III. FOOD SECTOR

Call Overview

Status of Industry

Food and beverage processing is a main growth driver of the Philippine manufacturing sector, with annual growth rate of 2.4% and gross value added amounting to 795.83 B in 2018. It comprises over 46% of manufacturing industries in 2017 and consistently contributes a large percentage to the country's Gross Domestic Product (GDP) since the 1990s (Philippine Statistics Authority). Most of the food processing industries are classified as Micro, Small, and Medium Enterprises (MSMEs) located all over the country. This sub-sector generates the employment of over 800,000 (Philippine Statistics Authority).

Coverage

Processing refers to any action that substantially alters the initial raw materials or product or ingredients to produce food. It is separate from primary production, which is the rearing, or growing of produce for harvest, and postharvest stages, which involves minimal transformation of food such as sorting and milling of grains, and slaughter of animal for food (Food Safety Act of 2013).

Industry Challenges and Partnerships

Despite its continuous growth, the food processing sector is hindered by several challenges that need to be addressed. Investments in research and development, technology transfer and upgrading — the widely accepted measures of innovation, have been historically low for food manufacturing industries in the Philippines (PIDS, 2017). These challenges were identified relative to the ASEAN integration in 2015 and still remain as the main challenges affecting the local industries. These are the following:

(1) Continued dependence on imported raw materials
(2) Need for improvement or innovation in local technology
(3) Ability to consistently deliver the required level of quality and food safety.

These industry concerns and challenges were also validated in the recent S&T consultation with the food industry conducted by the Council in partnership with the Board of Investments of the Department of Trade and Industry (DTI-BOI).

To be aligned with the global trends and international market that Philippine food products can take advantage of, the sector is also in close coordination with the Processed Food Industry Groups under the DTI - Export Marketing Bureau (EMB). Currently, there is also a partnership with the DTI – Center for Center for International Trade Expositions and Missions (CITEM) under their Value Food Innovation Program that aims to assist in the development and promotion of food products of Philippine SMEs. Under the partnership, PCIEERD will serve as the S&T partner of DTI-CITEM, along with relevant DOST agencies on research concerns for 10 priority products for funding. Identified products will be showcased at the DOST Innovation Hub Booth at the IFEX Philippines NXTFOOD Asia this year.

Thus, the Food Sector remains a priority for PCIEERD and shall continue to accept proposals under the following priority programs for 2022-2026 in line with the Harmonized National R&D Agenda:

Priority	Program	Call
Food and Nutrition Security	**Food Safety Program**	Strategic (Directed)
Countryside Development	**Food Innovation Program** • New Processing and Packaging Technologies for Local Food Industries	Mission
	• R&D for Specific Industry/Regional Concerns	Open
	DOST Halal S&T Program	Mission
Food and Nutrition Security Countryside Development	**DOST Smart Food Value Chain Program for the New Normal**	Mission

Call Objectives

To address the identified challenges, this Call includes programs and strategies towards the following:

1. Development of indigenous products as substitute for imported raw materials
2. Development of technologies for conversion of "waste-materials" into value-added products
3. Conduct of collaborative R&D on new technologies in response to global trends and ensuring safety and quality of products
4. Strengthening the capabilities and R&D network for the food sector

A. FOOD SAFETY PROGRAM

Call Rationale

Under Food and Nutrition Security, the DOST Integrated Food Safety program is DOST's support for the implementation of Republic Act 10611 or the Food Safety Act of 2013, with the following objectives:

1. To provide food safety related services to meet customer satisfaction;
2. To develop and implement effective systems, processes and protocols on food safety;
3. To develop and enhance human resource on food safety; and
4. To develop and institute strategies and mechanisms to sustain the food safety program.

The Food Safety Program is aligned with the following priorities:

SUSTAINABLE DEVELOPMENT GOALS ADDRESSED	• Goal 3: Good health and well-being • Goal 9: Industry, innovation, and infrastructure • Goal 12: Responsible consumption and production
KEY RESEARCH AREAS	• Rapid, Inclusive and Sustainable Economic Growth
11-POINT AGENDA	• Pursue R&D to address pressing national problems • Develop STI human resources and build a strong STI culture • Upgrade STI facilities and capacities to advance R&D activities and expand S&T services • Strengthen industry-academe-government and international STI collaboration

As action plan to the strategies, the developed DOST Food Safety Program has four (4) major components: Research and Development, Enhancement of Testing Capabilities on Food Safety, Human Resource Development, and Knowledge/Technology Transfer and Policy Advocacy Program, with the overall vision towards safe food for everyone, by everyone, through science, technology, and innovation. Human Resource Development of capacity building food safety teams was completed in 2019 while the current projects implemented are on the following R&D aspects (Fig. 1):

R&D to Support Risk Assessment in Philippine Foods

- Risk Profiling of Hazards in Philippine Food to Support National Risk Management
- Prevalence of Mycotoxin in Rice and Corn in the Philippines
- Prevalence of Heavy Metals and Pesticide Residues in Milled White Rice and White Corn Grits in the Philippines
- Exposure Assessment of Food Chemical Contamination in Metro Manila: A Pilot Total Diet Study Approach

R & D in Support to Food Industry

- Development of Food Safety Guidelines for the Food Service Sectors
- Development of Grading System for Adoption of Food Establishments in the Philippines

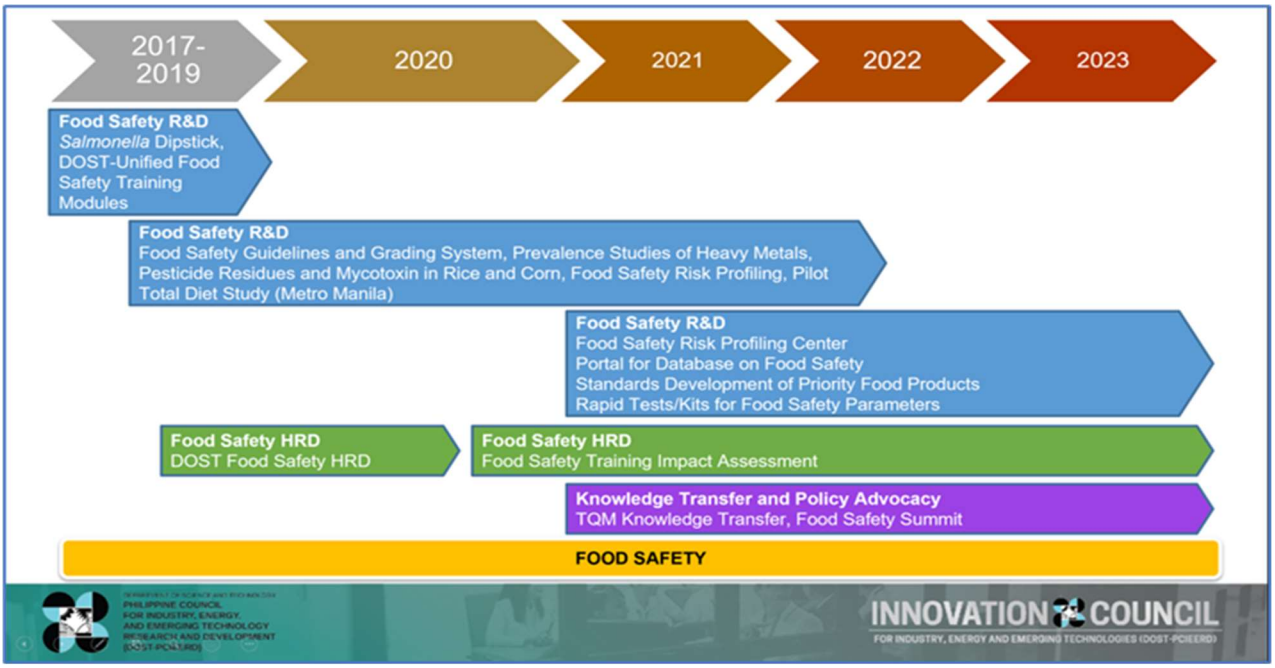

Figure 1. Priorities under the DOST Integrated Food Safety Program

These projects were implemented to jumpstart the R&D activities towards building the national capacity for food safety risk assessment as basis for policies and further studies, with the program milestones given in Figure 2. In 2020, out of 10 proposals received under Food Safety, the Council has approved for implementation the *Development of Draft Standards and Recommended Code of Practice for Processing of Peanut Butter*.

Figure 2. Milestones under the DOST Integrated Food Safety Program

Call Objectives

To further continue with the priorities under the Food Safety Program on building our national capacity towards risk assessment of Philippine food, this Call has the following objectives:

- To establish a food safety risk profiling center to integrate the application of risk profiling and the results of previous R&D studies on risk assessment of Philippine food. The center will help assist the national food safety risk managers in prioritizing food safety issues and in channeling resources to appropriate risk management options.
- To develop harmonized test methods on food safety parameters for reduced cost of compliance of industries in terms of technical barriers to trade

Call Scope

Priorities	Output	Timeline
NICER for Food Safety Risk Profiling	• Established Food Safety Risk Profiling Center • Consolidated data in Philippines related to food safety risk analysis • Food Safety Risk profiles on chemical and microbiological hazards	2022-2024
Development of ASEAN Harmonized Test Methods for Food Safety Parameters	• Harmonized Test Methods Manual • Set of Technical Guides	2022-2026

Specific Features Sought in this Call

1. The implementing agency and proponent should have track record and established expertise on food safety.
2. A collaborative undertaking among HEIs in the region. Institutions from other region/s which are working on similar or related research area may also be engaged given their capability and commitment.
3. The proposal must include the following details:
    a. Clearly presented values or the corresponding opportunity cost for the proposed interventions. This can include details on potential socio-economic impact in terms of projected increase in productivity of risk managers or additional income of industry, as well as potential benefits in terms of public health.
    b. Defined partnerships or collaborations with food safety regulatory agencies and other relevant institutions for the project implementation and sustainability of operations
    c. Sustainability plan including established mechanisms in terms of institutional, financial, and human resources capability. It shall indicate the commitments of the host institution and collaborating HEIs/institutions to sustain operations of the center.
    d. Counterpart funding from the partner agencies to be involved in the project.
    e. Counterpart resources (e.g. facilities, equipment) available in each implementing agency

For the Risk Profiling Center

1. Multi-year project (maximum of 3 years) with a clear roadmap of R&D activities and outputs.
2. Have at least three (3) R&D project proposals which may have different implementing agencies.
3. Submit endorsement by the Regional Development Council (RDC) or its equivalent and by the Head of the Implementing Agency.
4. Organizational and operational structure of the proposed Food Safety Risk Profiling Center

B. FOOD INNOVATION PROGRAM

Call Rationale

Innovation covers a wide range of activities that aim to translate ideas into useful new products, processes, and services. For the Food Sector, an array of possibilities exists for innovation - from the sourcing of raw materials, processing, packaging, including marketing and distribution systems. In the Philippines, while there are large corporations operating in the country, majority of food manufacturers are still MSMEs. Thus, the challenge of introducing innovations by generating concepts and creating new products entail a level of risk that are usually too high to bear especially for micro and small entrepreneurs, particularly on access to processing technologies and facilities.

Several products and improved processes were developed under the Food Innovation program since 2017 as shown in Figure 3. In 2020, there were 36 proposals received under Food Innovation with the following proposals approved for implementation:

- Under Enabling Systems for Food Innovation
  - Technical Support to DOST Food Innovation Centers
  - Development of FIC Competency in Moving New Products from Concept to Market Launch
  - Development of Competency on Establishment and Validation of Adequate Processes for Thermally Processed Food
  - Thermal Processing of Selected Materials Using Agitated-Type Retorts

- Under Product Innovation
  - Development of Innovative Food Products from Colored Philippine Tubers and Root Crops through the UPLB – DOST Food Innovation Center
  - Development and Field Testing of Retort Foods as Food Ration for Men in Uniform during Combat and High Risk Operations

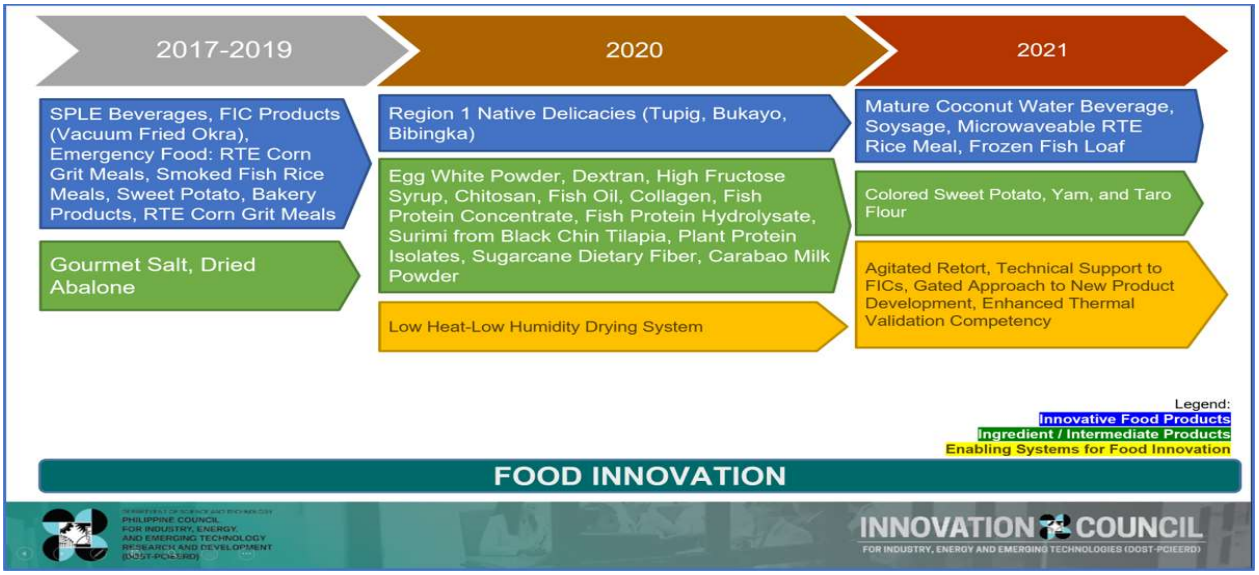

Figure 3. Priorities under the Food Innovation Program

Call Objective

This program aims to improve the capability of local industries by developing processing and packaging technologies that are not yet available in the local scenario and are seen to revolutionize the current practices of industries for better quality products with improved safety and/or nutritional benefits.

Call Scope

Priorities	Output	Timeline
New Processing and Packaging Technologies for Local Food Industries	• **Established process for local products**	**2022-2024**
R&D for Specific Industry/Regional Concerns		
Salt and Flavor Enhancers • Determination of the effect of iodization on salt processing and product characteristics • Process and product optimization of flavor enhancers from indigenous sources (*e.g. seaweeds, oyster*) • Development of healthier flavor enhancers for noodles and other flour-based products	• Policy Recommendation on use of iodized salt for manufacturing • Flavor enhancers	2022 -2026
Natural Sweeteners • Product innovation and development of other forms of stevia (*e.g. stevia liquid, tablets*)	Stevia product variants	2023
Milk • Development of community-based system for pasteurization and sterilization of milk	Equipment system for community-based milk processing	2024

Priorities	Output	Timeline
Coconut • Utilization and value-adding of coconut processing by-products (i.e. coconut pulp or "*sapal"* and curd or *"latik)* • Development and quality improvement for emerging coconut products (vinegar, butter, aminos)	• Established processes for coconut products	2023

Specific Features Sought in this Call

1. The implementing agency and proponent should have track record and an established expertise on food processing.
2. Endorsed by the Head of Implementing Agency. Proposals submitted for consortium must also include endorsement from the Regional Consortium Chair.
3. Sound scientific basis for the proposed technology including:
    a. Relevant data and literature to provide situationer for the pressing national problems to be addressed
    b. Appropriate experimental design and statistical analyses when applicable
    c. Advantages and differentiation over existing similar technologies
4. The proposal must include the following details:
    a. Clearly presented value or opportunity cost of the proposed technology including:
        i. Socio-economic impact (projected increase in productivity of risk managers or additional income of industry)
        ii. Current demand for the proposed technology
        iii. Environmental impact and waste management plans
    b. Letter of intent with defined partnership with company/ies willing to test and/or adopt the technology.
    c. Detailed plans for transfer of technology to end user.
    d. Sustainability plan for the proposed technology (institutional, financial, and human resources) for the host institution and partner industry.
    e. Counterpart funding from the partner agencies to be involved in the project.
    f. Counterpart resources (e.g. facilities, equipment) available in each implementing agency

C. DOST HALAL S&T PROGRAM

Call Rationale

In support of RA 10817 or the Philippine Halal Export Development and Promotion Act, and as provider of scientific and technical knowledge in support to the development of the Halal industry, the DOST implemented the DOST Halal S&T Program which lays down the plans and programs for four (4) areas, namely: (1) Research and Development, (2) Human Resource Development, (3) Knowledge Transfer, and (4) Halal Verification Laboratory Testing (Figure 4).

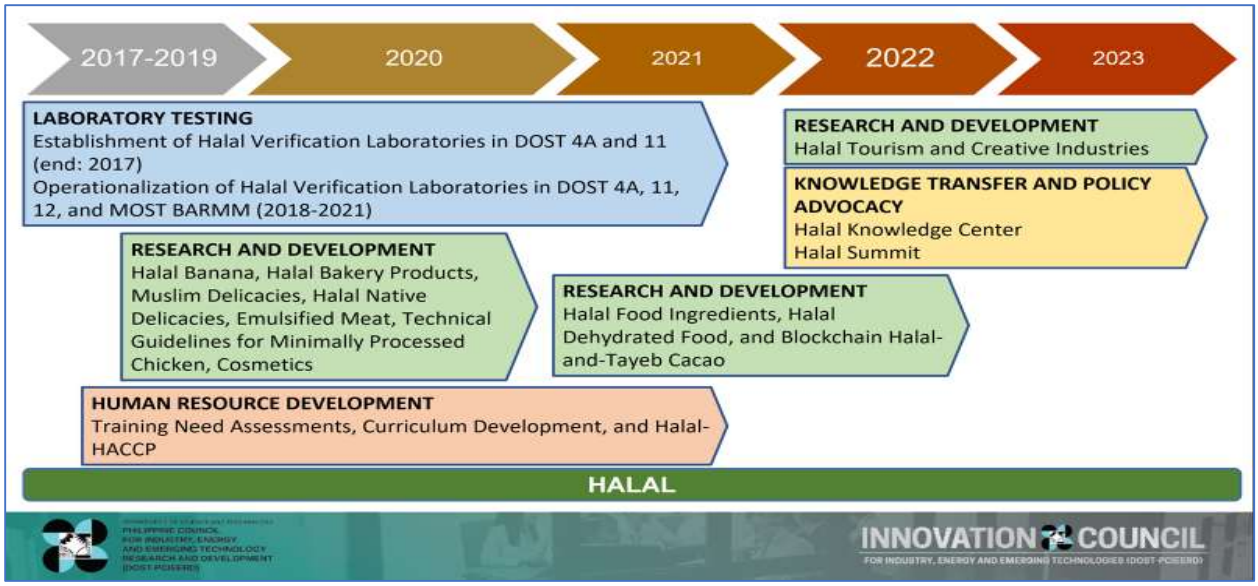

Figure 4. Priorities under the DOST Halal S&T Program

These initiatives hope to strengthen the Halal industry specifically in meeting world standards, promoting competitiveness of entrepreneurs, increasing capability in Halal accreditation and formulating standards, and upgrading Halal research and development. The program started in August 2018 has achieved several accomplishments and milestones as of 2020 (Figure 5).

Figure 5. Milestones of the DOST Halal S&T Program as of 2020

In 2020, the following R&D projects were approved out of 9 proposals received under the program:

- Blockchain-Based Novel System/Application for Transparent Traceability of Halal-and-Tayeb Cacao Products
- Development of Halal Compliant Dehydrated Food Products from Selected Food Materials (Fruits, Vegetables, and Rootcrops)

- Establishment of Halal Assurance System for Selected Food Ingredients (Dried and Powdered Onion, Garlic, Black Pepper, and Chili)

Following the program milestones for 2020 with the developed Halal Assurance Systems for different products and personnel competencies, another aspect of the Halal ecosystem that the program envisions to cater is the aspect of Halal Tourism.

S&T for Accelerating Halal Tourism Industry

The Philippines ranks 36th out of 130 countries in the 2019 Global Muslim Travel Index, up by 5 notches from 2018 and tied at the 9th spot for Non-OIC destinations together with France and Spain (Figure 6).

TOP 10 OIC DESTINATIONS

RANK	GMTI 2019 RANK	DESTINATION	SCORE	CHANGE
1	1	Malaysia	78	0
1	1	Indonesia	78	1
3	3	Turkey	75	1
4	4	Saudi Arabia	72	1
5	5	United Arab Emirates	71	-3
6	6	Qatar	68	0
7	7	Morocco	67	3
8	8	Bahrain	66	0
8	8	Oman	66	1
10	10	Brunei	65	1

TOP 10 NON-OIC DESTINATIONS

RANK	GMTI 2019 RANK	DESTINATION	SCORE	CHANGE
1	10	Singapore	65	0
2	18	Thailand	57	0
3	25	United Kingdom	53	0
3	25	Japan	53	1
3	25	Taiwan	53	2
6	29	South Africa	52	1
7	31	Hong Kong	51	-2
8	34	South Korea	48	5
9	36	France	46	0
9	36	Spain	46	3
9	36	Philippines	46	5

Figure 6. Top 10 Destinations – 2019 Global Muslim Travel Index

With its strong tourism industry, the country is accelerating its plans to position itself as one of the world's preferred destinations for Muslim tourists. The Department of Tourism (DOT) has a series of initiatives as part of a major drive to create a long-term infrastructure across the country to diversify its visitor arrivals by attracting Muslim visitors - especially from the neighboring ASEAN region and the Middle East. In 2016, it has partnered with Crescent Rating and the Halal International Chamber of Commerce and Industries of the Philippines (HICCIP), to help build capabilities and resources as well as launch a destination marketing campaign (Crescent Rating, 2016). A Muslim Travel Guide (Figure 7) was also developed which includes necessary information for top destinations in the country in partnership with HalalTrip, a global online platform for Muslim travelers.

Figure 7. Excerpts from the Muslim Travel Guide for the Philippines

The DOT is also crafting a roadmap for Halal Tourism to further develop and expand the arrivals from the Middle East and other Muslim nations (Business Mirror, 2019). For 2021, the DOT has the following priority activities on Halal Tourism:

- Implementation of the Memorandum Circular on the Guidelines Governing the Operations and Recognition of Muslim-Friendly Accommodation Establishments
- Project on BIMP-EAGA Culinary Promotions entitled: Mindanao Halal Culinary Tourism Product Development
- Establishment of Halal Food Circuit within Mindanao Regions to be handled by DOT Mindanao Regional Offices.

The program is aligned with the following priorities:

SUSTAINABLE DEVELOPMENT GOALS	Goal 8: Decent work and economic growth
KEY RESEARCH AREAS	Rapid, Inclusive and Sustainable Economic Growth
11-POINT AGENDA	• Maximize utilization of R&D results through technology transfer and commercialization • Expand STI assistance to communities and the production sector, particularly MSMEs

Call Objective

To call aims to continue with the development of national capacity for improvement of the local Halal industries for strengthening of the Halal ecosystem in the country. This will be done by addressing needs of the Halal Tourism industry by ensuring availability of Halal Food, building capability of the hospitality industry to be Muslim-friendly, and development of a tourist portal for Muslim travelers.

Call Scope

Priorities	Output	Timeline
HRD and Knowledge Transfer:		
Strengthening Halal compliance of food service establishments	• 13 New Halal-HACCP Trainers/Auditors	2022 -2023

Priorities	Output	Timeline
HRD and Knowledge Transfer:		
	• 42 assisted companies with Halal certification	
Establishment of Halal Knowledge Center	Central repository with online database of R&D output and Halal-related activities	2022-2023
R&D:		
Development of Recommended Code of Practice for Halal-friendly hospitality industry • Lodging/Accommodation • Recreation facilities (resort, spa, amusement parks, tourist sites)	• Data on level of compliance of establishments to Halal principles • Recommended Codes of Practice	2023-2024
Enhancing Digital Presence: Development of Halal Tourist Portal	Philippine Halal Tourist Portal	2025-2026

Specific Features Sought in this Call

1. The implementing agency and proponent should have track record and an established expertise on the proposed project.
2. Multi-year project with a clear roadmap of R&D activities and outputs. The proposal must include the following details:
    - Endorsement by the DOST Halal S&T Program Leader
    - Detailed Review of Literature by including previous works and relevant studies where the proposal will take off.
    - Data/information related to the proposal's potential socio-economic impact and marketability:
        - Projected employment generation after the completion of the project. Identify the possible specific jobs to be involved and/or estimated number of personnel needed.
        - Estimated income/productivity rate once the technology/study is established
        - Information/data/activities on potential market expansion of the products
        - Advantages of the proposed technology and its target cost over the existing/commercially available/similar technologies in the market.
        - Potential impacts to the identified industry
    - Data on how the project can contribute in improvement of environmental conditions by including any possible environmental impact from the proposal.
    - Clear plans for utilization of project results:
        - Specify mechanisms for sustainability of operations/technologies
        - Strategies for wider adoption of the technologies by indicating how the project results can be scaled up to be widely used or available.
        - Plans for promotion and transfer of technology to end user

- Sustainability for the resources to be generated, capacity built from the project proposal, and equipment being requested.

- Adequate counterpart funding from the implementing agency and other partners.
- Letter of commitment from identified cooperating agencies willing to test and/or adopt the technology.
- Risk Management Plan. Identify the risks on the implementation of each project. Develop and submit an action/contingency plan for identified risks and prepare alternative activities to avoid delays in the conduct of the activities of the project and its implementation.
- Technology Roadmap

D. DOST SMART FOOD VALUE CHAIN PROGRAM FOR THE NEW NORMAL

Call Rationale

The DOST Smart Food Value Chain Program for the New Normal was conceptualized in 2020 to address food self-sufficiency. The pandemic led to difficulty in the movements of goods from the farms to the consumers. Results of the survey conducted by IATF TWG on Anticipatory and Forward Planning in the first month showed that 35%of the respondents were not able to sell their produce which led to wastage of produce and losses for the farmers. Although, the government is assuring the people that there is enough food supply, bringing them to the consumers becomes a problem.

The program, as shown in Figure 8, aims to utilize smart and innovative technologies throughout the value chain- from production, processing, distribution up to consumption. Support activities that encompass the whole chain are Food Security, Supply Chain Management, Waste Management and Recovery, Human Resources Development, Technology Development and Deployment. Smart production systems, deployment of high yielding varieties, use of innovative technologies, application of ICT and data analytics are interventions that will be applied in the agri-food chain.

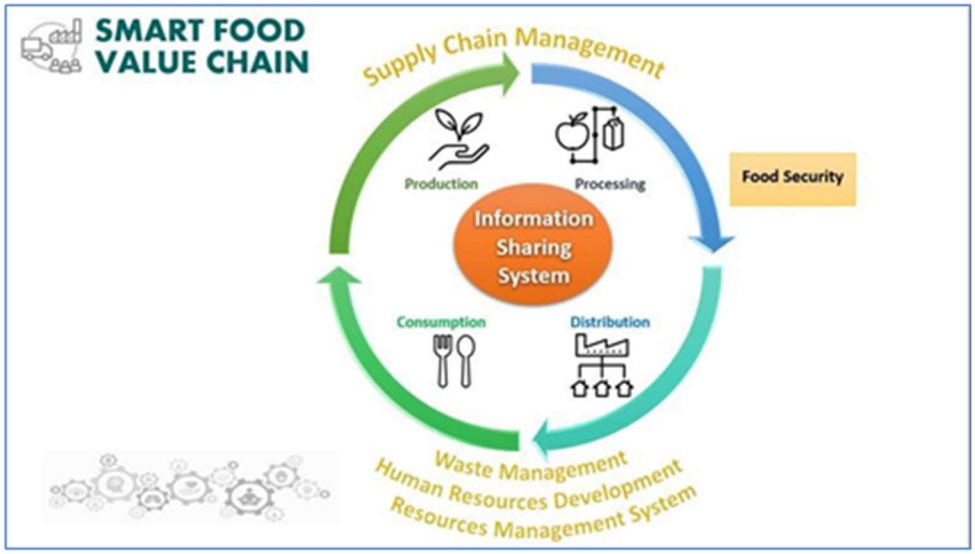

Figure 8. DOST Smart Food Value Chain Program for the New Normal

The following component projects were approved under the Call for the DOST Smart Food Value Chain program in 2020:

1. *Upgrading of Selected Food Processing Centers and Roll out of Technologies in the Regions*
    - Development and Deployment of a Smart Toll Processing System for Vacuum-Fried Mixed Chips, Spray-Dried Buko Powder, and Thermally Processed Tuna Congee
    - Upgrading of the Vacuum-Fried Fruits and Vegetables Production in the Western Visayas Food Innovation Center
    - Leveling-up of Quezon's Bagsakan Center Agri-Processing Facilities through Adoption of the Smart Food Value Chain Framework
2. Development of Mobile Modular Food Processing Facility (MFPF)
3. Upgrading the Capability of Existing Distribution Centers /Trading Posts in the Delivery of Fresh and Semi-Processed Vegetables in the Supply Chain: Focusing on Packaging Technology and Logistics

The program is aligned with the following priorities:

SUSTAINABLE DEVELOPMENT GOALS ADDRESSED	• Goal 2: Zero Hunger • Goal 9: Industry, innovation and infrastructure • Goal 12: Responsible consumption and production
KEY RESEARCH AREAS	• Rapid, Inclusive and Sustainable Economic Growth
11-POINT AGENDA	• Pursue R&D to address pressing national problems • Conduct R&D to enhance productivity and improve management of resources • Strengthen and utilize regional R&D capabilities • Upgrade STI facilities and capacities to advance R&D activities and expand S&T services • Expand STI assistance to communities and the production sector, particularly MSMEs

Call Objective

This Call aims to develop an IT-based platform to capture, process, and provide timely and reliable data to effectively trace resources and aid in efficient and informed decision-making in food supply chain management. The system should be able to provide analytics and management reports for action of the stakeholders. This will establish complete and strong link among the farmers, traders and logistics, distributors, processors, retailers, and relevant government and non-government institutions.

Call Scope

Priorities	Output	Timeline
Development of an Integrated Food Value Chain and Resource Management System (FVCRMS)	IT-based platform for effective management of resources within the food supply chain	2022-2023

Specific Features Sought in this Call

1. This call is open to all HEIs, Startups, or TBIs, with good knowledge and established expertise on supply chain management and data analytics.

2. The proponent should have established partnership with DOST Regional Offices, private institutions, local government units, and other government agencies that would contribute data on the different stages of the value chain.
3. The proposed system must integrate existing developed systems/platforms of other agencies on value chain and resource management.
4. The proposal must include the following details:
    a. Sound scientific basis for the proposed technology including:
        i. Relevant data and literature to provide situationer for the pressing national problems to be addressed
        ii. Appropriate experimental design and statistical analyses when applicable
        iii. Advantages and differentiation over existing similar technologies
    b. Socio-economic impact
    c. Environmental impact
    d. Identified strategies for deployment and transfer of the proposed system to the end users
    e. Sustainability plan
    f. Current and potential demand for the system

Food Sector Programs Funding Allocation

Program Priorities	Duration	Budget					
		2022	2023	2024	2025	2026	TOTAL
Food Safety • **Food Safety Risk Profiling Center**	**2022-2024**	**30M**	**30M**	**20M**	**-**	**-**	**80M**
• ***Development of ASEAN Harmonized Test Methods for Food Safety Parameters***	**2022-2026**	**5M**	**5M**	**5M**	**5M**	**5M**	**25M**
Food Innovation • **New Processing and Packaging Technologies for Local Food Industries**	**2022-2024**		**20M**	**20M**	**10M**	**-**	**50M**
• **Specific Industry/Regional Concerns**	**2022-2026**	**5M**	**5M**	**15M**	**5M**	**5M**	**35M**
DOST Halal S&T Program • **R&D on Accelerating Halal Tourism**	**2022-2026**	**5M**	**7M**	**3M**	**3M**	**2M**	**20M**
• **Halal Knowledge Center**	**2022-2023**	**10M**	**5M**	**-**	**-**	**-**	**15M**
DOST Smart Food Value Chain Program							
• **Development of Integrated Food Value Chain Resource Management System**	**2022-2023**	**10M**	**5M**	**-**	**-**	**-**	**15M**