Locally Developed Food Processing Equipment for MSMEs
(DOST-PCIEERD supported project)

Presented By:

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One of the major contributors to the country’s growing economy is the manufacturing sector with food manufacturers as the top sub-sector.
• Major sectors of the food processing industry: fruits and vegetables; fish and marine products; meat and poultry products; flour and bakery products; beverage and confectionery dairy foods; food condiments and seasonings; food supplements; bottled water; snack foods and fats and oils.
• The industry contributes more than 40% of the total manufacturing output and approximately 20% of Gross Domestic Product (GDP) per annum.
An Overview:
Philippine Food Manufacturing Industry

**Philippines GDP**
Year-to-year change

**GROSS VALUE ADDED in MANUFACTURING**
1st Quarter 2012 and 1st Quarter 2013
AT CURRENT PRICES, IN MILLION PESOS

<table>
<thead>
<tr>
<th>INDUSTRY/INDUSTRY GROUP</th>
<th>Q1 2012</th>
<th>Q1 2013</th>
<th>Growth Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food manufactures</td>
<td>261,860</td>
<td>300,813</td>
<td>14.9</td>
</tr>
<tr>
<td>Beverage industries</td>
<td>14,541</td>
<td>15,058</td>
<td>3.6</td>
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<tr>
<td>Tobacco manufactures</td>
<td>680</td>
<td>633</td>
<td>-6.9</td>
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<tr>
<td>Textile manufactures</td>
<td>10,752</td>
<td>9,511</td>
<td>-11.5</td>
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<tr>
<td>Wearing apparel</td>
<td>16,345</td>
<td>18,165</td>
<td>11.1</td>
</tr>
<tr>
<td>Footwear and leather and leather products</td>
<td>1,278</td>
<td>1,691</td>
<td>32.3</td>
</tr>
<tr>
<td>Wood, bamboo, cane and rattan articles</td>
<td>3,384</td>
<td>2,747</td>
<td>-18.8</td>
</tr>
<tr>
<td>Paper and paper products</td>
<td>3,339</td>
<td>3,037</td>
<td>-9.0</td>
</tr>
<tr>
<td>Publishing and printing</td>
<td>3,427</td>
<td>3,101</td>
<td>-9.5</td>
</tr>
<tr>
<td>Petroleum and other fuel products</td>
<td>44,066</td>
<td>32,968</td>
<td>-25.2</td>
</tr>
<tr>
<td>Chemical &amp; chemical products</td>
<td>24,268</td>
<td>26,485</td>
<td>9.1</td>
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<tr>
<td>Rubber and plastic products</td>
<td>7,478</td>
<td>7,158</td>
<td>-4.3</td>
</tr>
<tr>
<td>Non-metallic mineral products</td>
<td>11,011</td>
<td>11,457</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Source: National Statistical Coordination Board
The Wall Street Journal
Food processing industry needs critical attention

Local food processors are faced with challenges like:

- maintaining market share
- wide variety of imported processed foods readily enter the market due to increased trade liberalization
- innovating or introducing new products
Issues and Challenges: Philippine Food Manufacturing Industry:

• High capital investment and acquisition of state of the art equipment deprived our local manufacturers of the opportunity to expand product lines in order to meet a diverse range of customer requirements and become **globally competitive**.

• Processed products, particularly food manufactured by ASEAN neighbours like Thailand, Malaysia and now Vietnam, are more competitive (price and quality wise) and are continuously being sold and patronized by the local market.
Priority need of the food processors:

- Affordable equipment to increase production efficiency and compliance to standard requirements that will enable our food processors—MSMEs to become more competitive (local and foreign market)
• DOST’s leadership and drive towards industry development particularly, in the regions; and

• S&T intervention on localized fabrication of food processing equipment – vital in improving MSMEs competitiveness and sustained growth.
Design and Development of Process Equipment for Food Processing Firms

Implementation: May 2011 – December 2013

Implementing Agencies:

• DOST- Project Management Engineering Design Service Office (PMEDSO);

• Metals Industry Research Development Center (MIRDC); and

• Industrial Technology Development Institute (ITDI)
GENERAL OBJECTIVE:

- To promote the development of locally fabricated process equipment for the food processing industry sector.
SPECIFIC OBJECTIVES:

- Design and fabricate food processing equipment prototypes to substitute imports that are appropriate and affordable for use by food processors;
- Evaluate the performance of process equipment prototypes; and
- Monitor actual operating performance of equipment prototypes through field testing.
SIGNIFICANCE:

• Reduce importation and address issue on high cost of equipment.

• Process equipment will be made available for commercial use at an affordable cost.

• Improve the performance and efficiency of local food processors.

• Project will benefit local equipment fabricators, domestic food processors and indirectly benefit farmers and food growers.
Food processing equipment prototypes

1. Water Retort
2. Freeze Dryer
3. Vacuum Fryer
4. Spray Dryer
5. Vacuum Packaging Machine
6. Immersion Freezer
7. Vacuum Evaporator
GOOD NEWS....

• DOST Regional Offices will establish their regional Food Innovation Centers (FICs)

• Locally developed food processing equipment will be showcased and tried out by potential adopters
DOST-PMEDSO  ITDI  MIRDC

DOST Regional Offices
(Lead: DOST 8)

Design & Development of Process Equipment for Food Processing Firms
(May 2011 – Dec 2013)

7 Process Equipment Prototypes
Designed, Fabricated, Tested

Roll-out of 5 Food Processing Equipment Prototypes in the Regions
(12 months)

Prototype of 5 Process Equipment
by accredited fabricators

Vacuum Packaging Machine
Water Retort
Vacuum Fryer
Spray Dryer
Freeze Dryer

DOST Food Innovation Centers
(2013-2016)

Food Innovation Center (FIC)
in every region

First 6 Regions:
2, 5, 6, 8, 10, 11

Vacuum Packaging Machine
Water Retort
Vacuum Fryer
Spray Dryer
Freeze Dryer
DOST-Developed Food Processing Equipment
DESCRIPTION:

- A cooking and sterilization vessel capable of withstanding extreme pressures
- Designed to destroy all microbes to prolong shelf-life and make products safe for consumption
- Utilizes water as a heating medium
- Sterilization applicable for various types of containers: metal, cans, glass, bottles, retortable pouches/plastics
BENEFITS/ADVANTAGES:

• Reduced process time translating to savings in cost of utilities, storage space, transportation costs;

• Provides an opportunity for food processors to shift to using retort pouch as alternative packaging for thermally-processed products at lower cost; the use of retort pouches provides other advantages like:
  
  - Enables conformity to regulations for thermally processed foods
  - Increased convenience for consumers: packages are light-weight and easy to open
  - Better package presentation
  - Readily available local expertise and technical support
Water Retort
Locally Developed Food Processing Equipment
Water Retort
Locally Developed Food Processing Equipment
Water Retort
Locally Developed Food Processing Equipment

FEATURES:

• Batch type, non-agitating, vertical pressure
• Water used as heating medium
• All stainless steel construction
• Simple to operate
• Cheaper than comparable-sized retort
• Modular set up is ideal for micro-scale processors
Water Retort
Locally Developed Food Processing Equipment

Ready to eat meals

Ready to eat meals
DESCRIPTION:

- Used for deep-fat frying; Designed to fry under reduced pressure and in a closed system that lowers the boiling point of both oil and water in food.

- Food dehydrates at a lower temperature thus, its natural color and flavor are retained.

- The product is crunchier in texture and absorbs less amount of oil in the process.
BENEFITS/ADVANTAGES:

• Simple and easy to operate

• Local fruits and vegetables like banana, mango, pineapple, durian, jackfruit, papaya, okra and carrot can be vacuum fried.

• Final products are crunchy, low in fat and high in fiber content.

• Process results in minimal changes in color and flavor

• Longer shelf-life, requiring no preservatives
Vacuum Fryer
Locally Developed Food Processing Equipment
Vacuum Fryer
Locally Developed Food Processing Equipment

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>PRESSURE GAUGE</td>
</tr>
<tr>
<td>2</td>
<td>FRYING VESSEL COVER</td>
</tr>
<tr>
<td>3</td>
<td>FRYING VESSEL</td>
</tr>
<tr>
<td>4</td>
<td>FRYING VESSEL FLUE GAS JACKET</td>
</tr>
<tr>
<td>5</td>
<td>SIGHT GLASS</td>
</tr>
<tr>
<td>6</td>
<td>FRYING VESSEL BURNER</td>
</tr>
<tr>
<td>7</td>
<td>LADDER</td>
</tr>
<tr>
<td>8</td>
<td>COVER SIGHT GLASS</td>
</tr>
<tr>
<td>9</td>
<td>VACUUM REGULATOR</td>
</tr>
<tr>
<td>10</td>
<td>SMIVEL JOINT</td>
</tr>
<tr>
<td>11</td>
<td>FRYING VESSEL, VACUUM CONTROL VALVE</td>
</tr>
<tr>
<td>12</td>
<td>MAIN CONTROL VALVE</td>
</tr>
<tr>
<td>13</td>
<td>OIL PREHEATMENT TANK VACUUM CONTROL VALVE</td>
</tr>
<tr>
<td>14</td>
<td>TEMPERATURE SENSOR</td>
</tr>
<tr>
<td>15</td>
<td>OIL PREHEATMENT TANK</td>
</tr>
<tr>
<td>16</td>
<td>TPA TANK</td>
</tr>
<tr>
<td>17</td>
<td>PREHEATMENT TANK BURNER</td>
</tr>
<tr>
<td>18</td>
<td>5 HP LIQUID RING VACUUM PUMP</td>
</tr>
<tr>
<td>19</td>
<td>OIL TRANSFER CONTROL VALVE</td>
</tr>
</tbody>
</table>
FEATURES:

- LPG fuelled
- Equipped with digital temperature controller
- All stainless steel construction
Vacuum Fryer
Locally Developed Food Processing Equipment

- jackfruit
- papaya
- tahong (mussels)
DESCRIPTION:

• Vacuum packaging is a method of removing air (oxygen) from the container, thereby prolonging food shelf life.

• Stores the food in minimum-air environment, preventing the growth of microorganisms and protecting the food from spoiling thereby extending the shelf-life of food significantly.

• Usually applied for long term storage of dry foods such as cereals, nuts, cured meats, cheese, smoked fish, coffee and potato chips (crisps)
BENEFITS AND ADVANTAGES:

• Enhances product quality

• Maintains the freshness and flavor of food

• Vacuum packing results to savings in the food industry (in terms of minimized storage and ease of transport)

• Can be used for a wide range of plastic bags like tri-laminates, retortable bags and PPE

• Can be used for products that require nitrogen flushing
Vacuum Packing Machine
Locally-developed Food Processing Equipment
FEATURES:

- A table-type unit that can be widely used in vacuum sealing of food products such as seafood, meat and dried fruits/vegetables – in flexible pouches

- Can be used for products that require nitrogen flushing
Vacuum Packing Machine
Locally-developed Food Processing Equipment

- rice
- corn
- tinapa
- crispy pata
DESCRIPTION:

• Used in converting liquids into dry powder

• The system subjects atomized liquid raw material to heated gas in a drying chamber, causing instantaneous evaporation

• Powder is discharged continuously from the drying chamber and collected in a cyclone-type dust collector
BENEFITS/ADVANTAGES:

• Preferred method of drying thermally-sensitive materials such as foods and pharmaceuticals

• Efficient and rapid methods of drying most liquid materials/food solutions or suspensions

• Can be used for heat-resistant and heat-sensitive products

• Offers better control of powder quality in terms of particle size and bulk density
Spray Dryer
Locally-developed Food Processing Equipment
Spray Dryer
Locally-developed Food Processing Equipment

FEATURES:

• High pressure pump/plunger pump

• Evaporation capacity : 5-6 kg of water/hour
Spray Dryer
Locally-developed Food Processing Equipment

Cow’s milk

Carabao’s milk

Mango
DESCRIPTION:

• Used to dehydrate heat-sensitive materials via process involving the sublimation of water content under vacuum conditions

• Used to preserve a perishable material or make the material more convenient for transport

• Freeze dried products may be stored at room temperature without refrigeration

• Enables retention of most of the quality characteristics of the unprocessed food material
Freeze Dryer
Locally-developed Food Processing Equipment

BENEFITS/ADVANTAGES:

• Can dry food materials below 40°C
• Dried material retains its shape & color
• Flavors, smells and nutritional content generally remain unchanged.
• Preserves temperature-sensitive products (e.g. enzymes, blood plasma, vaccines)
• Provides solution to certain delivery problems
• Freeze dried products can be rehydrated quickly
Freeze Dryer
Locally-developed Food Processing Equipment
Freeze Dryer
Locally-developed Food Processing Equipment

1. Vacuum Chamber Assembly
2. Ice Condensing Chamber Assembly
3. Pirani Gauge
4. Vacuum Pump
5. Condensing Unit
FEATURES:

• Consists of vacuum chamber with five adjustable trays

• Condensing capacity of up to 4L/24 hours
Freeze Dryer
Locally-developed Food Processing Equipment
Freeze Dryer
Locally-developed Food Processing Equipment

durian
avocado
tahong
<table>
<thead>
<tr>
<th>EQUIPMENT PROTOTYPE</th>
<th>SPECIFICATION OF PROTOTYPE</th>
<th>APPLICATIONS</th>
<th>PRODUCTS TESTED</th>
<th>EQUIPMENT COSTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Spray dryer</td>
<td>1 to 5 kg/hour</td>
<td>Drying of food and herb extract, Fruit juice, Dairy product into powder form</td>
<td>1. Maltodextrin 2. Milk (Carabao)</td>
<td>Php 850,000</td>
</tr>
<tr>
<td>5. Freeze dryer</td>
<td>Capacity: 4trays (300mmx500mm) Condensing Rate: 3L/24hrs Ice condenser temp: App. -20 °C</td>
<td>For freeze drying high value food products and pharmaceutical products</td>
<td>1. Carrots 2. Potato 3. Langka (jackfruit) 4. Durian</td>
<td>Php 600,000</td>
</tr>
</tbody>
</table>
END OF THE PRESENTATION

THANK YOU