Handbook on the Processing of Banana in Palau

BY: LYDIA M. MARERO and THOMAS TARO

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One of the research outputs is utilization of bananas which is the subject of this book. Bananas are important food resource not only in Palau, but also in Micronesia, as well as the whole Pacific region.

This hand book is a practical application of research knowledge which can be used by families and as product ideas for food business enterprise.

Dr. SINGERU SINGEO
Executive Director
College of Micronesia Land Grant Program
Production and utilization of local foods in Palau help address self-sufficiency and enhance food security in the Republic. Development of value-added food products from bananas will benefit the people in meeting the needs for nutritious and healthy food items. It also supports the tourism industry, the lifeblood of Palau economy, with the production of local foods.

With the availability of information as results of researches conducted at the Research and Development (R & D) Station of the Palau Community College-Cooperative Research and Extension (PCC-CRE), consumers will be benefited. Increasing productivity of farmers for their value-added agricultural produce will also be addressed. Moreover, this is an opportunity of creating job opportunities for those who engage in food microenterprises in the production of various processed products derived from bananas.

Technology transfer of developed products are conducted by PCC-CRE free of charge to participants of outreach programs like Expanded Food and Nutrition Education Program (EFNEP) and Food Technology Classes.

PATRICK U. TELLEI, EdD
President
Palau Community College
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LYDIA M.MARERO
THOMAS TARO
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>MESSAGE</td>
<td>v</td>
</tr>
<tr>
<td>FOREWORD</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGMENT</td>
<td>vii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>NUTRITIONAL VALUE OF BANANAS</td>
<td>5</td>
</tr>
<tr>
<td>PROCESSING OF BANANA PRODUCTS</td>
<td>7</td>
</tr>
<tr>
<td>Banana Chips</td>
<td>7</td>
</tr>
<tr>
<td>Banana Catsup</td>
<td>8</td>
</tr>
<tr>
<td>Banana Bread</td>
<td>9</td>
</tr>
<tr>
<td>Banana Figs</td>
<td>10</td>
</tr>
<tr>
<td>Banana Pastilles</td>
<td>11</td>
</tr>
<tr>
<td>Banana Salad</td>
<td>12</td>
</tr>
<tr>
<td>Banana Preserves</td>
<td>13</td>
</tr>
<tr>
<td>Banana Fritters</td>
<td>14</td>
</tr>
<tr>
<td>Banana Crepes</td>
<td>15</td>
</tr>
<tr>
<td>Banana-Root crop Delight</td>
<td>16</td>
</tr>
<tr>
<td>Banana Turnover</td>
<td>18</td>
</tr>
<tr>
<td>Banana Flakes</td>
<td>19</td>
</tr>
<tr>
<td>Banana Rolls</td>
<td>20</td>
</tr>
<tr>
<td>Banana Pie</td>
<td>21</td>
</tr>
<tr>
<td>Banana Blossom Croquette</td>
<td>22</td>
</tr>
<tr>
<td>Banana Flour</td>
<td>23</td>
</tr>
<tr>
<td>Banana Pancake Mix</td>
<td>24</td>
</tr>
<tr>
<td>Banana Pancakes</td>
<td>25</td>
</tr>
<tr>
<td>Banana Steamed Cake Mix</td>
<td>26</td>
</tr>
<tr>
<td>Banana Steamed Cakes</td>
<td>27</td>
</tr>
<tr>
<td>Banana Doughnut Mix</td>
<td>28</td>
</tr>
<tr>
<td>Product</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Banana Doughnuts</td>
<td>29</td>
</tr>
<tr>
<td>Banana Tama Mix</td>
<td>30</td>
</tr>
<tr>
<td>Banana Tama</td>
<td>31</td>
</tr>
<tr>
<td>Banana Pasta Mix</td>
<td>32</td>
</tr>
<tr>
<td>Banana Pasta</td>
<td>33</td>
</tr>
<tr>
<td>Banana Pasta with Sauce</td>
<td>34</td>
</tr>
<tr>
<td>Banana Cookie Mix</td>
<td>35</td>
</tr>
<tr>
<td>Banana Cookies</td>
<td>36</td>
</tr>
<tr>
<td>Banana Brownie Mix</td>
<td>37</td>
</tr>
<tr>
<td>Banana Brownies</td>
<td>38</td>
</tr>
<tr>
<td>Banana Muffin Mix</td>
<td>39</td>
</tr>
<tr>
<td>Banana Muffins</td>
<td>40</td>
</tr>
<tr>
<td>Banana Wine</td>
<td>41</td>
</tr>
<tr>
<td>Banana Vinegar</td>
<td>42</td>
</tr>
<tr>
<td>SENSORY EVALUATION OF BANANA PRODUCTS</td>
<td>43</td>
</tr>
<tr>
<td>PACKAGING STUDIES AND SHELF-LIFE OF</td>
<td>44</td>
</tr>
<tr>
<td>PROCESSED BANANA PRODUCTS</td>
<td></td>
</tr>
<tr>
<td>TECHNOLOGY TRANSFER OF PROCESSED</td>
<td>46</td>
</tr>
<tr>
<td>BANANA PRODUCTS</td>
<td></td>
</tr>
<tr>
<td>REFERENCES</td>
<td>48</td>
</tr>
<tr>
<td>ABOUT THE AUTHORS</td>
<td>49</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table                                      Page
1  Nutritive value of different varieties of banana        6
2  Selected banana food products and their suitable
    packaging materials                                    44
3  Number of participants and places where
    Food Technology Classes were held                    47
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Rubiang variety <em>(Musa sapientum var. cinerea)</em></td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Lacatan variety <em>(Musa sapientum var. lacatan)</em></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Mechad variety <em>(Musa sapientum var. cinerea)</em></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Meskebesang variety <em>(Musa sapientum var. compressa)</em></td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Banana Chips</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Banana Catsup</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Banana Bread</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Banana Figs</td>
</tr>
<tr>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Banana Pastilles</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Banana Salad</td>
</tr>
<tr>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Banana Preserves</td>
</tr>
<tr>
<td>12</td>
<td>14</td>
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<tr>
<td></td>
<td>Banana Fritters</td>
</tr>
<tr>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Banana Crepes</td>
</tr>
<tr>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Banana-Root crop Delight</td>
</tr>
<tr>
<td>15</td>
<td>18</td>
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<td></td>
<td>Banana Turnover</td>
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<td>16</td>
<td>19</td>
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<tr>
<td></td>
<td>Banana Flakes</td>
</tr>
<tr>
<td>17</td>
<td>20</td>
</tr>
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<td>Banana Rolls</td>
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<tr>
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<td>21</td>
</tr>
<tr>
<td></td>
<td>Banana Pie</td>
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<td>19</td>
<td>22</td>
</tr>
<tr>
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<td>Banana Blossom Croquette</td>
</tr>
<tr>
<td>20</td>
<td>23</td>
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<td>Banana Flour</td>
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<td>Banana Pancake Mix</td>
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<td>22</td>
<td>25</td>
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<td>26</td>
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<td>Banana Steamed Cake Mix</td>
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<tr>
<td></td>
<td>Banana Doughnut Mix</td>
</tr>
<tr>
<td>26</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Banana Doughnuts</td>
</tr>
<tr>
<td>27</td>
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</tr>
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<td>Banana Tama Mix</td>
</tr>
<tr>
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<td>32</td>
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<td></td>
<td>Banana Pasta Mix</td>
</tr>
<tr>
<td>Figure</td>
<td>Page</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>30  Banana Pasta</td>
<td>33</td>
</tr>
<tr>
<td>31  Banana Pasta with Sauce</td>
<td>34</td>
</tr>
<tr>
<td>32  Banana Cookie Mix</td>
<td>35</td>
</tr>
<tr>
<td>33  Banana Cookies</td>
<td>36</td>
</tr>
<tr>
<td>34  Banana Brownie Mix</td>
<td>37</td>
</tr>
<tr>
<td>35  Banana Brownies</td>
<td>38</td>
</tr>
<tr>
<td>36  Banana Muffin Mix</td>
<td>39</td>
</tr>
<tr>
<td>37  Banana Muffins</td>
<td>40</td>
</tr>
<tr>
<td>38  Banana Wine</td>
<td>41</td>
</tr>
<tr>
<td>39  Banana Vinegar</td>
<td>42</td>
</tr>
<tr>
<td>40  School children tasting banana products</td>
<td>43</td>
</tr>
<tr>
<td>41  Banana food products under storage</td>
<td>45</td>
</tr>
<tr>
<td>42  Participants of Food Technology Class in Ngiwal State</td>
<td>46</td>
</tr>
</tbody>
</table>
INTRODUCTION

Bananas, (Musa sapientum L.) also called dessert bananas, are mainly consumed as a fresh fruit. There is a great potential for promotion of consumption of banana varieties and farmers can profit from these opportunities.

Consumers are becoming increasingly aware of the health and nutritive benefits of eating more fresh fruits like bananas. Bananas are considered to be good for the treatment of gastric ulcer and diarrhea. Bananas act as an aid to digestion. Due to their high content of B6 vitamin (pyridoxine), they help to reduce stress and anxiety. They are also considered beneficial for cancer prevention and heart diseases. The high content of carbohydrates makes them a very good source of energy for example for people practicing sports. High in potassium, bananas helps to better brain functioning.

Sweet dessert bananas are generally eaten raw, while cooking bananas and plantains are boiled, steamed, fried or roasted. As the fruit has a limited shelf life, processing is important.

Bananas are easy to digest and, since they are similar in chemical composition to the mucus of the stomach lining, have a soothing effect in the treatment of gastric ulcers and diarrhea. It is also known as good mood food since the high Vitamin B6 content can help relieve stress and anxiety (Lieberman, 1990).

Stems can be made into dietary supplement and aid to prevent or cure cancer (Goldberg, 1994).

Worldwide, bananas rank fourth as the most consumed food after rice, wheat, and corn.

In Palau, there are three most common varieties of bananas: meskebesang (the cooking variety), mechad (dessert bananas), and rubiang (bananas used to make bread).
The Palau Community College-Cooperative Research and Extension (PCC-CRE) has tissue-cultured banana planting materials given out to farmers for free as an extension activity of the Agriculture Section of R & D Station.

The advantage of growing bananas is that the crop is planted only once and the main plant grow its suckers for the next plant.

There are many processing possibilities for bananas which are attractive to consumers, especially for tourists who come to Palau and always creating demand for banana food products.
Fig. 1. Rubiang variety (*Musa sapientum* var. *cineria*)

Fig. 2. Lacatan variety (*Musa sapientum* var. *lacatan*)
Fig. 3. Mechad variety (Musa sapientum var. cinerea)

Fig. 4. Meskebesang variety (Musa sapientum var. compressa)
Bananas contain mostly carbohydrates (25.4%) next to water (72%) and has an energy value of 104 kilocalories per 100 grams. Table 1 shows the nutritional composition of different varieties of bananas, such as Cavendish (Musa sapientum var. Cavendish); Mechad (Musa sapientum var. cinerea); and meskebesang (Musa sapientum var. compressa).

Among the three banana varieties, Meskebesang has the most energy, beta carotene, and ascorbic acid contents.

Due to its high Vitamin B6 (pyridoxine) content, bananas help reduce anxiety and stress. Pyridoxine is important in chemical reactions of proteins and amino acids in the body and important in the production of red blood corpuscles (Lieberman et al., 1986). Because bananas are mainly carbohydrates, there is a calming effect and after consumption there is greater sleepiness in studies on carbohydrate foods on human mood (Spring, 1982).

Bananas are also rich sources of the mineral potassium, which helps regulate muscle contraction, nerve impulses, and functions of heart and kidneys (Rosenman, 1992).
Table 1. Nutritional composition of different varieties of bananas.

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Cavendish</th>
<th>Mechad</th>
<th>Meskebesang</th>
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<tr>
<td>Edible portion, %</td>
<td>64</td>
<td>73</td>
<td>57</td>
</tr>
<tr>
<td>Water, %</td>
<td>74.4</td>
<td>73.4</td>
<td>72.2</td>
</tr>
<tr>
<td>Energy, kcal</td>
<td>104</td>
<td>105</td>
<td>159</td>
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<tr>
<td>Protein, %</td>
<td>0.9</td>
<td>1.2</td>
<td>1.1</td>
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<tr>
<td>Fat, %</td>
<td>0.9</td>
<td>0.3</td>
<td>0.4</td>
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<td>Carbohydrate, %</td>
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<td>Crude Fiber, %</td>
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<td>0.5</td>
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<td>Ash, %</td>
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</tr>
<tr>
<td>Calcium, mg%</td>
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<tr>
<td>Phosphorus, mg%</td>
<td>20</td>
<td>34</td>
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<tr>
<td>Iron, mg%</td>
<td>0.8</td>
<td>0.7</td>
<td>0.9</td>
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<tr>
<td>Retinol, mg%</td>
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<tr>
<td>B-carotene, mg%</td>
<td>75</td>
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<td>190</td>
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<td>Total Vit. A (RE), mcg%</td>
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<tr>
<td>Thiamin, mg%</td>
<td>0.04</td>
<td>0.02</td>
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<td>Riboflavin, mg%</td>
<td>0.04</td>
<td>0.02</td>
<td>0.06</td>
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<tr>
<td>Niacin, mg%</td>
<td>0.8</td>
<td>0.6</td>
<td>0.7</td>
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<tr>
<td>Ascorbic acid, mg%</td>
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Adapted from FCT-FNRI, 1997.
Fig. 5 Banana chips.

**Ingredients:**
2 lbs *Meskebesang* bananas, mature green
1 cup sugar
1 cup water
1 cup oil

**Procedure:**
- Clean, peel, and slice green cooking bananas to about 1 mm thick.
- Fry bananas until yellowish brown (first frying).
- Soak fried bananas in sugar solution of 1 cup sugar and 1 cup water for 1 minute. Drain.
- Fry again until chips are shiny.
- Cool, pack, and label.
Fig. 6. Banana catsup.

**Ingredients:**
2 lbs *Meskebesang* bananas, ripe  
1 cup vinegar  
1 cup sugar  
½ cup onion, chopped  
¼ tsp. red food color  
½ tsp. cinnamon powder  
½ tsp. black pepper, powdered  
½ tsp. cloves, powdered  
½ tsp. paprika, ground

**Procedure:**
• Boil ripe cooking bananas in water for 15 minutes. Peel.  
• Blend with equal amount of water and transfer to a saucepan.  
• Add all the ingredients and cook to jam consistency.  
• Pour into sterile bottles with new caps.  
• Cool, label, and seal.
Fig. 7. Banana bread.

**Ingredients:**
1 lb *Rubiang* bananas, ripe  
2 cups all-purpose flour  
1 tsp. baking soda  
½ cup oil  
½ cup sugar

**Procedure:**
- Peel and mash ripe bananas.  
- Mix bananas with flour, sugar, and baking soda.  
- Add oil gradually, mix well, and knead.  
- Set dough for 30 minutes in an unlighted oven covered with wet paper towel.  
- Transfer to baking pans and bake at 300°F for 30 minutes.
Fig. 8  Banana figs.

**Ingredients:**
- 2 lbs Cavendish bananas, ripe
- 2 cups brown sugar
- 1 cup water

**Procedure:**
- Peel bananas and blanch in boiling water for 30 seconds.
- Prepare syrup by boiling 1 cup water and 1 cup sugar.
- Drop bananas in boiling syrup and cook 1 minute.
- Remove from fire and let bananas soak overnight.
- Drain. Add 1/3 cup sugar to syrup and boil. Add bananas and cook 5 minutes. Repeat procedure for 3 days.
- Plump bananas by soaking in syrup for 1 week.
- Drain bananas and dry.
**Ingredient:**
- 2 lbs Meskebesang bananas, ripe
- 1 cup sugar
- 1 cup water
- 1 cup dry milk
- 1 Tbsp butter

**Procedure:**
- Boil ripe bananas, peel and slice 3 cm thick and mash.
- Mix sugar, water, dry milk and mashed bananas and cook in slow fire until thick. Add butter.
- Place cooked bananas in a plastic bag and press with rolling pin to 1 cm thick. Slice 4 cm long and 1 cm wide.
- Wrap in cellophane.
BANANA SALAD

Fig. 10. Banana salad.

Ingredients:
1 lb  *Mechad* bananas, ripe
1 cup salad greens, sliced (lettuce)
1 pc med. tomato, sliced crosswise
1 cup carrots, diced
½ cup yoghurt

Procedure:
• Peel ripe mehad bananas and slice diagonally 1 inch thick.
• Lay on plate as base.
• Top with sliced lettuce, carrots and yoghurt.
BANANA PRESERVES

Fig. 11. Banana preserves.

Ingredients:
2 lbs Meskebesang bananas, ripe
2 cups sugar
1 cup water

Procedure:
• Boil ripe cooking bananas and peel.
• Prepare syrup with 2 cups sugar in 1 cup water and boil.
• Cook bananas in syrup for 15 minutes. Drain.
• Pack in sterile jars and fill with the cooking syrup.
• Remove air by inserting knife between bananas and sterilize half-sealed in boiling water for 25 minutes.
• Seal fully, cool, label, and store.
Fig. 12. Banana fritters

**Ingredients:**
- 1 lb ripe cooking bananas,
- 1 cup all-purpose flour
- 1 pc egg
- ½ cup sugar
- ¼ cup water
- 1 cup oil

**Procedure:**
- Peel ripe cooking bananas and slice in two longitudinally.
- Mix flour, egg, sugar and water.
- Dip bananas in batter and fry in hot oil.
Ingredients:
1 lb Mechad bananas, ripe
1 cup all-purpose flour
1 pc egg
½ cup water
½ cup sugar

Procedure:
• Peel and slice bananas and dredge in sugar. Set aside.
• Prepare crepes by mixing flour, egg, and water and transfer 1/2 cup of mixture in a greased pan, tilt to make a wide circle and cook until brown.
• Wrap bananas with crepes.
Fig. 14. Banana-root crop delight.

**Ingredients:**

- 5 pcs ripe cooking bananas, cubed
- 2 pcs. coconut, grated
- 5 cups water
- 2 cups taro, cubed
- 2 cups cassava, cubed
- 2 cups sweet potato, cubed
- ½ cup sago
- 2 cups ground glutinous rice
- 2 cups sliced jackfruit
- 1 cup sugar
Procedure:
- Mix 2 cups grated coconut and 1/2 cup water and squeeze out about 1 cup coconut milk. This is thick coconut milk,
- Pour 4-1/2 cups water again to the grated coconut and squeeze out 5 cups coconut milk (thin milk). Transfer to a stock pot and boil.
- Add taro, cassava, sweet potato and sago and simmer until tender, with constant stirring.
- Shape powdered rice moistened with water into small balls and drop into the simmering mixture.
- Stir in bananas, and jackfruit, and simmer 10 minutes.
- Blend in sugar and 1 cup thick coconut milk.
- Cool and serve.
Fig. 15. Banana turnover.

**Ingredients:**
1 lb ripe banana, Rubiang variety
1 cup sugar
1 cup all-purpose flour
1 pc egg
½ cup water
½ cup yoghurt
1 cup oil

**Procedure:**
- Peel and mash ripe bananas.
- Mix mashed bananas with sugar and cook for 5 minutes with constant stirring. Set aside.
- Mix flour, water, egg, and yoghurt and knead into a dough.
- Cut dough into pieces and flatten with a rolling pin.
- Shape dough with a round -rimmed saucer. Fill each wrapper with mashed bananas, fold over and seal edges with fork tines.
- Fry in hot oil.
**BANANA FLAKES**

Fig. 16. Banana flakes.

**Ingredients:**
- 2 lbs cooking bananas, mature but green
- 1 cup sugar
- 1 cup water
- 1 cup oil

**Procedure:**
- Peel green cooking bananas and slice thinly.
- Fry in hot oil. (first frying).
- Dip in syrup prepared from boiling 1 cup sugar and 1 cup water.
- Fry again until golden brown.
- Cool, pack, seal, and label.
Fig. 17. Banana rolls.

**Ingredients:**

1 lb ripe cooking bananas  
1 cup sugar  
25 pcs flour wrappers  
1 cup oil

**Procedure:**

- Peel and slice longitudinally ripe cooking bananas into 2.
- Lay sliced banana on a wrapper, sprinkle sugar and wrap.
- Fry in hot oil.
Fig. 18. Banana pie.

**Ingredients:**

1 lb ripe banana, *Rubiang* variety  
1 cup sugar  
1 cup all-purpose flour  
1 pc egg  
½ cup water  
½ cup yoghurt

**Procedure:**

- Peel and mash ripe bananas. Mix mashed bananas with sugar and cook for 5 minutes with constant stirring. Set aside.
- Mix flour, water, egg, and yoghurt and knead into a dough.
- Cut dough into pieces and flatten with a rolling pin.
- Divide dough into 2, flatten out 1 part with a rolling pin and line a pie plate with the dough. Fill with cooked mashed banana and cover with the flattened remaining dough. Bake at 300°F for 30 minutes.
Fig. 19. Banana blossom croquette.

**Ingredients:**
- 1 pc banana blossom
- 1 cup all-purpose flour
- 1 pc egg
- ½ cup water
- 1 cup oil

**Procedure:**
- Separate banana blossoms from the peels and remove the middle hard part. Boil in water for 5 minutes.
- Cool, press, and chop blossoms.
- Mix flour, egg, water, and chopped banana blossoms.
- Heat oil and fry 1/2 cup mixture.
Fig. 20. Banana flour.

**Ingredients:**
2 lbs cooking bananas, green

**Procedure:**
- Cook green bananas.
- Peel and grind.
- Dry in the sun for 8 hours or until crisp.
- Blend and sift.
- Pack in thick plastic bags, seal, label, and store.
Fig. 21. Banana pancake mix

**Ingredients:**
- 2 cups banana flour
- 2 cups all-purpose flour
- 1 cup sugar
- 1 cup dry milk
- ¼ cup baking powder
- 1 tsp. salt

**Procedure:**
- Mix together all ingredients in a plastic bag.
- Pack 1 cup mixture in thick (0.5 mil) plastic bags, seal and label.
- Store in a clean, dry place.
BANANA PANCAKES

Fig. 22. Banana pancakes.

Ingredients:
1 pack   Banana Pancake Mix
1 pc    egg
½ cup   water
¼ cup   oil

Procedure:
• Mix all ingredients in a mixing bowl to form a batter.
• Pour ¼ cup batter into frying pans, cook both sides.
• Serve banana pancakes with syrup, jam, margarine, or peanut butter.
BANANA STEAMED CAKE MIX

Fig. 23. Banana steamed cake mix.

**Ingredients:**
- 2-½ cups banana flour
- 2-½ cups all-purpose flour
- 2 cups sugar
- ¼ cup baking powder
- 1 pack coconut powder

**Procedure:**
- Mix all ingredients in a plastic bag.
- Measure 1 cup mixture and pack in thick plastic bags, seal, label and store in a clean, dry place.
BANANA STEAMED CAKES

Fig. 24  Banana steamed cakes.

**Ingredients:**
1 pack  Banana Steamed Cake Mix
¾ cup  water
1 Tbsp  grated cheese

**Procedure:**
- Mix Banana Steamed Cake Mix with water and transfer ¼ cup mixture into muffin pans. Top with grated cheese.
- Steam for 20 minutes.
BANANA DOUGHNUT MIX

Fig. 25. Banana doughnut mix.

Ingredients:
- 3 cups banana flour
- 3 cups all-purpose flour
- 1 cup dry milk
- 1 cup sugar
- 4 Tbsp. baking powder
- ½ tsp. nutmeg powder
- ½ tsp. cinnamon powder

Procedure:
- Mix all ingredients in a plastic bag.
- Pack one cup (240 g) in thick (0.5 mil) plastic bag, seal, and label.
- Store in a clean, dry place.
BANANA DOUGHNUTS

Fig. 26. Banana doughnuts.

Ingredients:

1 pack  Banana Doughnut Mix
1 pc    egg
2 Tbsp. oil
1 cup   oil for frying

Procedure:

• Empty 1 pack Banana Doughnut Mix into a mixing bowl, add 1 egg and 2 Tbsp. oil.
• Knead and divide dough into 6 balls.
• Flatten thickly and cut with doughnut cutter or form into rings.
• Deep fry in hot oil.
BANANA TAMA MIX

Fig. 27. Banana *tama* mix.

**Ingredients:**
- 3 cups banana flour
- 3 cups all-purpose flour
- 1 cup dry milk
- 1 cup sugar
- 4 Tbsp. baking powder
- 1 tsp. salt

**Procedure:**
- Mix all ingredients in a plastic bag.
- Pack 1 cup (240 g) in thick (0.5 mil) plastic bag, seal, label and store in a clean, dry place.
Fig. 28. Banana *tama*

**Ingredients:**
- 1 pack Banana Tama Mix
- 1 pc egg
- 2 Tbsp. oil

**Procedure:**
- Empty 1 pack of Banana Tama Mix into a mixing bowl, add 1 egg and 2 Tbsp. oil.
- Mix well, knead and divide dough into 6 balls.
- Deep fry in hot oil.
**Fig. 29. Banana pasta mix.**

**Ingredients:**
- 2-½ cups banana flour
- 2-½ cups all purpose flour
- 1 Tbsp. salt

**Procedure:**
- Mix all ingredients in a plastic bag. Shake bag well to obtain a uniform mixture.
- Pack 1 cup mixture in a thick plastic bag, seal, label, and store in a clean, dry place.
Fig. 30 Banana pasta.

**Ingredients:**
1 pack **Banana Pasta Mix**
1 pc **egg**

**Procedure:**
- Empty 1 pack of Banana Pasta Mix into a mixing bowl, add 1 egg, and mix well to form dough.
- Roll dough on a floured cutting board with a rolling pin, and cut into pasta with a knife.
- Drop banana pasta in boiling water and cook until pasta floats (about 2 minutes).
- Drain, add 1 Tbsp. oil, and toss.
Fig. 31  Banana pasta with sauce.

**Ingredients:**
- 1 cup chicken, cooked, and diced
- ¼ cup onion, chopped
- 1 Tbsp. garlic, minced
- ¼ tsp. black pepper
- 1 can Nestle’s Cream
- 1 Tbsp. oil
- 1 cup chicken stock
- sprig parsley or green onions

**Procedure:**
- Saute garlic, onion, and chicken in vegetable oil.
- Add chicken stock, salt, pepper, and Nestle’s cream.
- Cook for 5 minutes.
- Pour over cooked pasta. Garnish with parsley or chopped green onions.
Fig. 32. Banana cookie mix.

**Ingredients:**
- 6 cups banana flour
- 6 cups all-purpose flour
- ¼ cup baking powder

**Procedure:**
- Mix all ingredients in a plastic bag and shake well to obtain a uniform mixture.
- Measure 4 cups of Banana Cookie Mix into thick (0.5 mil) plastic bags, seal, and label.
- Store in a clean, dry place.
Fig. 33. Banana cookies

**Ingredients:**
1 pack  Banana Cookie Mix
1 cup (2 sticks)  margarine
1 cup  sugar
3 pcs  eggs
1 Tbsp.  vanilla

**Procedure:**
- Cream margarine with 1 cup sugar.
- Add eggs, one at a time, and mix well.
- Add 1 Tbsp. vanilla and mix well.
- Empty 1 pack Banana Cookie Mix into the mixture, and knead into dough.
- Roll with a rolling pin and cut with cookie cutter.
- Bake banana cookies at 275°F for 45 min.
- Pack in thick plastic bags, seal, and label.
Fig. 34. Banana brownie mix

**Ingredients:**

- 3 cups banana flour
- 3 cups all-purpose flour
- 3 tsp. baking Soda
- 3 cups cocoa powder
- 3 tsp. salt

**Procedure:**

- Mix all ingredients in a plastic bag.
- Measure 2 cups mixture and pack in thick (0.5 mil) plastic bags, seal, and label.
- Store at room temperature in a clean, dry place.
**BANANA BROWNIES**

Fig 35. Banana brownies

**Ingredients:**
- 1 pack Banana Brownie Mix
- 1 cup butter
- 2 cups sugar
- 3 pcs. eggs
- 1 tsp. vanilla
- 1 cup chopped nuts

**Procedure:**
- Cream butter, then add sugar gradually.
- Add eggs one at a time mixing very well after each addition. Mix in vanilla.
- Add 1 pack Banana Brownie Mix and mix well.
- Add 1/8 cup chopped nuts.
- Pour mixture into greased pan. Smoothen surface with a rubber scraper and top with the remaining nuts.
- Bake at 350°F for 15 minutes.
BANANA MUFFIN MIX

Fig. 36. Banana muffin mix

**Ingredients:**
- 3 cups banana flour
- 3 cups all-purpose flour
- 4 tsp. baking soda
- 1 tsp. salt

**Procedure:**
- Mix all ingredients in a plastic bag.
- Measure 2 cups mixture and pack in thick plastic bags, seal, and label.
- Store at room temperature in a clean, dry place.
Fig. 37. Banana muffins

**Ingredients:**
1 pack  Banana Muffin Mix
½ cup  raisins, chopped
½ cup  nuts, chopped
1 cup  yoghurt
1 pc.  egg
2 Tbsp.  margarine
½ cup  brown sugar

**Procedure:**
• Preheat oven to 350 F.
• Combine margarine, egg, and yoghurt. Add 1 pack Banana Muffin Mix and mix with a few strokes.
• Fold in chopped nuts and raisins.
• Fill greased muffin pans ½ full.
• Bake at 350°F for 20 min. or until toothpick comes out clean.
Fig. 38. Banana wine

**Ingredients:**
- 5 ripe cooking banana, boiled and mashed
- 5 cups sugar
- 20 cups water
- 2 Tbsp. yeast
- 1 Tbsp. brown sugar

**Procedure:**
- Boil banana in water until soft about 1 hour, peel and cut into small pieces.
- Place 1 cup bananas and 1 cup water in a blender and blend for 2 minutes. This is banana puree.
- Dissolve yeast in 1 cup lukewarm water and add brown sugar. Let stand 10 minutes or until foamy.
- Mix banana puree with equal amount of water and stir in sugar and yeast solution.
- Transfer the mixture to a bottle and cover with paper towel secured with a rubber band.
- Ferment for 1 month and filter. The filtrate is banana wine.
- Pasteurize banana wine by heating to 90°C for 15 minutes.
- Cool, bottle, seal, and label.
Fig. 39. Banana vinegar

**Ingredients:**
5 lbs. ripe cooking bananas, boiled and mashed
5 cups sugar
20 cups water
2 Tbsp. yeast
1 Tbsp. brown sugar

**Procedure:**
- Boil bananas in water until soft, about 1 hour, peel and cut into small pieces and blend to make puree.
- Dissolve yeast in 1 cup lukewarm water.
- Mix banana puree with equal amount of water and stir in sugar and yeast solution.
- Transfer the mixture to a bottle and cover with paper towel secured with a rubber band.
- Ferment for 3 months and filter.
- Pasteurize at 90° C for 15 minutes.
- Cool, bottle, seal and label.
SENSORY EVALUATION OF BANANA PRODUCTS

Banana bread and other selected products were evaluated by about 5,000 respondents in the span of five years. The products were served to the public during events like Earth Day, Career Awareness Week, Women’s Month, Tourism Week, Olechotel Belau Fair, World Food Day, Independence Day, as well as a main visitors’ item at the PCC-CRE R & D Station, served to school children, students, parents, teachers, and other guests. All food tasters liked the product very well.

The food products, particularly the dry mixes, were put on exhibit at the 2002 and 2006 Japan Food Expo, Hawaii in 2006, Guam in 2007, and Italy Food Expo in 2007. During the 2006 “Taste of Palau” event, the tourists tasted the banana food products and they signified their interest in buying these foods if sold in the market.

Fig. 40. School children tasting banana products.
Banana food products and their suitable packaging materials were studied and results are shown in Table 2.

Table 2. Selected banana food products and their suitable packaging materials.

<table>
<thead>
<tr>
<th>Food Product</th>
<th>Packaging Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flour, and flour products</td>
<td>Polyethylene(PE) and poly propylene (PP) bags, 0.5 mil</td>
</tr>
<tr>
<td>Chips</td>
<td>PP bags, 0.5 mil</td>
</tr>
<tr>
<td>Fermented products</td>
<td>PET(poly ethylene terephthalate) plastic bottles</td>
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</tbody>
</table>

Banana flour and dry mixes were found stable when packed in 0.5 mil thick PE or PP bags and stored at room temperature. Banana Chips was found stable in 0.5 mil PE plastic bags. Frozen products were suitably packed in 0.5 mil PP bags.
Fig. 41. Banana food products under storage studies.

The processed products kept well in their respective suitable packaging materials for a period of one year or longer for the dried and fermented products.

Banana Flour and dry mixes also kept for one year or longer at room temperature (27°C to 32°C) when packed in thick (0.5 mil) plastic bags.

Baked/cooked/fried banana products like cookies, and chips, had a shelf-life of two weeks at room temperature (27°C-32°C). Cooked products kept for two weeks at refrigeration temperature (10°C) and 6 months at freezing temperature (<0°C).

Fermented products like wine and vinegar, packed in PET bottles were found to be stable at room temperature (27°C-32°C) for more than 2 years or longer.
Selected banana food products were taught to 636 participants in PCC-CRE Expanded Food and Nutrition Education Program (EFNEP) and Food Technology Classes in a 24-hour training period, usually done in a three-week, 2-hour per day sessions. The places and number of participants of training are shown in Table 3.

Fig. 42. Participants of Food Technology Class in Ngiwal State.
Table 3. Number of participants and places where Food Technology Classes were held.

<table>
<thead>
<tr>
<th>Place</th>
<th>Number</th>
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<td>Melekeok State Old Age Center</td>
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<td><strong>Total</strong></td>
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REFERENCES


LYDIA MARERO

Lydia Marero worked as Researcher-Food Technologist at the Palau Community College-Cooperative Research and Extension (PCC-CRE) for ten years. She developed about 150 processed food products from taro, cassava, sweet potato, fish, coconut, and banana and taught food technology classes as an extension program of PCC-CRE. She obtained three USDA grants for her projects on the utilization of root crops and product development of local foods and rabbit fish. A food scientist, an educator and a scholar, Lydia earned a Bachelor’s Degree in Food Technology at the De La Salle-Araneta University Foundation, graduating cum laude. Under a PCARRD scholarship, she pursued a Master’s Degree in Food Science at the University of the Philippines in Los Baños. She obtained her Doctoral Degree in Food Science from the Ochanomizu Women’s University in Tokyo, Japan as a Monbusho scholar and JSPS fellow. She further obtained a Post-Doctoral Degree in Food Science as a KOSEF fellow at the Seoul National University in South Korea.

THOMAS TARO

Thomas Taro was Director of the Research and Development Station, PCC-CRE and presently Vice-President of Palau Community College-Cooperative Research and Extension. He obtained his Master of Arts Degree in Education at the San Diego State University.