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Technology for a Social Cause: Formulated Emergency Relief Foods for Super Typhoon Yolanda (Haiyan) Survivors

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ABSTRACT

This study details how ready-to-eat (RTE) rice and rice-cornstarch noodle (*bihon*) product formulations of the College of Home Economics (CHE) of the University of the Philippines Diliman (UPD) were used to produce emergency relief foods for the survivors of super typhoon Yolanda (international name: Haiyan) in the Philippines. The RTE products were developed using established pasteurization technologies covered with commercial sterility test certifications from the Pilot Food Plant (PFP) of UPD-CHE and published food safety considerations for acidified foods. They do not require any cooking or reheating before consumption. They were prescribed with a one-month shelf-life at ambient storage temperature (28±2°C) during deployment as relief foods.

About 5,000 and 3,000 production units of the RTE cooked rice (200 g/pack) and bihon (150 g/pack), respectively, were produced at the PFP. Around 300 volunteers composed of faculty, staff, alumni, students, and acquaintances of UPD-CHE's departments and organizations manned the two-week staggered production, scheduled from late November to the first week of December 2013. In cooperation with organizations and private entities, the RTE products were deployed without cost from UPD to the stricken areas of Aklan, Iloilo, and Leyte. Feedback from the recipients of the products was favorable, indicating that the RTE foods are useful as emergency relief ration.

Keywords: Disaster relief, food technology, typhoon Yolanda, Haiyan

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The Philippines is considered one of the world's most disaster-prone countries. It is subject to frequent occurrences of strong typhoons, earthquakes, volcanic eruptions, and other natural catastrophic phenomena (Wingard & Brändlin, 2013). Being located along the so-called Pacific Ring of Fire and part of the typhoon belt (Steinberg, 2000), the country ranked second in the 2014 Climate Risk Index for natural disasters (Kreft & Eckstein, 2013).

Typhoon Yolanda (internationally known as typhoon Haiyan) was a category 5 typhoon that brought catastrophic destruction in central Philippines on 8 November 2013 (Chiu, 2013; Oksin, 2013; Lum & Margesson, 2014). According to the Joint Typhoon Warning Center (JTWC, 2013) of the U.S. Navy and U.S. Air Force, typhoon Yolanda began as a tropical disturbance east-southeast of Pohnpei, Federal States of Micronesia on 2 November 2013. Because of favorable environmental conditions, it became a severe tropical depression the next day (JTWC, 2013). It intensified into a typhoon by 5 November (JMA, 2013) and was designated the international name Haiyan. Subsequently, the JTWC assessed Haiyan/Yolanda as a category 5 super typhoon (JTWC, 2013). It is considered the deadliest typhoon on record to have landed in the Philippines. It tore through Tacloban City in the province of Leyte, initially affecting almost 13 million people (Chan, Liu, & Hung, 2013).

In the aftermath of typhoon Yolanda, the following were reported: roughly 6,300 deaths, 4.1 million displaced people, 1.1 million destroyed houses, and an estimated PhP 89.6 billion worth of damages mainly on the production and social sectors (NDRRMC, 2014). All communications systems, as well as power and water supplies, went down after the super typhoon struck (Ross, 2013). Before Yolanda entered the country, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) along with the Project Nationwide Operational Assessment of Hazards (Project NOAH) of the Philippine Department of Science and Technology (DOST) predicted that it would cause a storm surge of up to 5 meters (Bacani, 2013; Jerusalem, 2013; Ranada, 2013). Despite this forecast, however, the majority of people in the affected areas did not expect the typhoon's enormity and extent (Jerusalem, 2013). The ensuing storm surge, with waves ranging from 5 to 10 meters, easily inundated the low-lying areas of Leyte, especially Tacloban City (Rappler, 2013). It made the emergency planners of the country realize that their preparations were insufficient (Jegarajah, 2013; The Lancet, 2013).

The storm's survivors pleaded for help as they had nothing to eat in the immediate aftermath of the typhoon (Hancocks, Coren, Stevens, & Watson, 2013). Most survivors were left in a state of confusion, with some wandering aimlessly in the streets,

perhaps looking for family members (Hancocks et al., 2013). News reports recounted that law enforcers and government authorities from the stricken areas were nowhere to be found right after typhoon Yolanda, as they were likewise badly affected by the typhoon (Napallacan, 2013; Tribune, 2013). According to reports, fear widely spread as in the face of rampant looting and other acts of hooliganism (Napallacan, 2013; Tribune, 2013), further aggravated by news of the breakout of some prison inmates (Hancocks et al., 2013). Looting of essential items during a civil disturbance is often attributed to the need to survive (Frailing, 2007). The extent of Yolanda's brutality became more apparent in the succeeding days, as the number of reported mortalities, morbidities, and damages to properties and the environment continued to increase.

The regular emergency food rations distributed by the Department of Social Welfare and Development (DSWD) of the Philippines include raw rice, instant noodles, and canned foods (PCDSPO, 2013); the first two food items require cooking or at least hot water rehydration. Under the extremely chaotic conditions in the aftermath of typhoon Yolanda wherein utilities and basic amenities for food preparation were mostly non-existent, relief goods that require cooking and related preparations were obviously impractical.

Prior to typhoon Yolanda, the Department of Food Science and Nutrition (DFSN) of the College of Home Economics (CHE) of the University of the Philippines Diliman (UPD) had developed research-based technologies for the preparation of ready-to-eat (RTE) rice and rice-cornstarch noodle (*bihon*). These products were originally intended as military food rations. These product formulations are shelf-stable under Philippine ambient storage conditions and do not require a cold chain system for storage. They have been processed also with acid-pasteurization technology to control starch retrogradation (firming; *pagbabahaw* in Filipino) for at least a month. Retrogradation is used to describe firming that occurs as a result of the cooling and storage of starch-based products (Vaclavik & Christian, 2008). Such hardening or firming in starch-based formulations (Philpot, Martin, Butardo Jr., Willoughby, & Fitzgerald, 2006) has been hurdled in these formulations. As such, the food formulations appeared appropriate to become relief foods because they can be eaten without the need for cooking or hot water rehydration.

This article discusses how the laboratory-level technologies on rice-cornstarch noodle (bihon) and rice were used to produce shelf stable RTE products as emergency relief foods for typhoon Yolanda survivors.

FOOD RELIEF FOR TYPHOON YOLANDA VICTIMS

The usual initial responses to natural disasters include providing short-term emergency aid: material assistance, support services, and food relief (Malerba, Stirk, Swithern, Osborne, Sardiwal, Smith, ...Sparks, 2014). In the Philippines, the National Disaster Risk Reduction and Management Center (NDRRMC) and the Philippine Department of Social Welfare and Development (DSWD) are responsible for disaster relief operations (Lum & Margesson, 2014). The Philippine Department of Foreign Affairs (DFA) serves as the contact for foreign countries and international organizations providing assistance to the country. The international community provided significant humanitarian assistance for typhoon Yolanda survivors.

All these actors in the humanitarian relief operations made efforts to provide urgent food aid, shelter, and medical needs for Yolanda survivors. Relief food items distributed by the DSWD from various donors included energy bars, rice, and canned goods (PCDSPO, 2013). Filipinos in the United Kingdom, along with some British donors, provided relief foods such as RTE meals in easy-open cans, energy bars, and biscuits (PDI, 2013). According to the United States Agency for International Development (USAID, 2014), the United Nations World Food Program dispatched roughly 33,000 metric tons of food, including rice, specialized nutrition products, and high-energy biscuits to the typhoon-affected areas.

Though volunteers and supplies arrived within days in many of the affected areas, distributing food and relief commodities to some of the more remote locations posed to be a difficult task. For instance, it took 10 days after the disaster struck for supplies to reach the survivors on the island of Homonhon, Leyte (AFP, 2013).

UPD SOURCE-OF-SOLUTIONS PROJECT

The impetus to use the acid-pasteurized RTE bihon and rice products developed by UPD-CHE as emergency relief foods came from a news report that the Yolanda-stricken areas remained without basic utilities several days after the disaster and that chaos persisted, with food being the survivors' major concern. While attending a DOST meeting on 14 November 2013, the developer of the above technologies met Dr. Henry Ramos, director of the Project Management and Resource Generation Office, Office of the Vice Chancellor for Research and Development (OVCRD), UPD. He informed Dr. Ramos of the available technologies at CHE and their potential to help typhoon Yolanda survivors. Given sufficient funds, proper logistics, and volunteer efforts, a significant volume of RTE products could be produced and disseminated

as emergency relief foods in heavily affected areas where cooking and access to food and water were not yet available at the time.

By 16 November, the research team and OVCRD swiftly reached an agreement for the conduct of a project titled "Ready-to-Eat (RTE) Cooked Bihon and Rice as Emergency Foods for Yolanda Victims," to be funded by the Source-of-Solution (SOS) Grant. The SOS Grant generally provides funding to support commissioned research or creative work on results-oriented projects. It aims to promote the strategic value of UPD as a microcosm of Philippine society and, therefore, a great source of solutions to some of the most difficult national problems, including risk and disaster management (UPD-OVCRD, 2014). The goal was simple: to use the existing CHE technologies in the preparation of shelf-stable pasteurized RTE bihon and rice as emergency relief foods for super typhoon Yolanda survivors.

UPD FOOD TECHNOLOGIES

Three previous and ongoing research projects implemented at the UPD-CHE-DFSN serve as the scientific foundation of the above SOS Grant-funded project. The development of the RTE product technologies started as a self-funded research of the lead author of this paper at UPD, titled "Retrogradation Control in Acid-Pasteurized Rice" (Azanza, 2011). The acid-pasteurized, shelf-stable cooked rice is covered by a utility model in the Philippines (IPO No. 22011000008). The noodle (bihon) product technology was based on two OVCRD-funded research projects, titled "Acid-Pasteurized Ready-to-Eat (RTE) Traditional Philippine Noodles" (101008 PNSE, completed 2012) and "Use of Natural Antioxidants to Control Rancidity in Pasteurized Cooked Ready-to-Eat (RTE) Noodles" (121215 PNSE, ongoing project). Intellectual protection in the Philippines for the technology of acid-pasteurized, shelf-stable cooked bihon is being pursued.

Every bit of knowledge obtained from the above-mentioned research projects was used to produce the retrogradation-resistant products for the Yolanda survivors. Resistance to retrogradation (starch firming) and control of food safety were established by combining different food processing stages, or what is called as hurdle technology (Rahman, 2007). Generally, hurdle technology allows for the understanding of the complex interactions of food factors to design a series of hurdles to control the growth of spoilage or pathogenic microorganisms and ensure the safety of processed foods (Fellows, 2009). The RTE products of CHE were unique in that, aside from being safe, they were functional as relief foods because these were shelf-stable and RTE. More importantly, the products were seen to be

highly acceptable culturally to the Yolanda survivors, as these starch-based foods have long been part of the traditional Filipino food culture (Goody & Drago, 2010).

VOLUNTEERISM

The production of RTE foods at the UPD-CHE-PFP for Yolanda survivors was designed to be manned mostly by volunteers. This was to maximize the use of the funds to buy raw food and packaging materials and to pay for production utilities. Also, the RTE foods for Yolanda survivors were intended to result from the hard work of the UPD-CHE community and its extended families and friends.

Volunteers for the pilot production were recruited through several means. Student organizations in the CHE were approached and briefed regarding the need for assistance. Several professors from the different departments of the CHE also strongly encouraged their students to participate in the pilot production. Moreover,

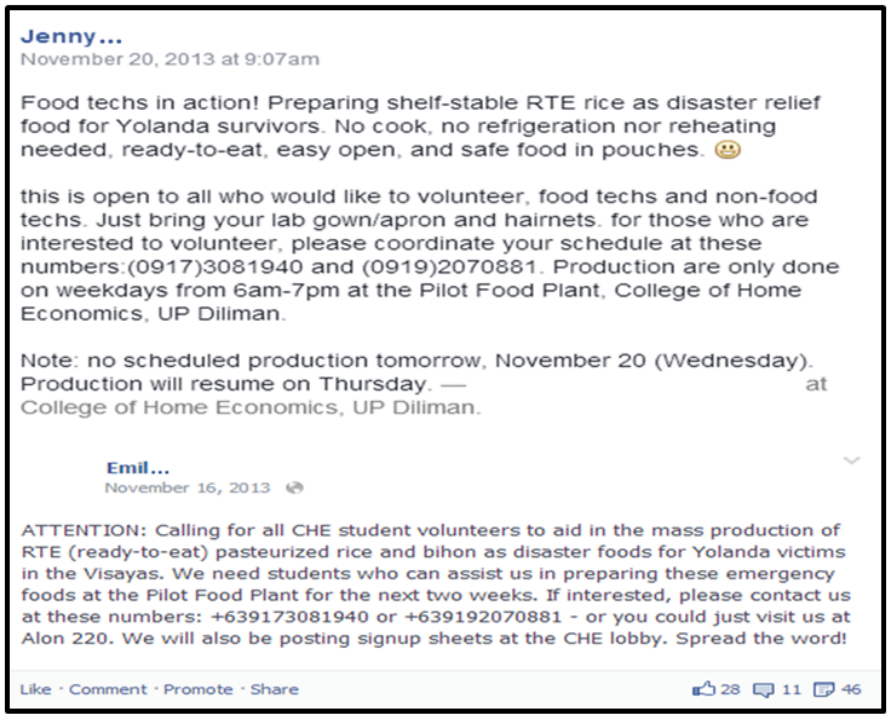

Figure 1. Recruitment and announcements on Facebook for the pilot production of RTE bihon and rice as emergency relief foods for super typhoon Yolanda survivors

Table 1. Sample of Facebook users who helped promote awareness of the need for volunteers in the pilot production of acid-pasteurized ready-to-eat (RTE) bihon and rice as emergency relief foods for typhoon Yolanda survivors

Date	Facebook User	Posted Comment
11/20/2013	Gef…	"Hi guys, if you want to help, Food Techs and non-Food Techs can volunteer."
11/20/2013	Winston…	"Sir Kevin, can you send a troop of scouts this Saturday, Nov. 23? Our food tech friends in UP need all the help they can get… By the way, need lab gowns/aprons and hairnets… Thanks!"
11/21/2013	Althea…	"This is something we can do inside the campus."
11/21/2013	Desiree…	"Amazing! Ready-to-eat rice being produced and packed in UP Diliman for the evacuees. They need volunteers too."
11/21/2013	Reina…	"A unique way of helping Yolanda survivors. Don't forget to bring your apron/lab gown and hairnets."
11/23/2013	Charlene…	"Food Techs and non-Food Techs who want to volunteer, mass production is still ongoing until next week!"
11/23/2013	Tricia…	"Congratulations Food Techs! I'm so proud to be one. I'll join the production too!"

the project proponents promoted awareness of the SOS Project and recruited volunteers through Facebook, a popular social networking website (Figure 1). Posts regarding the pilot production of the emergency relief foods garnered substantial attention of CHE students and alumni (Table 1).

Those who actually volunteered were mostly undergraduate students from various CHE departments (Table 2). Fortunately, all CHE undergraduate students (except those from the Clothing, Textile, and Interior Design Department) are required to

Table 2. Profile of the College of Home Economics (CHE) volunteer in the pilot production of acid-pasteurized ready-to-eat (RTE) bihon and rice as emergency relief foods for Yolanda survivors

Type of Volunteer	Volunteer	
	Number	Percentage
Students/Department		
CTID	23	7.35
FLCD	39	12.46
FSN	80	25.56
HEEd	62	19.81
HRIM	81	25.88
Faculty and Staff	15	4.79
Alumni	8	2.56
Friends	5	1.60
Total	313	100.00

[1] CTID=Clothing, Textile and Interior Design; FLCD=Family Life and Child Development; FSN=Food Science and Nutrition; HEEd=Home Economics Education; HRIM=Hotel, Restaurant and Institute Management

take at least one food preparation course, hence, the student volunteers were already trained in safe food handling and quantity food preparation. The alumni and faculty volunteers were mostly from the Food Science and Nutrition Departments. Volunteers without formal food preparation training at the CHE were assigned to the packing and labeling stages only.

PRODUCTION

A core production group was organized to set the direction for the RTE food processing and provide oversight to volunteer workers at all times. The group consisted of the SOS Research Group (SRG) and the PFP Auxiliary Group (PAG) (Figure 2).

The SRG consisted of the SOS Project Leader and her research team (three research assistants and two laboratory aides). It was responsible for developing the processes, safety protocols, training concepts, and activities for the volunteers in the pilot

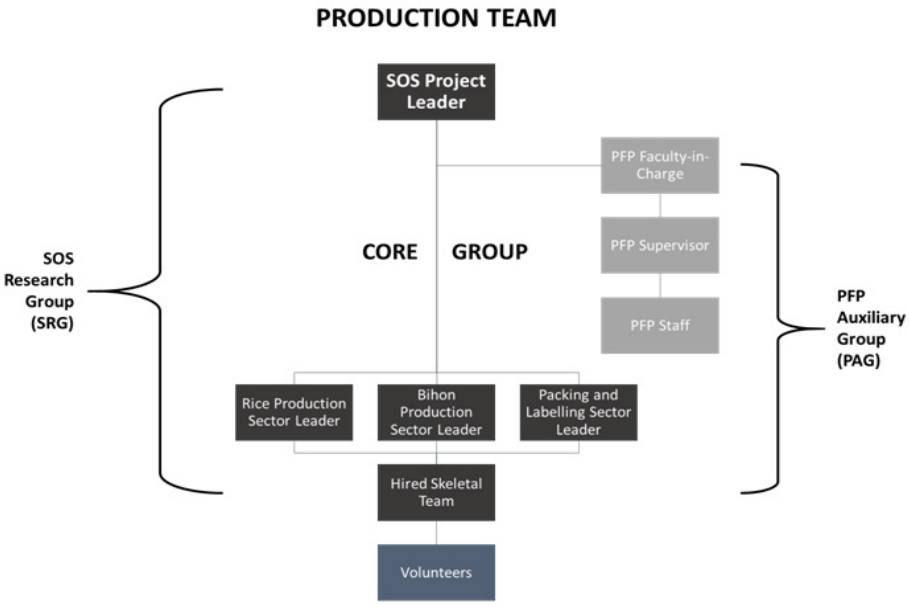

Figure 2. Organizational chart for the production team in the pilot production of ready-to-eat (RTE) bihon and rice as emergency relief foods for Yolanda survivors.

production of the emergency relief foods. During production, the SRG also provided leadership and constant oversight for pilot operations, being in charge of the production steps, process schedules, target production, supplies, and logistics.

The PAG assisted the SRG. It was composed of the DFSN faculty-in-charge of the PFP (group leader), the PFP supervisor, and the PFP staff. The PAG provided expertise in the operation of equipment needed for production, equipment operators, and overall production support to the SRG. When needed, the PFP faculty-in-charge served as alternate production team leader to the SOS Project Leader. Moreover, a five-member skeletal production team was hired and organized to ensure that production operations were continuously manned, in case volunteers were not available.

The core production group conducted trial runs prior to actual pilot production. They oriented the volunteers according to the general findings of the trial runs. The orientation included the production processes, safety protocols and controls, good manufacturing practices, and quality control procedures. Figure 3 shows the general procedure for the production of acid-pasteurized RTE bihon and rice.

Figure 3. Production process for the preparation of acid-pasteurized RTE bihon and rice as emergency relief foods for Yolanda survivors.

Production involved three sectors: (a) rice production, (b) bihon production, and (c) packing and labeling. Each sector had a leader who managed all volunteers and ensured the safety of the production processes. The leaders were BS Food Technology alumni of the CHE and research assistants of the SOS Project, all of whom had been trained to produce quality and safe foods. With the help of 313 volunteers, the Project achieved the target production of about 5,000 packs of RTE rice and 3,000 packs (reduced from 5,000 packs) of RTE bihon within two weeks, from mid-November to the first week of December 2013 (Table 3). The first week (5 working days) was allotted for rice production, and the second week for bihon production. The production target of the RTE bihon had to be decreased, however, because volunteers became scarce during the last week of production. It took three working days only to meet the reduced production goal. The remaining bihon ingredients and raw materials were subsequently donated to the University Food Service (UFS) for use in the preparation of daily meals for relocated UP Tacloban students living in the university dormitories.

Production processing details, particularly pH values and pasteurization schedules, were recorded and closely monitored for quality assurance. Packaging defects were

Table 3. Production statistics of acid-pasteurized ready-to-eat (RTE) bihon and rice as emergency relief foods for Yolanda survivors

RTE Food	Production Date	Amount (No. of Packs)		
		Good	Reject	Total
Rice	19 Nov	530	101	631
	21 Nov	936	76	1012
	22 Nov	922	62	984
	25 Nov	1092	52	1144
	27 Nov	1323	28	1351
	Grand Total	**4803**	**319**	**5122**
Bihon	28 Nov	422	6	428
	2 Dec	1403	187	1590
	4 Dec	1584	309	1893
	Grand Total	**3409**	**502**	**3911**

evaluated during sealing, after pasteurization, and during labeling and packing of the RTE products. The defects included microleaks, delamination, and compromised seals. Most of the production personnel worked overtime from 7:00 a.m. to 10:00 p.m. Volunteers were given free snacks.

This paper openly celebrates and honors the volunteers for their efforts to help the typhoon Yolanda survivors.

FOOD SAFETY PROCEDURES

The SOS Project used the control measures for ensuring the safety of acidified foods as described by Barron and Fraser (2013). The critical parameters were closely monitored, as follows: (1) RTE pasteurized products were properly acidified to a pH 4.6 or below; (2) the products were heated during acid steeping and cooked with acid media before being packaged for final pasteurization to assure quick and proper acidification. This means that manufacturing processes consistently reduced the equilibrium product pH per batch production to pH 4.6 or below within 24 consecutive hours (USFDA, 2010); (3) adequate lethalities for the pasteurization steps in boiling water bath processes were used to control microorganisms of public health significance; (4) the final equilibrium pH values were checked, controlled, and documented after the products were pasteurized; and (5) 100% of the pouches for acidified products were checked to ensure that a hermetic seal was obtained and maintained during sealing, after pasteurization, before packing in cartons, and before eventual distribution to Yolanda survivors. Checking of packaging material integrity was also done 100% to ensure if maintained at the same steps. Other related literature used to complete the development of the food safety protocol for the product included Arndt Jr., (2013), Bacon and Sofos (2003), FAO/WHO (1993), ICMSF (2011), Jenson and Moir (1997), USFDA (2010), USDA-FSIS (1997, 2009).

Table 4 shows the actual pH values of the RTE products immediately after pasteurization and their final equilibrium pH. The pH of the steeping/cooking solution used for the products was <3.0 to ensure that their final equilibrium pH would be ≤4.6 (Azanza, 2011; Azanza, Marte, & Morales, 2012). According to the USFDA (2010) Guidance for Industry: Acidified Foods, when the equilibrium pH of an acidified product reaches ≤4.6 within 24 hours of the manufacturing process, the likelihood that *C. botulinum* spores will grow and germinate is eliminated. Since the RTE products already had pH values of <4.2 immediately after pasteurization, these values were maintained until final equilibrium pH values were reached (Table 4). Likewise, Jenson and Moir (1997) state that the minimum pH for growth of

Bacillus cereus is about 4.3 at 30-35°C. As Table 4 shows, the microorganisms associated with rice and bihon products that are considered of public health significance, including *C. botulinum* and *B. cereus,* were not likely to grow in the RTE products considering that their pH from work-in-process to the final products was below 4.2.

Table 4. The pH values of acid-pasteurized ready-to-eat (RTE) rice and bihon at various processing stages

RTE Food	Production Date	Product pH	
		Immediately After Pasteurization	Finished Equilibrium pH
Rice	19 Nov	4.05±0.10	4.06±0.11
	21 Nov	3.94±0.07	3.98±0.08
	22 Nov	3.93±0.15	4.12±0.12
	25 Nov	4.04±0.08	4.00±0.02
	27 Nov	3.85±0.75	4.06±0.09
Bihon	28 Nov	4.01±0.05	4.05±0.06
	2 Dec	3.90±0.07	3.85±0.11
	4 Dec	3.89±0.04	3.90±0.17

THE PRODUCTS

A production unit of RTE rice consisted of acid-pasteurized cooked rice (200 g) packed inside a laminated nylon/polyethylene (PE) stand-up pouch (140 mm x 235 mm). The product has white translucent cooked rice grains and a distinct natural rice flavor. A unit of acid-pasteurized RTE cooked rice may be stored in its original unopened packaging in a cool (28±2°C) dry place for a month.

A unit of the RTE bihon pack, on the other hand, is composed of an acid-pasteurized cooked rice-cornstarch noodle (150 g) sealed inside the same packaging material as the rice product, with a spice mix component (5.7 g) and edible oil component (10 g) that are individually packed in laminated foil sachets. The RTE bihon is brown and has a soft-cooked texture and a typical bihon taste. The spice mix and oil components were no longer subjected to acid-pasteurization since these were already made shelf-stable based on their low water activity control. The RTE bihon may be stored in its original unopened packaging in a cool, dry place for a month. The bihon must be mixed well with the oil and spice mix components before being eaten.

The resident faculty nutritionists in the CHE calculated the nutrient contents of the RTE foods, which were duly presented in the back label of the packs. The processes

used to pasteurize the products were based on time-temperature process schedules, which had been verified through commercial sterility tests that the CHE conducted to ensure the products' safety. According to FAO, commercial sterility is achieved when sufficient heat or thermal processing is applied, rendering food microorganisms incapable of growing at temperatures at which the food is likely to be held during distribution or storage (Heinz & Hautzinger, 2007).

DISTRIBUTION

Table 5 presents details on the distribution of the RTE rice and bihon products to Typhoon Yolanda survivors, including the various organizations and individuals that helped. To assure the safety of the distributed RTE rice and bihon, the Project tested their field performance by conducting a preliminary field distribution within Metro Manila. During the field test, the products were distributed under the direct supervision of a project staff, with the assistance of receiving authorities from concerned government institutions.

The first distribution site for RTE rice was Jose Fabella Center in Mandaluyong City. The Jose Fabella Center, a residential institution managed by the DSWD, provides temporary shelter for stranded and homeless people; it was modified to serve as a holding area and temporary shelter for displaced survivors of typhoon Yolanda (Dinglasan, 2013; DSWD, 2013a). The Project turned over the RTE rice products to the DSWD personnel on site for distribution. The first distribution site for RTE bihon was the Acacia Residence Hall in UPD, with the aid of staff from the Office of Student Activities, Office of Student Housing, and University Food Service of UP Diliman. The Acacia Residence Hall accommodated 273 cross enrollees from the University of the Philippines Tacloban (UPT) who survived but were displaced due to typhoon Yolanda (Bolido, 2013).

At the first distribution sites, the SOS project staff maintained communications with the receiving authorities and distributing entities on a daily basis. Within three days of endorsement of the RTE products, the project staff went back to each of the first field distribution site to interview the recipients regarding the acceptability of the products. In view of the positive performance of the RTE products in the preliminary distribution sites in Metro Manila, the Project went ahead with their distribution in the typhoon-affected areas.

For all distribution activities of the RTE products, the Project obtained acknowledgment receipts from the receiving authorities and distributing entities.

Table 5. Distribution of the acid-pasteurized ready-to-eat (RTE) bihon and rice as emergency relief foods for Yolanda survivors

Emergency Relief Food	Distribution Assisting Entity	Recipient
RTE Rice	Department of Social Welfare and Development personnel at Jose Fabella Center	*Who* : Relocated survivors housed at the DSWD-run temporary shelter in Metro Manila *Where*: Jose Fabella Center, Mandaluyong City, Metro Manila *Controlled product field performance evaluation**
	Members of UP Hamili Brotherhood (fraternity) and UP Hamilia Sisterhood (sorority)	*Who* : Surviving residents in a heavily devastated Yolanda-stricken area *Where*: Brgy. Pasig, Lambunao, Iloilo *When* : 11/30/2013
	Volunteers from Junior Chamber International Manila	*Who* : Disembarking survivors flown from Tacloban City for exit-processing and relocation *Where*: Villamor Air Base, Pasay City, *When* : 12/14/2013
RTE Bihon	Office of Student Activities, the Office of Student Housing, and the University Food Service of UP Diliman	*Who* : Student transferees (survivors) from University of the Philippines Tacloban *Where*: Acacia Residence Hall, UP Diliman, Quezon City *Controlled product field performance evaluation**
	Private businessman	*Who* : Surviving residents in a heavily devastated Yolanda-stricken area *Where*: Brgy. Ambolong, Batan, Aklan *When* : 12/21/2013
	Leyte-based student volunteer from the University of the Philippines Diliman	*Who* : Surviving school children and their families in a heavily devastated Yolanda-stricken area *Where*: Telegrafo Elementary School, Brgy. Telegrafo, Tolosa, Leyte *When* : 12/23/2013

*Preliminary controlled field distribution per test product done in Metro Manila.

It also explained the nature and shelf life of the RTE products to the receiving authorities. It advised them to distribute the products immediately despite the one month shelf-life, but not before checking the integrity of the packaging materials and hermetic seals. The authorities were also to tell the recipients to consume the RTE products immediately after opening.

About 2,000 packs of RTE rice, along with other provisions of food, clothing, and amenities, were airfreighted to Iloilo in the Visayas (central Philippines) and distributed to residents of the heavily affected towns, particularly Barangay Pasig, Lambunao. Arrangements for the products' transport and their distribution were undertaken by the UP Hamili Brotherhood and UP Hamilia Sisterhood. These organizations, a fraternity and sorority, respectively, value the principles of social responsibility and civic consciousness. Barangay Pasig was reported to have roughly 5,600 affected families and about 1,300 devastated houses due to typhoon Yolanda (One Iloilo, 2013).

Another batch of RTE rice was distributed at Villamor Air Base in Pasay City, Metro Manila, with the help of the Junior Chamber International (JCI) Manila; it was used to feed the survivors arriving from Tacloban. The Villamor Air Base is the headquarters of the Philippine Air Force; it served as DSWD's processing center of displaced typhoon survivors arriving in Manila (Dinglasan, 2013; DSWD, 2013b). The incoming survivors received medical services, food, temporary shelter, counseling, and transportation (DSWD, 2013b) provided through the combined efforts of government agencies, nongovernment organizations, and other volunteers (Balana, 2013). Typhoon survivors were given meals after disembarking the C-130 planes and other military planes provided by foreign aid (Delfin, 2013). The JCI Manila is considered the oldest nonpolitical and nonsectarian youth service and leadership development organization in the Philippines and in Asia (JCI Manila, 2011). Referred to the Project by some of the CHE volunteers, this organization also provided services in transporting the RTE rice from UPD-CHE to Villamor Air Base.

A UPD student and native of Leyte, Angeline Calurasan, offered to bring and distribute RTE bihon packs in her hometown — Barangay Telegrafo, Tolosa, Leyte. She brought 140 packs, along with toys and school supplies, and distributed these to 140 affected elementary school children and their families. The municipality of Tolosa was where typhoon Yolanda was reported to have made its second landfall (Fonbuena, 2013).

About 1,500 packs of RTE bihon were transported to Aklan province, Western Visayas on board the company trucks of Nicin Barros, a businessman. These were distributed

to the residents of Barangay Ambolong, municipality of Batan. Batan was one of the hardest hit municipalities in the province (Bandiola, 2013). Almost 100% (428,668 individuals) of the population of Aklan were affected by typhoon Yolanda, leaving some 34,000 residents homeless (Bandiola, 2013). Being a native of Aklan himself, Mr. Barros offered to help distribute the emergency relief foods, free of charge.

FEEDBACK ON RTE BIHON AND RICE AS DISASTER RELIEF FOODS

A structured set of interview questions was prepared for use in getting feedback from some recipients of the products (Figure 4). The questions had to do with the perceived appropriateness of the products as relief food and aspects for improvement. Copies of the questionnaires were given to the assigned distribution entities.

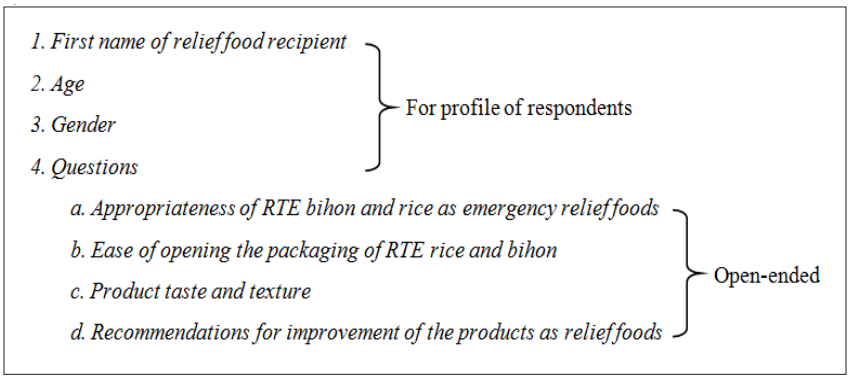

Figure 4. Interview guide questions to obtain feedback from recipients of the acid-pasteurized ready-to-eat (RTE) bihon and rice.

According to Turner (2010), a standardized open-ended interview is a basic type of qualitative interviewing method used for research or evaluation. In this type of interview, the interviewers follow a predetermined set of open-ended questions that are asked of all interviewees (Turner, 2010). This study used this method since it is cited as the most structured and efficient qualitative interviewing technique when several interviewers are involved (Sewell, 1999), especially when volunteer interviewers are used. Also, in this method, the interviewees are likely to be exposed to the same questions asked in the same order, therefore responses become comparable (Martella, Nelson, Morgan, & Marchand-Martella, 2013).

The study used two modes of distribution for the products: through formally recognized organizations that are known to conduct volunteer work during disasters and through private entities or individuals who expressed interest in helping distribute the products, strictly following the SOS Project protocol for distribution. The SRG conducted the interviews of the food recipients. According to Ms. Calurasan, who personally distributed the RTE bihon in Tolosa, the recipients extended the product by adding vegetables and broth. The volunteer student cited (translated from Tagalog): "A pack of pasteurized bihon is enough for a family of 4-5 members because family recipients would add broth and vegetables to it."

Tables 6 and 7 summarize the results of the first-hand interviews conducted by the project staff and from some food distributors in Aklan. The Project chose the interview respondents using convenience sampling. It interviewed only a few

Table 6. Summary of feedback on the acid-pasteurized ready-to-eat (RTE) bihon as emergency relief food for Yolanda survivors

Survey Site/Date	Profile of Respondents (Consumers)		Comments on Relief Food	%
Brgy. Ambolong,	Gender:			
Batan, Aklan,	Female	6	• Good relief food	100
Western Visayas	Male	4	• Tasty 100	
21 December 2013	**Total**	**10**	• Too salty	10
			• Packaging easy open	90
	Ages (years):		• Recommended changes:	
	21 – 30	1	- make less salty	10
	31 – 40	3	- use of easy to open packaging	10
	41 – 50	6	- more ingredients	10
	Total	**10**	- detailed label	10
Acacia Residence				
Hall, University	Gender:			
of the Philippines,	Female	6	• Good as relief food	100
Diliman	Male	1	• Typical bihon/like home cooked	43
14-15 January 2014	**Total**	**7**	• Texture firm/ like not fully cooked	29
			• Easy to open	100
	Ages (years):		• Tasty 29	
	11 – 20	7	• Recommended changes:	
	Total	**7**	- make less salty	14
			- more flavor	14
			- more serving	14
			- less firm	14
			- longer shelf life	14

recipients from the various distribution sites because of their sensitive conditions at the time. It seemed not appropriate to ask the disaster survivors to respond to interviews, given the prevailing situation where they were staying.

As shown in Tables 6 and 7, all respondents indicated that both RTE bihon and rice were appropriate as relief food. However, they found the RTE bihon to be too salty. As such, the spice mix portion relative to the entire product formulation needs to be re-analyzed. The recipients also suggested the addition of more ingredients and flavor to the RTE bihon, the extension of its shelf life, and improvement of the packaging so that it will be easier to open.

The recipients also recommended the inclusion of *ulam* (viand) in the RTE rice and increasing the serving size per pack. The recommendation to include viand may not be possible, however, because the retrogradation control through acidity control

Table 7. Summary of feedback on the acid-pasteurized ready-to-eat (RTE) rice as emergency relief food for Yolanda survivors

Survey Site/Date	Profile of Respondents (Consumers)		Comments on Relief Food	%
Jose Fabella Center,	Gender:		• Good as relief food	100
Mandaluyong City	Female	2	• Tasty 38	
22 November 2013	Male	6	• Texture dry	38
	Total	**8**	• Texture soft	25
			• Not easy to open	38
	Age (years):		• Recommended changes:	
	11 – 20	1	- make packaging easy to open	38
	21 – 30	4	- include ulam (viand)	25
	31 – 40	1	- increase serving	13
	41 – 50	1	- make softer	13
	51 – 60	1		
	Total	**8**		
Villamor Air Base,	Gender:			
Pasay City	Female	4	• Good as relief food	100
14 December 2013	Male	3	• Good texture	100
	Total	**7**	• Not easy to open/needs scissors	71
			• Recommended changes:	
	Age (years):		- make packaging easy to open	43
	11 – 20	1	- include ulam (viand)	14
	21 – 30	2	- include *pandan* (screw	29
	31 – 40	1	pine) flavor	
	41 – 50	2		
	51 – 60	1		
	Total	**7**		

may be compromised in the process development when cooked rice is mixed with meat, vegetables, and spices.

Also, the RTE rice texture may be a major consideration because some recipients said it was soft, while others found it firm and dry. Rice is a staple in the country and the populace in general would have developed their respective definitions of what good eating quality rice should be. Adjusting the eating quality of the RTE bihon and rice is limited, however, by the fact that the processing must consider retrogradation control in general and microbial safety.

LESSONS LEARNED

The SOS Project aimed to use the food technologies developed by UPD-CHE in the preparation of shelf-stable, acid-pasteurized bihon and rice as emergency relief foods for typhoon Yolanda survivors. The study achieved its objective and even learned more. The major insights obtained in the implementation of the SOS Project fall into the following categories: application of technology developed from the laboratory to real-life situation, technology application for a social cause through volunteerism, and feedback on the technology transfer for a social cause.

The application of the laboratory-developed food technologies to real-life situation needs to be appreciated from several perspectives, including the urgency of purpose, scale-up operations, and imposition of safety precautions on the developed technologies prior to larger scale production and distribution. In the SOS Project, the transfer was buffered with a lot of safety precautions to avoid causing harm to the recipients of the final processed products. The absence of any reported outbreak in the distribution of the RTE products indicated a successful technology transfer. The study was fortunate because the available technologies had commercial sterility test certifications, which verified the safety of heat-treated food products intended for large-scale production. Leading a large-scale production of food products that would have actual consumers beyond the usual field-testing participants was a daunting experience for the academic research team. Nonetheless, the team managed to apply the technologies with extreme control of food safety through good manufacturing procedures. In addition to these precautions on the production side and instructions to the food distributors, the team addressed also the risk of product mishandling during distribution remained, which could render the products unsafe for consumption when they reached the intended recipients. The survivors of typhoon Yolanda were already a vulnerable group and additional health problems due to unsafe relief foods were unacceptable.

The use of technologies of food science to pursue a social cause was made possible through social networking and availability of a trained pool of volunteers who have background on safe food handling. The social media facilitated the recruitment of volunteers. The strong desire to help and be useful during times of disaster motivated the Project proponents not to hesitate to be involved in and to rely on volunteers to meet the Project objective. The volunteers production and packing sections were the groups who relentlessly implemented the most manual steps without complaints. The transporters and distributors of the relief foods also implemented and took the more risky job of going to the field and handling potentially compromising situations in order to reach the survivors.

The feedback obtained from the recipients of the food packs provided insights on how to improve the products as relief emergency foods. The recipients unanimously accepted the RTE food products as good emergency relief foods, but refinements must be made. The packaging must be an easy-open type and the shelf-life of the products longer. The recipients also suggested adjustments to the taste and the addition of more flavors and viands. That the recipients found the products acceptable as relief foods is a source of honor to the product development initiatives of the CHE.

One insight gained from the implementation of the SOS Project was that a solution to a problem can be easily found when it is for a social cause. As experienced by the Project, all answers to concerns on logistics, funding, and services seemed to be readily at hand at the time they were needed. The social worth of the cause allowed the Project proponents to be divested of the discomfort of asking for urgent assistance from sources of solutions. At the end of the day, the SOS Project serves as an example of how technological outputs developed in academic laboratories can become an answer to an immediate need of the country.

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