rural-urban continuum (Akkoyunlu, 2015; Palo et al., 2020). Gotangco et al. (2017)'s assessment of NCR's indirect vulnerabilities using a supply chain framework (Figure 3) suggests that natural and man-made disruptions at the rural sources of rice and water, and disruptions during the distribution process significantly contribute to NCR's indirect and direct vulnerabilities.

Increased indirect vulnerabilities exacerbate the direct vulnerabilities of NCR, which reduces the livability and sustainability of the megacity (Gotangco et al., 2017). This concept was clearly manifested during the onset of the COVID-19 pandemic in March 2020, where lockdowns and quarantine measures nationwide temporarily disrupted the food supply chain of NCR (Arcalas, 2020; Palo et al., 2020). With barriers to local transportation and inter-provincial roadblocks, perishable food supply to NCR decreased, which caused prices of nutritious food to rise (de Vera, 2020; Mapa, 2020).

Figure 3: Supply chain framework of indirect vulnerability (Gotangco et al., 2017)
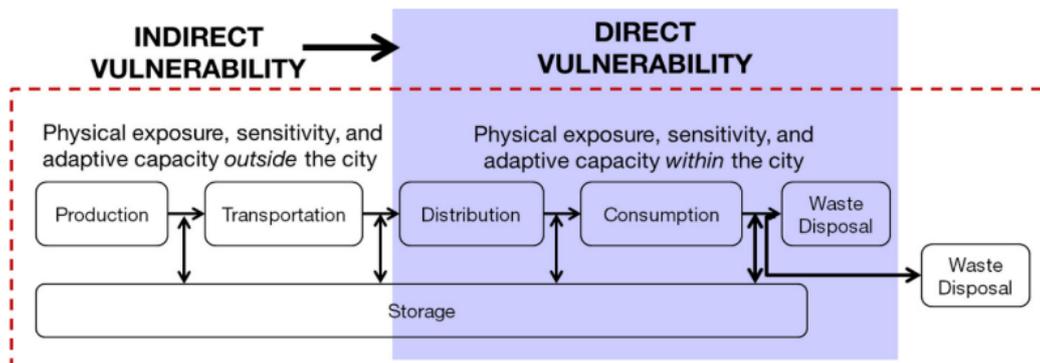
> **Box 1: OFWs and food insecurity during COVID-19**
>
> One major source of Filipino households' income comes from Overseas Filipino Workers (OFWs) foreign remittances (Yang, 2011). In 2019, the incoming remittances to the Philippines ranked as the fourth largest in the world at USD 35.176 million, making up almost 10% of the country's GDP (Knomad, 2021). However, Murakami et al. (2021) predict that layoffs caused by the pandemic would cause this to decrease by 14-20% in 2020, which would cause food expenditure to decrease by 1-2%. The majority of OFWs work blue collar jobs abroad, and their families in the Philippines depend on the incoming remittances for household expenditures including food (Boquet, 2017a; Semyonov & Gorodzeisky, 2004). Hence, even a 1-2% decrease in food expenditure due to a decrease in remittances by OFWs could translate to a significant increase in the number of vulnerable people experiencing food insecurity in the country.

Due to COVID-19, approximately 70% of the country's population became unemployed or underemployed, with 2.2 million workers losing their jobs due to business closures (IATF TWG for Anticipatory and Forward Planning, 2020; Palo et al., 2020). The livelihoods of rural farmers, food suppliers and dealers were also negatively impacted by COVID-19 because road lockdowns and market closures prevented them from distributing and selling their local harvest (Arcalas, 2020). This led to massive food waste and intensified food insecurity both in NCR where the urban poor[2] could not afford the rising prices of nutritious food (APF of Canada, 2021; Palo et al., 2020); and in the rural areas where farmers could not purchase various food products due to lost income (Conde, 2020).

As citizens of a lower-middle income country, two-thirds of all Filipino households cannot afford healthy diets due to the high cost of nutritious food relative to their income (FAO, 2021). In the Philippines, a healthy diet is comprised of 103 grams of meat, 103 grams of fruit, 200 grams of vegetable, and 200 grams of rice daily for the average Filipino adult (Palo et al., 2020). In NCR, 35% of all households cannot afford healthy diets (FAO, 2021). This translates to 4.69 million people as of 2018 who suffer from malnutrition due to the high cost of a nutritious diet. The disrupted food supply chain, local layoffs, and decreased incoming remittances (Box 1) are all predicted to contribute to lower purchasing power, unaffordable food prices, and an increase in malnutrition incidences in the Philippines amidst COVID-19 (FAO, 2021; Palo et al., 2020).

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[2] The word "poor" is defined as "individuals and families whose income fall below the poverty threshold as defined by NEDA and/or cannot afford in a sustained manner to provide their minimum basic needs of food, health, education, housing and other essential amenities of life" (Social Reform and Poverty Alleviation Act, 1997). As of 2019, NEDA identifies a person living with an income below PHP 12,577 (approximately CHF 233.79) a month as poor (NEDA, 2019). Urban poor can therefore be described as people living under the poverty threshold in the urban area.

2.2 Food Security and Nutrition in Singapore

According to the CIA (2021), Singapore is considered a city-state with a total land area of 709.2 sq.km, making it one of the smallest countries in the world. Despite the country's relatively small population of 5.8 million as of July 2021, it has the fifth-highest real GDP per capita of USD 97,341 worldwide (CIA, 2021). Based on 2017 estimates, 75.2% of its GDP came from services, 24.8% from industrial activities, and 0% from agriculture (CIA, 2021).

A majority of Singapore's land is allocated for industrial activities, with only 1% allocated as agricultural land (CIA, 2021). Due to this situation, the country is heavily reliant on imported food other countries (Figure 4).

To manage the country's food sources, the Ministry of the Environment and Water Resources established the Singapore Food Agency (SFA) as a statutory board in 2019 to consolidate all food security efforts (SFA, 2021).

Figure 4: Singapore's food sources (SFA, 2020)
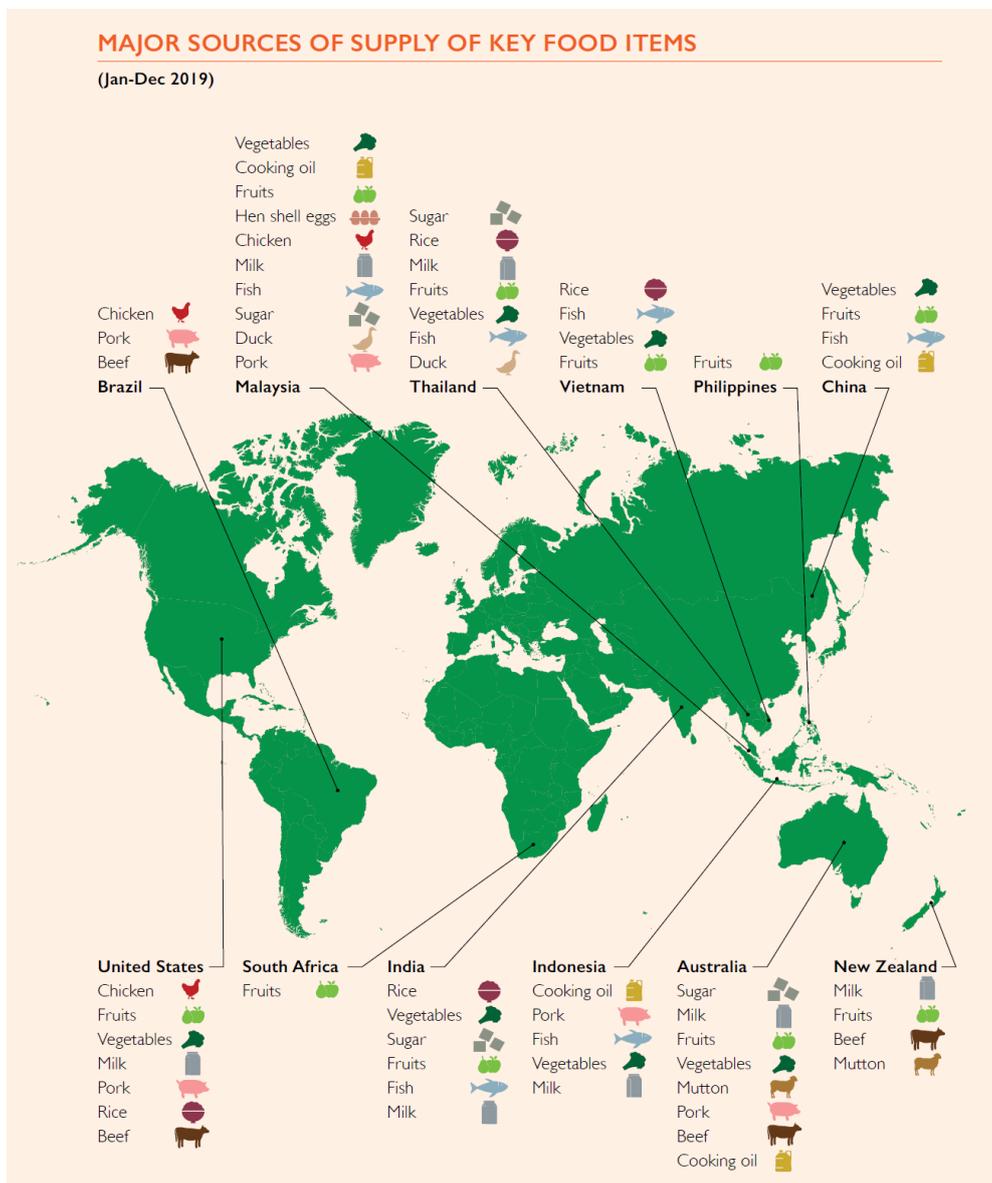
Innovations such as urban gardening on rooftops and carpark structures and farming at sea in Singapore will allow increased local food production despite limited agricultural land (Image from Lim (2021)).

The mandate of the SFA is to ensure sufficient food supply for Singapore's inhabitants (SFA, 2021). The country currently adopts a "three food baskets" strategy to ensure food security. The three-prong strategy is to "diversify import sources; raise local production; and encourage firms to grow food overseas" (SFA, 2020).

To diversify import sources, Singapore established free trade agreements with multiple countries. For instance, Singapore's fruits are imported from Malaysia, China, and South Africa, United States, India, the Philippines, Australia, New Zealand, Vietnam, and Thailand (SFA, 2020). Realizing that heavy reliance on imported food can be risky, the SFA also aims to boost local food production and source 30% of its food locally by 2030, through significant investments in research and development (Koh, 2020; SFA, 2020; Teng, 2020). Lastly, Singapore supports its local companies in growing food overseas by facilitating networking, and providing financial programs for private food enterprises (Enterprise Singapore, 2021; SFA, 2020).

Box 2: Singapore's public investment in logistics
Singapore's government has extensively invested in developing logistic capabilities through initiatives such as the National Single Window, a platform that streamlines all the permit approval process digitally (Lam & Ramakrishnan, 2017); hence, despite Singapore's small land mass and population, it ranks as one of the world's top sea and air cargo hubs (MPA Singapore, 2021; Tongzon, 2018). In terms of in the food supply chain, the government's investments include cold chain centers, automated services, and data analytics capabilities (Lam & Ramakrishnan, 2017). These investments in the logistics infrastructure, coupled with their trade-friendly policies has contributed immensely to the food security of the country (Teng, 2020).

When COVID-19 cases increased in Singapore last February 2020, panic-buying broke out but food shortage did not occur (Youjin & Chandra, 2020). In addition, when the government initiated its first stay-at-home order on April 7, 2020 (COVID-19 (Temporary Measures) Act 2020, 2020), people rushed to the supermarkets again to stockpile goods; but food supply and prices in the country remained stable despite the sudden increase in demand (Koh, 2020). These incidences illustrate the resiliency of Singapore's food supply chain even during a pandemic.

Section 3: Philippines' solutions for food resiliency during COVID-19

Given the crippling effect of COVID-19 on NCR's food system, several government and civil society initiatives came up to address issues that aggravated food insecurity and malnutrition. This section discusses these initiatives to set the context of the proposed innovation.

3.1 DA and civil society interventions in the Philippines

The Department of Agriculture (DA) is the Philippines' National Government Agency (NGA) mandated to promote "agricultural development by providing the policy framework, public investments, and support services needed for domestic and export-oriented business enterprises" (DA, 2021). According to a rapid assessment done by the FAO (2021), the DA implemented several policies as an emergency response to the disrupted food system due to COVID-19.

Among these included the Food Pass, *Kadiwa ni Ani at Kita* program, Urban Agriculture Program (UAP), price freeze, and a social amelioration program (Appendix A).

Aside from the DA's Kadiwa ni Ani at Kita program, several civil society organizations started initiatives to connect farmers to consumers through social media platforms, e-commerce websites, and support services that could decrease food waste and enhance food security. These include the Move Food Initiative (ENN & Scaling Up Nutrition Movement, 2020), Kids Who Farm (CIVICUS, 2020), Mayani.ph (Salterio, 2021) Rural Rising Philippines, Sadiwa, and Veggies for Good among others (Rappler.com, 2020). However, even with all these initiatives, communities around NCR still had limited access to food, and many continued to suffer from hunger, which is evidenced by the presence of the community food pantry initiative that started on April 14, 2021 (Box 3) (Cabato, 2021).

3.2 Government-issued "passes"

As a response to the escalating COVID-19 outbreak in March 2020, the Philippine President placed the entire island of Luzon under "enhanced community quarantine", which forbade the movement of people outside their houses except for essential workers and front liners (Community Quarantine over the Entire Luzon and Further Guidelines for the Management of the Coronavirus Disease 2019 (COVID-19) Situation, 2020).

The Scout Dr. Lazcano Community Pantry before it was shut down. (Source: Rappler Philippines, 2021)

Box 3. Boom of Community Pantries in the Philippines

On April 14, 2021, a Filipino civilian started the first community food pantry in NCR, which eventually became a trend that inspired more than 300 community pantries to operate around the whole country (del Castillo, 2021). The community food pantry solicits food donations from those who have food to spare so that those suffering from financial hardships could take what they need (Cabato, 2021; del Castillo, 2021). Although this is a great initiative by citizens to aid the government in assuring access to food by all during the pandemic, critics claim that it is also a sign that the local and national government agencies fall short in ensuring food security during the pandemic (Wong, 2021). In addition, unlike institutionalized food banks in developed countries (Riches, 2018), community pantries are only temporary solutions to food insecurity as they rely on the donations of private individuals and organizations, who are not obliged to supply food on a regular basis.

The Maginhawa Community Pantry, the first to open up to locals. (Source: Bloomberg, 2021)

During the initial lockdown instituted by the government, around 56 checkpoints were placed in NCR to restrict the movement of the people (Dela Cruz, 2020). However, these checkpoints also caused many delays and waiting times for the front liners, essential workers and severely delayed the deliveries of fresh produce (Tomacruz, 2020). As a response to this situation, the government launched a series of "passes" to reduce the bottlenecks, including the revival of the Food Pass (Box 4), a newly introduced RapidPass, and the S-Pass. A detailed description of these passes can be found in Appendix B, while Table 2 summarizes the three passes' purpose and features.

The presence of these three passes conveys two things. On one hand, it shows that there is an attempt to involve digital technology in facilitating unhampered essential movement, coordination and communication. On the other hand, the roll-out of multiple passes with varying application processes and requirements shows that there a lack of coordination within the different regulating agencies in the Philippines. The next section briefly discusses the Philippine government's strategies in digital transformation, and the conflicts arising from multi-level governance that impede this.

Table 2: Travel passes comparison

	Food Pass	RapidPass	S-Pass
Launch Date	December 2004, March 2017, March 2020	April 2020	March 2021
Level of Digitization*	1	3	2
Developer	N/A	DOST, DICT, DCTx	DOST
Purpose	To facilitate the movement of agricultural products from the provinces to the capital (NCR)	To reduce the bottleneck at the checkpoints and ensure the swift transit of frontliners and authorized personnel	To ensure the swift passage of the identified users and ensure that they have the proper authority to travel. To serve as the repository of the different travel requirements of LGU all located in one place.
Target users	Companies engaged in the deliveries of agricultural produce	Frontliners & Authorized personnel	Travelers, OFWs, Authorized personnel
Registration method	Application through email	Application through Website – Rapidpass.Ph	Application through website – S-Pass.Ph
Technology Leveraged	None	Smartphone application and website	Website
Implementation	Sticker issued by DA to be placed on the windshield	QR code (printed or digital) to be shown to the checkers	Travel permits to be shown to the checkers

*The following scale was adapted from Hanelt et al. (2015) to determine the level of digitization:
1: Purely physical pass
2: Digitally enhanced physical pass
3: Fully digitized pass

- **1987 CONSTITUTION, ARTICLE II (1986-1992)**
- **NATIONAL INFORMATION TECHNOLOGY PLAN FOR THE 21ST CENTURY (1992-1998)**
- **E-PHILIPPINES STRATEGY GOVERNMENT INFORMATION SYSTEMS PLAN (1998-2001)**
- **PHILIPPINE STRATEGIC ICT ROADMAP (2006-2010)**
- **PHILIPPINES DIGITAL STRATEGY (2011-2016)**
- **E-GOVERNMENT MASTER PLAN OF 2012**
- **PHILIPPINES DIGITAL TRANSFORMATION STRATEGY 2022**

Section 4: Philippine government's digital transformation strategies

The Philippine government has been prioritizing digital transformation as early as 1986 (Trece, 2021). The earliest mention of digitalization[3] was in the 1987 Constitution which highlighted the importance of developing Information and Communications Technology (ICT) in nation building (UN ESCAP, 2016). From 1986 to 2021, there have been several national ICT strategies and policy in place (Figure 5) (Trece, 2021; UN ESCAP, 2016).

These plans have led to significant efforts towards digital transformation in the Philippine government. They served as the regulatory framework for passing of the Data Privacy Act of 2012, Cybercrime Prevention Act of 2012, Executive Order no. 2 on the Freedom of Information, and the formation of the Department of Information and Communications Technology (DICT) as the lead agency to implement all public ICT efforts under Republic Act 10844 (Trece, 2021). These written plans show that various policies and initiatives for the Philippine Government's digital transformation are already in place; however, barriers to complete digital transformation persist.

4.1 Barrier of multilevel governance

One identified barrier for transitions in the Philippines is the multi-level governance structure that creates conflicts in power dynamics and unharmonized prerogatives of NGAs and LGUs (Marquardt, 2017). This barrier is applicable to digital transformations as well. For instance, the task of coordinating with different governing agencies to cooperate towards a digital transformation that centralizes and streamlines multi-level and multi-agency processes, has proven to be an extremely difficult feat that lags beyond their initial timelines without producing benefits for stakeholders. Instances of delayed and currently unsuccessful digital transformations towards centralization include the Department of Energy's (DOE) Energy Virtual One Stop Shop (EVOSS), which has been delayed

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[3]Bican & Brem (2020) describes digitalization as the application of digitization techniques as socio-technological processes; while digitization is the technical process where analog information is transformed into a digital format.

A delivery vehicle with the Food Pass sticker. (Source: CNN Philippines, 2020)

by more than a year[4] from its March 2020 target go live date (An Act Establishing the Energy Virtual One-Stop Shop for the Purpose of Streamlining the Permitting Process of Power Generation, Transmission, and Distribution Projects, 2018); and the Philippine Congress' Philippine Identification system (An Act Establishing the Philippine Identification System, 2017) which missed its target of issuing digitally stored identification numbers to 25 million citizens by September 2019 (CNN Philippines, 2020; Gatpolintan, 2018).

The Philippines has a multi-level governance structure in place where NGAs hold the most regulatory power to create policies, but implementation of these policies is contingent on the acceptance, financial and human capacities of LGUs (Marquardt, 2017). Conflicts in power dynamics of different government agencies have created barriers to improve traffic congestion in NCR (Sidel, 2020), and land-based logistics in the country (Box 4). The case of the Philippines is not unique, as power dynamics in multi-level governance have been cited as barriers to the implementation of environmental and socio-technical innovations and transitions in Scotland (Sugden et al., 2012), Australia, China and Bulgaria (Daniell et al., 2014). Hence, coordination, communication, cooperation and collaboration among different governing agencies are imperative for multi-level governments to implement policies, transitions and transformations sustainably, (Di Gregorio et al., 2019; Marquardt, 2017).

As a parallel effort to simplify the transportation of agri-fishery produce and commodities, the DA in conjunction with the MMDA, DILG, and the Philippine National Police (PNP) launched the "Food Lane Project" in 2004 (Accreditation Guidelines for the Food Lane Project, 2004), and then relaunched it in March 2017, as it was "forgotten" after its first launch (Pablo, 2017). For this project, the government designated specific food lane routes for delivery trucks of agricultural and fishery goods (DA-AFID, 2017). The food lanes could be used by trucks with a "Food Pass" sticker, which also exempts them from truck bans within NCR, and from paying fees at checkpoints to promote the availability of affordable food for consumers (DA-AFID, 2017). Although there are currently no explicit studies on the Food Lane Project to our knowledge, DA's geo-mapping[5] of food movement issues reveal that the Food Pass was not acknowledged by several LGUs
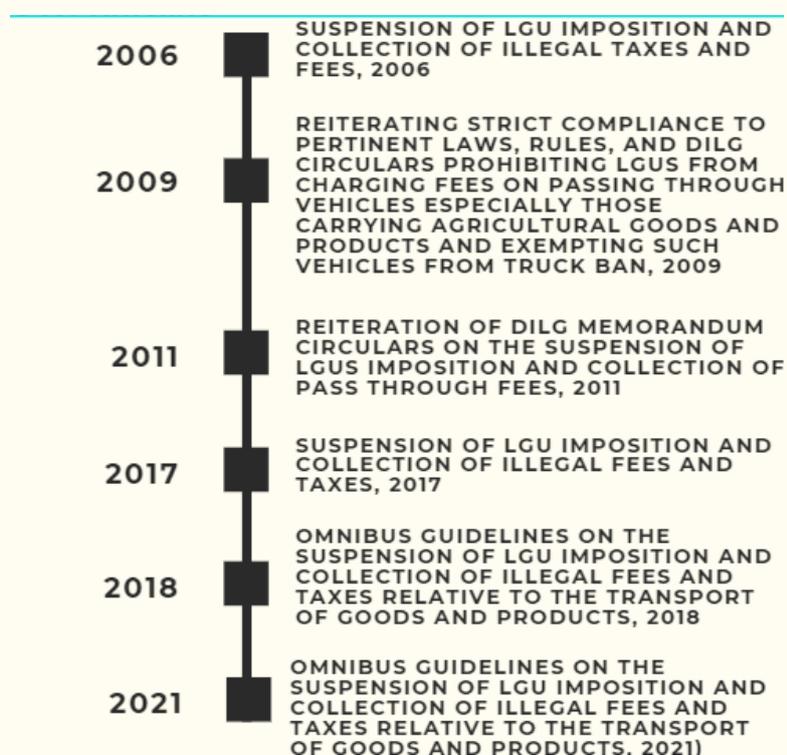
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[4]On August 2020, the Anti-Red Tape Authority (ARTA) had to intervene to hasten the implementation of the EVOSS (ARTA, 2020a). In addition, as of July 7, 2021 the EVOSS has still not been utilized by target users (energy developers and concerned government agencies) based on unstructured interviews with 3 employees of the DOE's Renewable Energy Management Bureau.

Box 4: Multi-level governance conflicts in logistics:

The concept of travel passes is not new. Before the COVID-19 pandemic, delivery trucks were subjected to various rules and regulations from different agencies and local governments. Depending on the truck's route, LGUs can charge the truck drivers various fees for passing through their territory (such as a "sticker fee") under Republic Act 7160, Section 141(The Local Government Code of the Philippines, 1991).

Due to the confusing and conflicting rules from different LGUs, NGAs and the complaints received from various stakeholders about illegal fees being collected at different checkpoints, the DILG issued a memorandum prohibiting the collection of illegal payments and taxes related to the transport of goods in 2006. However, this was frequently not enforced according to memorandums released by DILG in 2009, 2011, 2017, 2018, and the latest joint memorandum circular with the Anti-Red Tape Authority in January 2021, which cite that LGUs persist with collecting fees from cargo trucks, despite multiple orders from different NGAs that prohibit this.

Figure 6: Timeline of DILG's regulations prohibiting fees

2006 — SUSPENSION OF LGU IMPOSITION AND COLLECTION OF ILLEGAL TAXES AND FEES, 2006

2009 — REITERATING STRICT COMPLIANCE TO PERTINENT LAWS, RULES, AND DILG CIRCULARS PROHIBITING LGUS FROM CHARGING FEES ON PASSING THROUGH VEHICLES ESPECIALLY THOSE CARRYING AGRICULTURAL GOODS AND PRODUCTS AND EXEMPTING SUCH VEHICLES FROM TRUCK BAN, 2009

2011 — REITERATION OF DILG MEMORANDUM CIRCULARS ON THE SUSPENSION OF LGUS IMPOSITION AND COLLECTION OF PASS THROUGH FEES, 2011

2017 — SUSPENSION OF LGU IMPOSITION AND COLLECTION OF ILLEGAL FEES AND TAXES, 2017

2018 — OMNIBUS GUIDELINES ON THE SUSPENSION OF LGU IMPOSITION AND COLLECTION OF ILLEGAL FEES AND TAXES RELATIVE TO THE TRANSPORT OF GOODS AND PRODUCTS, 2018

2021 — OMNIBUS GUIDELINES ON THE SUSPENSION OF LGU IMPOSITION AND COLLECTION OF ILLEGAL FEES AND TAXES RELATIVE TO THE TRANSPORT OF GOODS AND PRODUCTS. 2021)

An approved applicant of the Foodlane Accreditation program. (Source: Romblon News, 2020)

during quarantine periods to contain the COVID-19 virus. This is a clear example of power conflict in multi-level governance because the LGUs have their own permits and restrictions in place, which supersedes the DA's Foodlane policy according to The Local Government Code of the Philippines (1991).

4.2 Factors for successful digital transformation

1. Adopt a culture of participatory collaboration

A collaborative approach is needed for a successful implementation. Given the different stakeholders involved in the project and the many layers of authority involved for a government's digital transformation, the importance of collaboration cannot be overemphasized (Noveck & Glover, 2019).

However, collaboration cannot simply be mandated from the top, as the Noveck and Glover (2019) highlight: "**it must be deliberately set in train in order to meet the coordination, information, and mobilization challenges that the public problems present** (Noveck & Glover, 2019)."

Learning from the case of India, back in 2009, it had the gargantuan task of implementing a national digital identity system called Aadhaar for its 1.15 billion citizens (WEF, 2017). Despite the scale of the project, the government was ultimately able to enroll and issue 1.15 billion digital identity numbers (WEF, 2017). The success of this project can be attributed to many factors, however two of the key factors were: (1) The decentralized approach adopted by the government which engaged private and public sector partners

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[5]DA's geo-mapping initiative for food resiliency during quarantine periods to contain COVID-19 was accessed through this link on July 1, 2021: https://bit.ly/DAgeomapping

effectively and (2) the meticulous planning of the sponsoring agency. This initiative has incurred around $1 billion in savings every year for the government (WEF, 2017).

Figure 7: Agile Methodology Framework (AgileAsia, 2021)
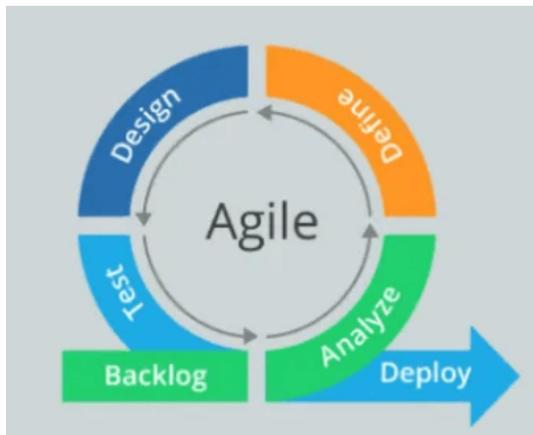
2. Implement an agile way of working

Given the scale of the project, one of the ways to overcome the inertia is to adopt an 'adaptive' mindset (Noveck & Glover, 2019). Under an adaptive mindset, it is important to adopt an agile way of working. Borrowing from the language of software development, rather than following the traditional, waterfall way of project management where the project follows a linear progression from ideation to implementation, agile way of working means to work in a loop – to always constantly iterate and improve (Estler et al., 2014). It's a continuous cycle of designing, creating, testing, analyzing, and improving.

Similar to how software companies release beta versions of their software, doing pilot testing for the solution in a target city and constantly improving is beneficial for the project implementation.

Breaking it down into smaller and manageable silos makes it easier to implement the project for the people involved (Noveck & Glover, 2019). A country that has been successful in fostering an agile perspective is Singapore. For instance, the Government Technology Agency (GovTech) of Singapore is tasked to implement the country's Smart Nation and Digital Government transformation, so it engages with the private sector to generate ideas in improving services and provides support and funding for digital innovations with potential to contribute to the digital transformation (GovTech, 2021). By adopting an open innovation model, Singapore's government can successfully implement numerous digital solutions in partnership with the private sector (Noveck & Glover, 2019).

Section 5: Lessons from Singapore and Philippines' governance trend

5.1 Public investments in digitalizing logistics for food security

Among other factors, the Singaporean government's long-term investments in logistics for food security (Box 2, pg. 13) makes Singapore much more food secure than the Philippines. Despite the global disruption of COVID-19 on food supply chains, Singapore's Global Food Security Index still ranked 19th worldwide, and 3rd in the Asia-Pacific region in 2020 (The Economist, 2021). Singapore's food security can be attributed to effective contingency planning by the SFA, extensive free trade agreements, and efficient logistics, as more than 90% of their food is imported from over 170 countries (Teng, 2020).

In the Philippines, the presence of logistical bottlenecks is a daily challenge for perishable food items that are transported to the NCR from agricultural provinces, despite numerous regulatory efforts by NGAs to eliminate bottlenecks caused by unscrupulous fees and requirements required by LGUs (Box 4). This was amplified during the onset of COVID-19 as LGUs imposed roadblocks to prevent the spread of COVID-19, and consequently hampered the movement of perishable goods (FAO, 2021; Palo et al., 2020; World Bank, 2020).

Learning from Singapore, and following the recommendations of the World Bank (2020), and NEDA (2017), digitalization of logistics is one way to eliminate bottlenecks in the food system to ensure efficient and quick delivery of perishable food items. Digitalization could also reduce food waste and food prices to promote affordable and accessible nutritious food to all city dwellers (FAO, 2019, 2021; FAO et al., 2020). Digitalization of logistics involves a wide array of technologies throughout the supply chain, including the use of apps to improve communication, coordination, logistics visibility and data collection for analytics and evidence-based planning (Kayikci, 2018).

5.2 Digital Technology for Food Pass

Poor coordination and power conflicts between the Philippines' DA and LGUs led to the inefficient implementation of the Food Lane project, which was first launched in 2004 (Accreditation Guidelines for the Food Lane Project, 2004; Pablo, 2017). Although the regulatory framework to improve the movement of goods (especially perishable food) on land has been established by NGAs, compliance to these top-down orders has not been observed. Hence, to break the cycle of simply imposing new regulation to reiterate compliance to unsuccessfully implemented regulation, our project proposes to leverage digital technology that acknowledges and validates the multi-level governance structure in the Philippines, to promote transparency among public and private entities, and ease of passage for trucks carry agricultural and fishery products.

Section 6: The Innovation-DAAN

The comparison of the Food Pass, Rapid Pass and S-Pass (Table 2) which were launched during COVID-19 shows that the Food Pass is the least digitized pass among the three. Hence, there is an opportunity to digitize the Food Pass, which could promote its presence to the public, ease the application and approval processes, and enhance its credibility, functionalities and utility (Bican & Brem, 2020). This is where the smartphone application, DAAN, comes in, as a digital technology with the potential to contribute to digitalizing the logistics in Philippines' agricultural sector, towards the country's digital transformation for food security.

6.1 Digital Policy Canvas

To summarize the synthesize the discussion thus far, this section presents a Digital Policy Canvas (WEF, 2017) (Figure 8) that highlights the opportunity for DAAN to pave the way for a digital transformation in logistics towards NCR's food security. For a more detailed version of the budget, refer to Appendix C. The estimated budget for the innovation is PHP 4,666,300, and the development period until the soft roll out will require 12 months.

Figure 8: Digital Policy Canvas

Process & Partners

Inter-agency, multi-level governance collaboration with the private sector for successful project implementation.

Context

Food insecurity and malnutrition are pervasive issues in NCR, especially during COVID 19. Compared to Singapore, the Philippine government has made very few investments in digitalizing logistics for food security, even with the Philippines' digital transformation strategies.

Stakeholders

Lead Agencies: DA, DICT
Checkpoint Requirements and Regulations: LGUs, DILG
Checkpoint Implementation: MMDA, PNP
Private Sector: Agricultural Co-ops and agri-fishery businesses, Food transportation companies

Solutions & Approaches

The solution is to unlock the potential of the Food Lane Project by digitizing the Food Pass. Draws from Singapore's TraceTogether and SafeEntry, and Philippines' RapidPass and S-Pass.

Relevant regulatory framework:

1. The Omnibus Guidelines on the Suspension of LGU Imposition and Collection of Illegal Fees and Taxes Relative to the Transport of Goods and Products (2021)

2. The Food Lane Project

Issue / Opportunity Definition

Past attempts of the Philippine's government to improving logistics focus on issuing regulatory policies such as the Food Lane Project launched in 2004, which involves a physical Food Pass that should allow trucks carrying agri-fishery products unhampered movement to deliver goods in a timely manner. However, implementation remains limited, as solicitation of illegal fees on the road to transport food persists. The current process of applying for a Food Pass is mostly paper based which makes the application and approval process cumbersome and slow. The actual Food Pass is a physical sticker which is prone to counterfeit. Hence, there is an opportunity to digitize the Food Pass, which could unlock the potential of the Food Lane project towards food security in NCR.

Beneficiaries

Private Sector: Agri-fishery businesses involved in the transportation of their produce. Transparency in food transport also indirectly benefits the general population by ensuring sufficient flow of food and stable food prices.

Public Sector: LGUs: Communication and application approval portal to harmonize with NGAs policies; **DILG:** Monitoring; **DA:** Food security; **MMDA:** Traffic management; **PNP:** Checkpoint management; **ARTA:** Streamlining government processes

Investment

Project Cost Estimate: PHP 4,666,300 (~CHF 84,842)
App Development: PHP 3,000,000 (CHF 54,545)
Coordination Costs: PHP 600,000 (CHF 10,909)
Hosting fees: PHP 66,300 (CHF 1,205) per year
Procurement and Installation of Bluetooth RFID/Mobile Device: PHP 1,000,000 (CHF 18,182)

Risk

Multi-level governance conflicts, government agencies seeing the app as a threat and resistance to change. Close collaboration with the LGUs and NGAs will be necessary.

Timings

12 months from development to soft launch:
Month 1-3: Data gathering, initial application development.
Month 4-6: Prototype roll-out for internal testing and refinements.
Month 7-11: Pilot testing. Roll-out out of gateway devices.
Month 12: Soft roll-out of DAAN

6.2 Digital Business Model

To expound on the features of DAAN, this section discusses the content, experience and platform of the app, according to the digital business model framework developed by Weill & Woerner (2013) (Figure 9). Detailed features of DAAN's user interface (UI) and user experience (UX) are described in the succeeding pages.

1. Content: What is consumed?

DAAN is an app that acts like a digital Food Pass. It aims to help truck drivers travel swiftly and safely across county borders using a secure and reliable system that encompasses the following features:

A. From a business perspective:
1. Mapping of routes between points
2. Identifying the types of passes and information that are required at each checkpoint
3. A digital identity that shows approval to cross checkpoints
4. Quickly identify where their trucks are stuck

The application aims to serve as a repository of relevant information and latest updates about the regulations related to the transport of agri-fishery products such as the approved Food Lane routes, the pass or permits required per municipality, and the real-time tracking of their trucks.

B. From the authorities' perspective:
1. Ensuring only approved logistics trucks cross each checkpoint
2. Allowing the optimal number of trucks to cross the checkpoint without holding up traffic
3. Identifying staffing requirements to ensure smooth flow of traffic

The application will provide the authorities confidence that only approved logistics trucks pass through the checkpoints. Moreover, the real-time traffic volume at the checkpoints will also provide them the data needed to assess the logistical arrangement and the staffing requirements for each checkpoint to ensure that the traffic flows smoothly. Lastly, it provides them a channel to quickly broadcast all the relevant changes in its policies.

Figure 10: DAAN Digital Business Model Components

Figure 9: Digital Business Model Components

2. Experience: How is it packaged?

The experience of the app plays an important role in maintaining the satisfaction of the end users (Tan et al., 2020). To keep the users engaged, the following factors were considered in the development of the app: Utility, ease of use, and user journey.

A. Utility: The use of Bluetooth

The primary mode of transportation for logistics are heavy trucks and lorries, which are all, by law, registered in the Government's database. However, verifying the status for each of these vehicles and drivers is an issue because of the sheer number of vehicles. Based on the Land Transportation Office Annual Report 2020, the Philippines has almost 500,000 registered trucks and trailers on the road (LTO, 2020).

The Philippines has more than 73.91 million Internet users with a 67% penetration rate (Kemp, 2021). In addition, as smartphones become commodities, it could be assumed that trucking companies would have access to smartphones. Hence, an app that utilizes Bluetooth is ideal for this application. Bluetooth has increasingly become a trend in many government's contact-tracing efforts, including Germany (Leprince-Ringuet, 2020), Taiwan (Liu, 2021) and Singapore (Government of Singapore, 2020). These countries have adopted the use of Bluetooth for proximity contact tracing as well as entry gateways when entering locations. For instance, the TraceTogether application is for contact tracing and SafeEntry check-ins in Singapore. On the users' end, the contact tracing application will allow users to place their mobile phones (Bluetooth on, with the application open) near a device that is running the business gateway application[6] (Team SafeEntry, 2021). Doing so will allow the business gateway application to register the user's Bluetooth ID, linked to the back-end database that will associate the Bluetooth ID with the user profile for tracking. The ability to tap for identity verification will allow more seamless access across checkpoints, which will be adapted by DAAN.

B. Ease of Use

The ease of use of the application is a significant consideration as it will determine how likely people will use the app (Tan et al., 2020).

i. Drivers

DAAN will allow drivers to identify the trips they need to take, navigate their way through their routes and multiple checkpoints, and have all checkpoints passes on hand. An average driver spends 66 minutes in traffic a day in NCR, which is the fourth-worst traffic situation globally (TomTom International, 2020). Hence, giving the drivers the ability and permission to navigate and reach their destinations quickly is a feature of heavy consideration. One critical problem for drivers is the need to produce passes and permits to pass through checkpoints. The lack of transparency on the latest requirements and paperwork needed makes it difficult for drivers to pass through swiftly. Therefore, DAAN will function as a repository of all required passes that drivers could apply for and easily use on the road.

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[6]The business gateway application is a smartphone application with the same application available, or a physical gateway token (Team SafeEntry, 2021).

ii. Company Administrators

With drivers on the road, company administrators would plan the routes to facilitate logistics across the company. The application will allow company administrators to manage all trips in the company, including the drivers involved, routes and checkpoint passes that will be needed. This overview will give company administrators the ability to plan staffing needs and be on top of applications for checkpoint passes that are critical in allowing the flow of logistics from origin to destination. The ability to apply for checkpoint passes through the application via the planning tab will allow country administrators to file applications within a single app, making it a seamless process from application to usage of the pass by the drivers. Also, by tracking the drivers' location when trips are ongoing, company administrators will be able to locate their vehicles' real-time, and identify the exact location where drivers may be stuck in. The data collected can be captured and used for future planning of routes or for reporting of illegal fees and unregulated checkpoints.

C. User Journey

i. Setting up

1. The company administrator registers and gets a company account in the DAAN application.
2. In the DAAN application, the company administrator is able to create individual accounts for all drivers. Each driver will receive their unique username and password that they will use to log in via the DAAN app.
3. Drivers will then need to open the app and log in to their accounts. By logging in to their

account, the mobile phone's Bluetooth data will be synchronized into the database. This will allow the association of Bluetooth data with the driver's profile which is linked to the company.

ii. Planning a route

1. The company administrator can plan trips and assign the trips to drivers via the DAAN application.
2. While planning, the company administrator will be able to view all checkpoints that are along the suggested route from the origin and will be able to plot multiple points along the route. If the company has yet to receive a pass for checkpoints along the route, the company administrator will be able to upload the relevant documents and apply for the pass using the app. When the authorities approve of the pass, the app will synchronize the data and reflect that the pass has now be attained.
3. Drivers will be able to view all upcoming trips on the DAAN application mobile interface and view all passes associated with the trip. Drivers can see the status of the trips and will be able to link up with company administrators if passes are not available.

iii. Starting the trip

1. Drivers should only begin trips that have all checkpoint passes available as this ensures that unnecessary time is wasted at checkpoints when the approval is not granted to clear it.
2. Upon verifying that the trip should proceed, drivers will be able to indicate the start of the trip where location services will help the drivers navigate via the assigned route. Location will also be shared with the company administrator, who will see all ongoing trips at a company level.

3. When the driver approaches the checkpoint, the driver will use his mobile device and tap it at the mobile gateway that is set up at the checkpoint. Upon tapping, the mobile gateway device will capture the mobile Bluetooth data and retrieve the associated account, thereby verifying if the pass is available for this checkpoint. Upon verification, the driver can simply pass through the checkpoint.

iv. Ending a trip
1. Upon reaching the destination, drivers will confirm the end of the trip in the DAAN application. It is necessary to capture this data to allow company administrators to identify the time the truck reaches the destination and the amount of time needed to complete each trip.

3. Platform: How is it delivered?

For the final component, the solution will be implemented by utilizing an agile methodology and adopt the best practices in database set-up and integration. Designated physical checkpoints would also be necessary so that Bluetooth devices can be installed to process the approval process.

A. Adoption of agile methodology

The COVID-19 pandemic has shifted the way the logistics industry operates, and with that comes the everchanging need to innovate. As such, there is a need to adopt the agile methodology when developing DAAN. Current features of the application include route planning, seamless application of checkpoint passes, checkpoint verification via Bluetooth and delivery tracking. However, these features are just fundamental

features introduced to suit the current county regulations and constantly evolve. Hence, the need to constantly plan, design, build, test, and review is critical in achieving the DAAN application's success. Similar to Singapore's TraceTogether application, which is slowly integrating features over time, the development and implementation of the DAAN application will adopt a similar approach.

B. Database set-up and integration

The backbone of this application is the database setup and the Application Programming Interface (API) that can be integrated with relevant authorities' approval systems. Data will be stored in dedicated servers for the database to ensure that company information and critical information are stored securely. Apart from providing secured database access, data stored in the database will be encrypted using asymmetric key encryption. System integration between the DAAN application and relevant authorities' system will also ensure a seamless application process for users. There will be a real-time pull of data from the authorities' system, reflecting the latest updates on checkpoint pass applications for users, allowing companies to manage logistics smoothly.

C. Checkpoints with Bluetooth device for approval

DAAN proposes to acknowledge LGU checkpoints by installing Bluetooth devices at predetermined checkpoints, which would determine the eligibility of the pass presented by the truck driver. The physical set up would be similar to the Singapore SafeEntry Bluetooth device (Team SafeEntry, 2021). The succeeding pages describes the UI of the proposed app.
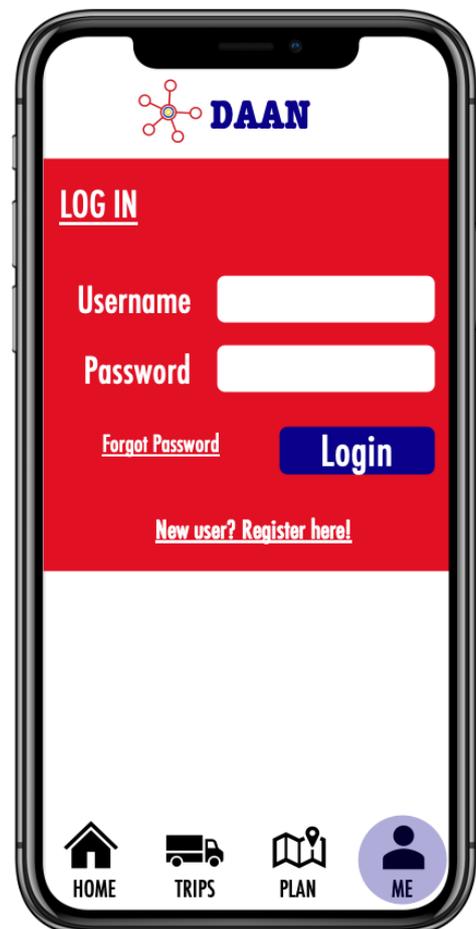
COMPANY ADMINISTRATOR

HOME
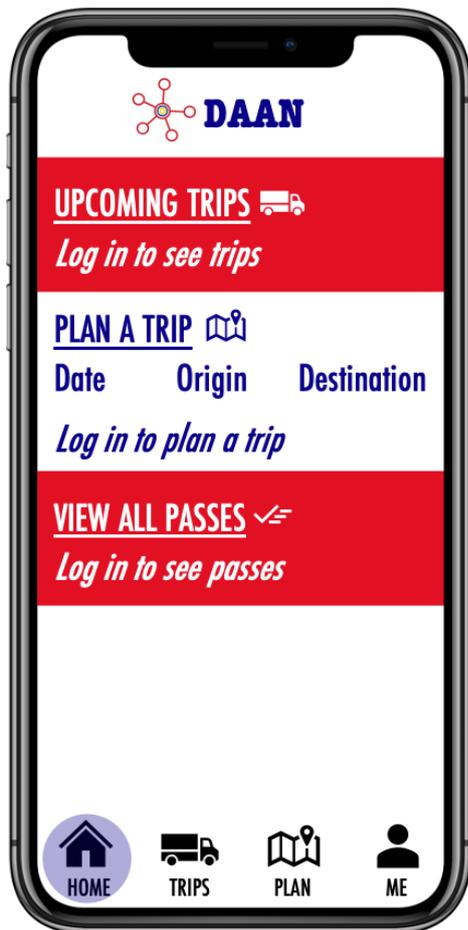
Upon accessing the application, company administrators will be presented with the home page. However, as the administrator is not signed in, he will not be able to view all upcoming trips, plan a trip nor view all passes the company has.

LOGIN

The company administrator will then need to log in to the system by going to "Me" at the bottom. They can then log in with their username and password.

COMPANY ADMINISTRATOR

DAAN

HOME - LOGGED IN

This home page gives an overview of upcoming trips, easy access for the company administrator to plan trips, and the ability to view all passes in accordance with passes that are needed first.

The upcoming trips section will show the dates, origin, destination, and status of the trips. The trips are displayed in chronological order and clicking "View all trips" will show the full display of all trips with details on each of the required passes and the statuses of it.

The plan a trip section will allow the company administrator to begin planning for the trip by keying in the origin and destination before being channeled to the "Plan" page.

The view all passes section is critical. It will allow company administrators to view all passes that are needed first, which is essential as only approved passes will enable drivers to clear checkpoints. This page will enable company administrators to see which passes will need to be follow-up on first.

COMPANY ADMINISTRATOR

VIEW ALL TRIPS

This page will highlight all upcoming trips the company has in chronological order according to the date of the trip.

Upcoming trips will show the date, origin, destination, status, and driver for each trip.

Highlighting the status is essential as it will allow company administrators to know which passes have not yet been attained and those that will need to be followed up.

This screenshot shows that all checkpoint passes have been attained, and, therefore, the green tick shows that this trip can proceed as planned.
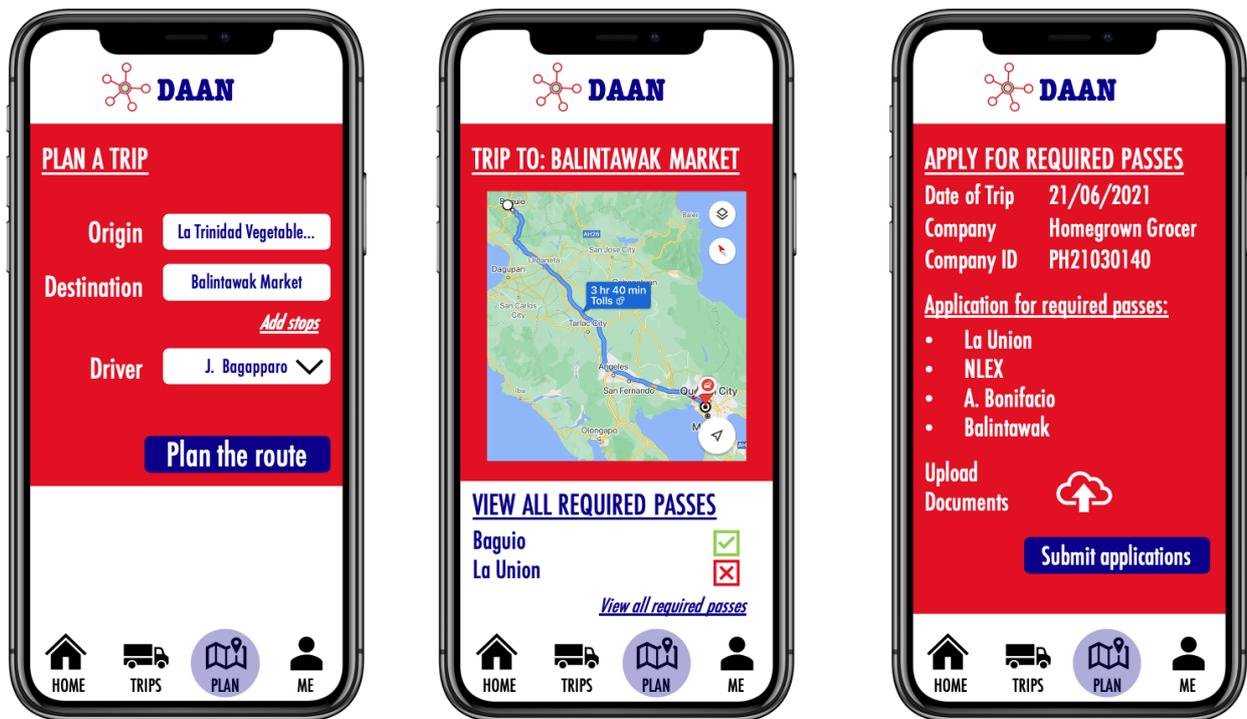
Should a pass not be present, the company administrator can follow-up with the pass application for this specific trip. This view will allow the company administrator to prioritize the follow-up of all required passes per the urgency of the trips.

As each trip is assigned to a specific driver, this page will also allow company administrators to know precisely which driver is fulfilling the trip.

Clicking on the driver's name will allow the company administrators to view all trips the driver has made or will be making, which will help facilitate the tracking of deliveries.

COMPANY
ADMINISTRATOR

DAAN

PLAN A TRIP

Origin — La Trinidad Vegetable...

Destination — Balintawak Market

Add stops

Driver — J. Bagapparo ⌄

Plan the route

HOME   TRIPS   PLAN   ME

TRIP TO: BALINTAWAK MARKET

3 hr 40 min Tolls

VIEW ALL REQUIRED PASSES

Baguio ✅
La Union ❌

View all required passes

HOME   TRIPS   PLAN   ME

APPLY FOR REQUIRED PASSES
Date of Trip   21/06/2021
Company   Homegrown Grocer
Company ID   PH21030140

Application for required passes:
• La Union
• NLEX
• A. Bonifacio
• Balintawak

Upload
Documents

Submit applications

HOME   TRIPS   PLAN   ME

PLANNING A TRIP

This page allows the company administrator to plan trips in a seamless way.

When the company administrator selects 'Plan', he can key in the origin and destination as well as the driver who is assigned to take this trip. Considering that each driver can make multiple stops, the company administrator can add multiple stops if required.

Upon selecting "Plan the route", the company administrator can view the route and see all required passes. If the pass is not available, clicking on the "X" will bring one to the application for the "required passes" view, where company administrators can upload required documents for the passes.

As the application will be integrated with the application system for local authorities, submission through the DAAN application will forward their applications to the local authorities.

DRIVER

HOME & TRIPS VIEW

These views are what the driver will be able to view upon login.

Drivers will see a similar view as the company administrator on the "Home" page, but they do not have the "Plan" feature. Drivers will be able to view all upcoming trips and all passes the company has on hand.

To start a new trip assigned to them, drivers can go to trips, select the trip and "Begin trip". Selecting "Begin trip" will allow the company administrator to know when trips begin and can track their trip status in real-time.

Section 7: DAAN-The road to food security

7.1 Advancing the food lane project

As an app, DAAN can increase awareness on measures towards crisis management (Foresti et al., 2015), such as DA's Food Lane Project, which works towards food security, but has not been fully developed and utilized. For agri-fishery businesses, administrators, and truck drivers, it promotes ease of submitting applications, acquiring permits to pass through checkpoints, and knowing where the food lanes and checkpoints are. For government agencies, it has the potential to provide a digital warehouse and repository of applications, digital approval process, and decrease the uncertainty about which trucks to grant passage to. The digital nature of DAAN will allow unlimited utilization of data collected over different conditions across time (Yoo, 2013), which can provide evidence for future planning. This app complements the DA's Food Lane Project, and can be adopted by the project, or integrated with the digital technologies that will be utilized by the stakeholders of the Food Lane Project.

7.2 Accommodating multi-level governance

Despite the Philippine government's efforts towards a centralized digital transformation, the prevailing trend has been towards decentralized digitalization due to the multi-level governance structure in place. Efforts that try to streamline different initiatives through a single digital system are currently futile as evidenced by the long delays in implementing the EVOSS and National Identification System.

Although the idea of a Unified Logistics Pass for all land-based cargo movement has been suggested by ARTA recently (ARTA, 2020b), this could take many years to implement based on historical trend. In addition, to manage a crisis effectively through digital technologies, timely and context-based intervention is necessary (Tan et al., 2020); hence, DAAN only focuses on the food sector, and accommodates the current situation of multi-level governance, by consolidating all necessary requirements by LGUs.

DAAN can be deployed relatively quickly using the agile methodology, and can be further enhanced with the collaboration of stakeholders. DAAN's API could be integrated into the Unified Logistics Pass' database in the future, while maintaining the historical data and useful features for concerned government agencies. In addition, the roll-out of DAAN would involve physical checkpoints that would be marked by a Bluetooth RFID device that would be used to determine the eligibility of trucks to pass; hence, physical check points would be "recognized" rather than illegal. Having a digital way to submit the applications would also require standardizing the way application fees are collected. This would give DILG and other NGAs the ability to monitor, approve and regulate fees and checkpoints, so that "illegal" fees and checkpoints can be distinguished quickly and discontinued.

CONCLUSION

A jeepney entering Baguio City to trade at the La Trinidad vegetable market. (Source: Sunstar Baguio, 2018)

Daan is the Filipino term for "road", "way", or the verb "pass". Just like roads that allow people to explore and go from one destination to another, our project explored and connected the concepts of food security, nutrition, digital transformation, logistics and governance to address the food crisis exacerbated by COVID-19. By proposing an app that accommodates the dynamics of multi-level governance and digitizes the concept of the DA's "Food Pass", we provide DAAN (a way or a road) to achieve the goals set for the Philippines' digital transformation and food security. The end of the food insecurity and malnutrition crises has been a "dream destination" for the Philippines, and although DAAN does not propose an ultimate solution to these problems, it provides a tool to manage these crises and paves a road to reach the dream of zero hunger.

# APPENDIX A: DA PROGRAMS FOR FOOD RESILIENCY DURING COVID-19 (FAO, 2021)

Program Title	Background
Food Pass	As part of the "Food Lane Project" first launched in 2004 and then relaunched in 2017, the Food Pass should be applied for and obtained by eligible cargo trucks carrying agri-fishery produce and commodities to allow the unhampered delivery of essential food items. An aggressive information campaign about this program was launched when lockdowns started due to COVID-19.
Kadiwa ni Ani at Kita	This program started before COVID-19 and was scaled up during the pandemic. It aims to directly connect small farmers and fisherfolk (SFFs) to consumers by physically opening markets near residential areas and helping the SFFs bring their produce to these markets, by overseeing mobile markets, and hosting an online platform to connect the SFFs to LGUs and consumers.
Urban Agriculture Program	A campaign to promote urban agriculture by providing capital incentives, small tools, technical assistance and financial reward to communities, public schools, universities and government offices who start urban farming to grow food.
Price Freeze	Suggested retail prices and mandated price ceiling for necessities were issued to maintain affordability of food.
Social Amelioration	Cash transfer programs for farmers growing rice on 0.5 to 2 hectares of land.

APPENDIX B: PHILIPPINE GOVERNMENT ISSUED PASSES DURING COVID-19

I. Revival of the Food Lane Conduct Pass Project

To ensure that the movement of food remains unhampered, the DA campaigned for the revival of the Food Pass (Box 2) by issuing a series of memorandums (Extension of the Validity of Previously-Issued Food Passes until the Lifting of the Enhanced Community Quarantine, 2020; Implementing Guidelines for the Delivery of Food and Other Agricultural Commodities to, from, and Passing through the National Capital Region (NCR) during the Thirty (30) Day Community Quarantine, 2020) and infographics to inform the public about the Food Pass.

To sign up for the pass, the individual or the business can visit the department of agriculture regional offices or visit this website: http://agribusiness.da.gov.ph/food-pass/ and email the requested forms to the email addresses listed there depending on the type of commodity:

Figure 1: Food Pass Sign-Up
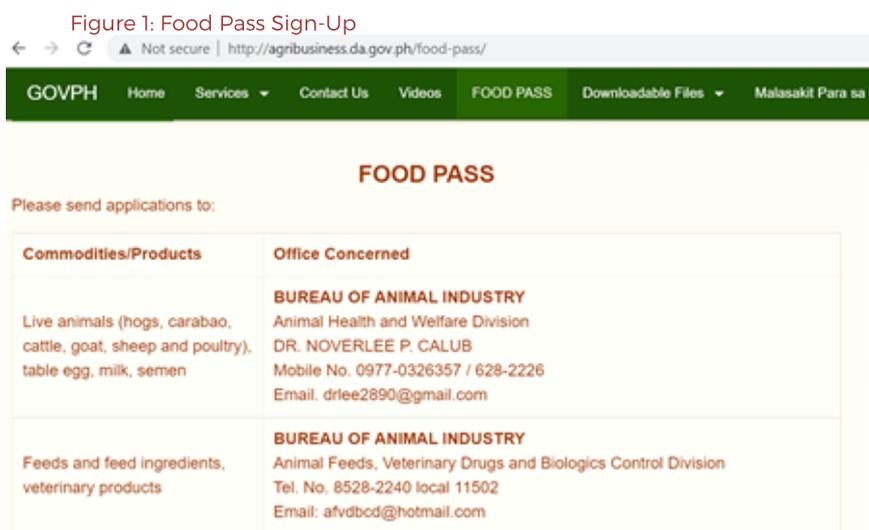
II. RapidPass

The RapidPass utilized a QR-based digital pass to allow the frontliners and authorized personnel to pass through unhampered checkpoints (DCTx, 2020). The application was developed in conjunction with the Department of Science and Technology (DOST), Department of Information and Communications Technology (DICT), and DEVCON Community of Technology Experts (DCTx), a volunteer-based group affiliated with the Developers Connect Philippines (DEVCON). It was also supported by private companies such as Microsoft, PLDT Enterprise, Amihan, Talino, etc. (DCTx, 2020).

The enrollment of the RapidPass was opened to Authorized Personnel Outside Residence (APOR). The government broadly defined APOR as people working as "medical frontliners, first responders, food suppliers, and assigned skeleton workforce in companies" (DICT, 2020).

The Rapidpass follows a four-step process. **Figure 2** shows how it works (DCTx, 2020):

Figure 2: How does RapidPass work?

The Rapidpass has two user roles – the frontliners and the essential workers and the assigned checkers at the checkpoints. The role of the frontliners is to apply for a pass through the website and print or save a copy of the QR code generated. Once they pass through a checkpoint, they need to present it to the checker (DCTx, 2020).

Meanwhile, the mobile application developed was created for the use of the inspectors at the checkpoints. PLDT, a major telecommunications company in the Philippines, donated over 200 phones for this endeavour (Dela Cruz, 2020). All the phones they donated came with the app pre-installed already – removing the need for check-in credentials and avoiding unauthorized log-ins. The figure below shows the user interface:

Figure 3: RapidPass UI (DCTx, 2020)
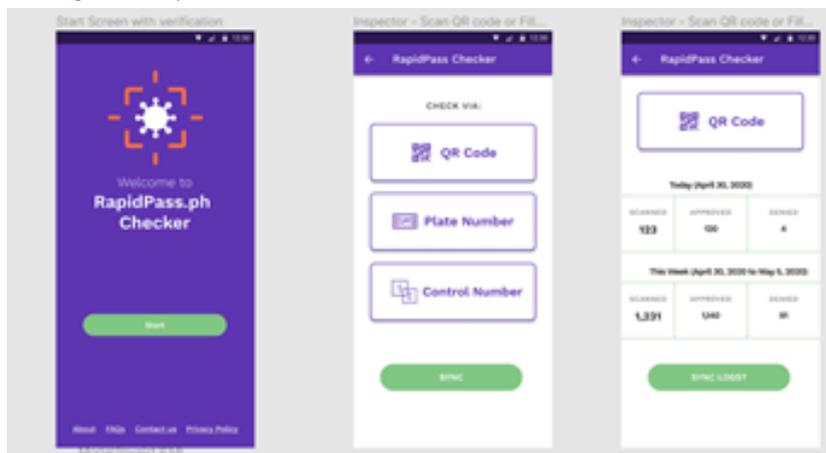
The RapidPass was operational from its launch on April 6 up until December 31, 2020[1].

III. S-Pass

The S-Pass stands for Safe, Swift & Smart Passage (DOST VI, 2020). It was developed and launched last March 26, 2021 (Arayata, 2021) by the Department of Science and Technology (DOST) IV office as a way to make inter-city and inter-province travel smoother for "Locally Stranded Individuals, Returning Overseas Filipinos, Emergency Travelers, and other travelers (DOST VI, 2020). Since the Philippines have varying rules and restrictions per municipality, depending on the severity of the COVID-19 outbreak in the area, the purpose of this pass is to ensure that the people who will enter the

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[1]News about the usage of RapidPass stopped after December 31, 2020, there was no new activity in their facebook page: https://www.facebook.com/rapidpassph/

restricted areas are authorized. It also aggregates all the travel requirements from the different regions by collating it all into one platform. This is to make it easier for travelers to prepare all the required documents if they go to a restricted area s (DOST VI, 2020). The screenshots below show how it works:

Figure 4: S-Pass User Interface (DOST VI, 2020)
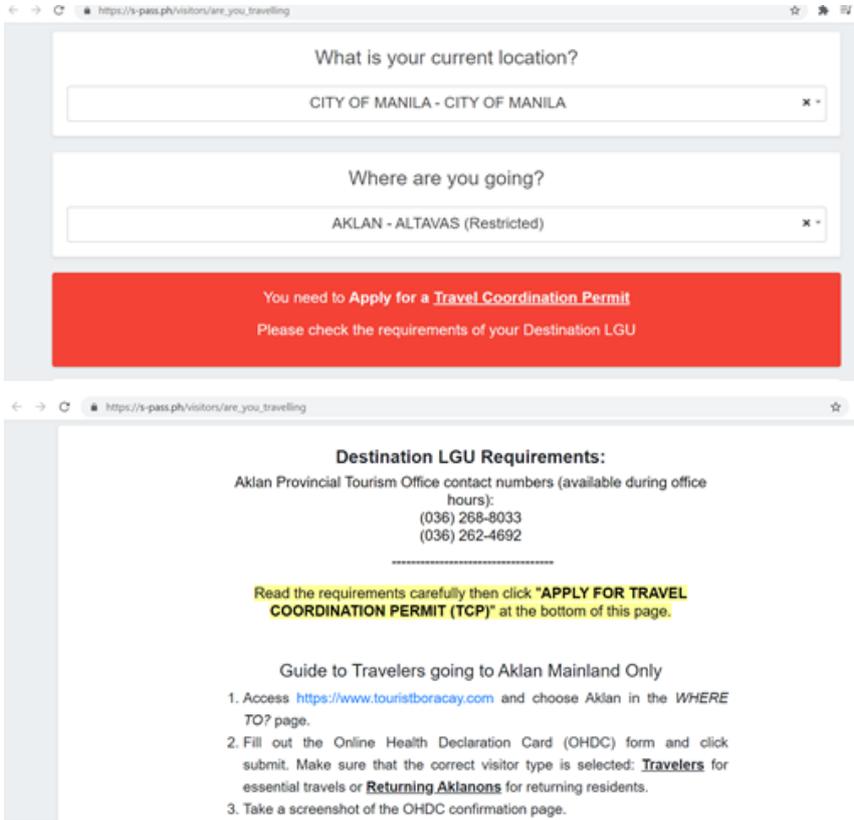
To use the service, travelers simply need to create an account in the S-pass website. They will choose which area they will go and check the list of requirements to travel to that area. If the area they need to pass through requires a travel permit, the traveler can apply online and receive the approval in the same platform (DOST VI, 2020).

APPENDIX C: BUDGET BREAKDOWN AND IMPLEMENTATION TIMELINE

The initial budget can be funded through start-up grants such as the Department of Science and Technology's (DOST) grants-in-aid program which provides support for early start-ups (DOST, 2014), or by pitching the idea to startup incubators like QBO (QBO Philippines, 2020). It may also be adapted by the UNDP's Accelerator Lab in the Philippines (ALab PH, 2021).

Project Cost Estimate*: PHP 4,666,300 (~CHF 84,842)
App Development: PHP 3,000,000 (CHF 54,545)
Team composition:
- Project Manager
- Technical Lead
- System analyst
- Full-stack developer
- Front-end Developer
- Backend Developer
- Creatives (UX, UI, Skinning)

Coordination Costs: PHP 600,000 (CHF 10,909) for 1 year
Inclusions:
- Meetings, focus group discussions, interviews, transportation, accommodation
- Hosting fees: PHP 66,300 (CHF 1,205) per year
- Google Play Developer Fee (Google, 2021): PHP 1,300 (CHF 24) one-time fee
- Apple Store Developer Fee (Apple Inc., 2021): PHP 5,000 (CHF 91) per year
- Server hosting fees (Lahn, 2019): PHP 5,000 (CHF 91) / month or PHP 60,000 (CHF 1,091) per year
- Procurement and Installation of Bluetooth RFID/Mobile Device: PHP 1,000,000 (CHF 18,182)

*Estimated budgets without references are based on the author's knowledge and experience as a procurement specialist.

The suggested implementation for the project is 1 year.
Month 1-3:
1. Define project requirements and get sign-off document from stakeholders.
2. Information gathering and refinement of application design
3. UI design and development
4. Initial application development

Month 4-6:
1. Prototype roll-out for internal testing.
2. Refine project internally and map routes and information required.

Month 7-11:
1. Pilot testing with minimal routes and onboarded companies.
2. Refinement of application.
3. Begin roll-out out of gateway devices or checkpoint-side application

Month 12:
1. Soft roll-out of DAAN.
2. Testing and further development of additional features

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