





# Kalabu (Kalamansi and Purple Sweet Potato) Snack Bar Innovation as an Alternative Snack for Diabetes

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## Abstract

Diabetes mellitus (DM) is a metabolic health disorder characterized by high blood sugar levels (hyperglycemia). Factors that can cause diabetes are heredity and an unhealthy lifestyle. The innovation of healthy snack bar 'Kalabu' aims to support the Healthy Living Community Movement (GERMAS). Snack bar "Kalabu" is a food product made from a mixture of local food ingredients kalamansi orange and purple sweet potato, then formed into a solid and compact form (food bar form). Product selection is based on current trends in society, is a practical alternative snack that can be consumed between activities and can be used to delay hunger when facing rush hours at certain times. This activity was carried out in Anggut Atas Village involving 5 alumni and 20 small business owners using demonstration and evaluation methods. Data analysis on knowledge was carried out using the T-Test test. The results of the implementation of community service obtained that the average knowledge of mothers about DM increased from 80.40 to 94.60. Likewise, with the acceptance of kalabu snack bar, most mothers (50%) liked the combination of purple sweet potato and kalamansi orange, and only a small percentage (15%) did not like the combination of kalabu snack bar flavors. It is expected to be an alternative to healthy snacks in an effort to support the healthy living community movement (GERMAS), especially as an alternative snack food that is safe for diabetics.

## A. Introduction

Diabetes mellitus (DM) is something problem of health metabolic Which be marked by the height much sugar blood (hyperglycemia) (Dilworth et al., 2021). Disease this is caused by a disturbance in metabolism except for long consequence inability of the pancreas to produce insulin in an amount that is Enough. Besides hyperglycemia, sufferers of diabetes experience problems metabolism of carbohydrates, fat, and protein. Diabetes includes in category disease descendants (hereditary) (Demidorgen, 2020). Disease This very maybe infectious the his descendants Of time front. For many sugar blood sufferers with diabetes Which is not controlled can lower the response immune and make it more prone to to infection. Illness was infectious Which should watch out for sufferer diabetes is gangrene (food diabetes). According to the International Diabetes Federation (IDF), amount sufferers of diabetes in Indonesia will reach 19,47 million in the year 2021. IDF estimates amount sufferers diabetes Of in Indonesia Can reach 28,57 million people by the year 2045. Estimation This is more height compared to the year 2021, The proportion of people with diabetes has increased by 167% in the last 10 years. According to the 2022 Bengkulu Province Health Profile, the number of DM sufferers is 47,116 people, of which 3,087 sufferers are in Bengkulu City, with a presentation of 54% of sufferers due to heredity, and 46% of sufferers due to unhealthy lifestyles (Asnawi & Eliska, 2023).

In an effort to realize the highest level of public health, health promotion plays an active role in empowering the community to behave in a healthy lifestyle, one of which is by supporting the Healthy Living Community Movement (GERMAS). GERMAS has several activity steps including healthy and nutritious food. Consuming healthy and nutritious food, especially fruit and vegetables, is very necessary for the body as a source of nutrients, vitamins, minerals and fiber in achieving a healthy diet according to the recommendations of balanced nutrition guidelines for optimal health (Loss et al., 2020).

Research results [Puspita & Agustina \(2019\)](#) found that as many as 97.1% of the Indonesian population in all age groups, consumption of vegetables and fruit is still low. The largest proportion of the population who do not consume enough vegetables and fruit is in the youth group (13-18 years), namely 98.4 percent. Likewise in the adult age group (96.9%) and the elderly (97.2%). This condition indicates that the Indonesian population's consumption of vegetables and fruit is still not in accordance with the context of balanced nutrition. The recommended minimum consumption of vegetables and fruit for teenagers and adults is 400 grams/person/day and for children under five (<5 years), aged 5-12 years, 300 grams/person/day.

Healthy snack innovation Snack bar 'Kalabu' exists as an effort to support the Healthy Living Community Movement (GERMAS) ([Porter et al., 2022](#)). Snack bar 'Kalabu' is a food product made from a mixture of local food ingredients calamansi orange and purple sweet potato, then formed into a solid and compact shape (a food bar form). Product selection is based on trends in today's society, it is a practical alternative food snack that can be consumed between activities and can be used to delay hunger when facing busy hours at certain times ([Wedamulla et al., 2022](#)). Product selection is also based on raw materials which are local food commodities in Bengkulu Province so it is easier to obtain and the price of raw materials is cheaper. Besides that, the Snack bar 'Kalabu' has the advantage of being a low-sugar and low-calorie product with the distinctive taste of fresh, sour kalamansi oranges.

Calamansi Orange (*Citrofortunella macrocarpa*) is one of the commodities cultivated and developed in Bengkulu Province, especially in Central Bengkulu Regency. Calamansi oranges are designed to be a model for the OVOP program (one village one product) in Bengkulu Province because this fruit is easy to preserve and has advantages over other oranges, namely higher vitamin C content and more balanced calcium ([Yu & Wang, 2021](#)). Calamansi oranges have the characteristics of a sour taste and contain a lot of water with a distinctive aroma, so they are often used as drinks and food flavoring. The nutritional content of a kalamansi orange contains 12 calories, 1.2 g fiber, 37 mg potassium, 7.3 g vitamin C, 57.4 mg IU vitamin A, 8.4 mg calcium, 15.5 g water, and contains 3 carbohydrates. %, minerals 1%, ascorbic acid 0.1%, citric acid 3% ([Baua, 2021](#)). Calamansi orange peel is rich in essential oils and 0.15% ascorbic acid. This orange is also very juicy has a sour taste and contains 5.5% citric acid. Calamansi juice is good for maintaining body health because it is rich in phosphorus (P), calcium (Ca), and vitamin C ([Noviyanty, 2019](#)).

The most favored sweet potatoes in Bengkulu Province are Japanese purple sweet potatoes and Cilembu sweet potatoes ([Yani & Rawiniwati, 2020](#)). Purple sweet potatoes have been widely processed and developed into various delicious foods and snacks because they are good for health. Purple sweet potatoes are known to be lower in calories than potatoes and have a higher vitamin content, namely vitamin A, vitamin B and vitamin C ([Ji et al., 2021](#)). Apart from that, purple sweet potatoes are also a source of beta carotenoid and rich antioxidants. Research results show that purple sweet potatoes are useful in preventing heart disease, maintaining body weight, preventing cancer, maintaining eye health and reducing the risk of inflammation.

Product snack bar Kalabu is this innovative product combines local flavors (Kalamansi orange and purple sweet potato) with fresh sourness in a healthy snack and will be a creative business opportunity that can compete in the market ([Richa et al., 2023](#)). Community Consumption Patterns in Bengkulu Province both lower-middle and upper-middle-class households have an average proportion of consumption expenditure for food that is greater than the average proportion of consumption expenditure for non-food. This is the basis that the people of Bengkulu are potential consumers for the development of a food product. On a broader scale, it is hoped that the product snack bar developed Kalabu can cover consumers on a national and international scale.

The use of raw materials originating from local foodstuffs increases the selling price of *bar* Kalabu is cheaper, so it can reach all groups compared to snack *bar* similar that are circulating in the market (SuchFastBite, Fruitbar, Cereal bar by Zee, Fitbar, Granobar and so forth). Besides that, *Snack bar* Kalabu also has the advantage of being low in sugar and low in calories with the distinctive taste of fresh, sour Kalamansi oranges so it is hoped that it can become a healthy snack alternative in an effort to support the healthy living community movement (GERMAS).

## B. Research Methods

Implementation of a healthy snack business program of *Snack bar* Kalabu consists of several stages, including:

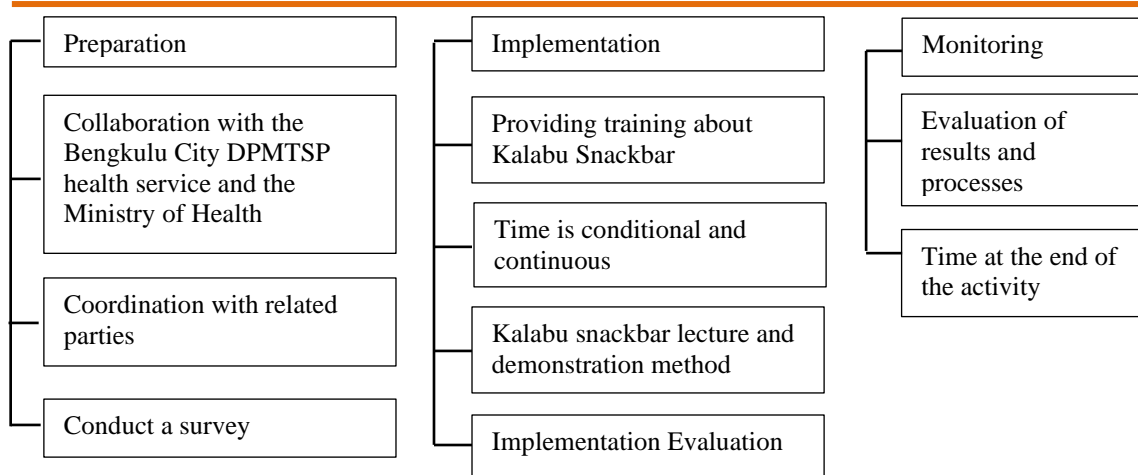


Figure 1. Stages for making a SnackBar

This community service was carried out in Anggut Atas Village, Bengkulu City for 2 weeks in September 2023, which was attended by 20 Anggut Atas PKK mothers. This activity carries out several stages of *Pre test* and *Post Test* respondents' knowledge about DM and the benefits of Purple Mothers and Kalamansi Oranges for health, after that training was carried out in making the snack *bar* Kalabu with demonstrations, and then evaluation of the results. The instruments used in this activity are questionnaires and modules. Data analysis tests are carried out using tests *T-test*.

### C. Result and Discussion

Activities are carried out according to a mutually agreed schedule. The schedule of events begins with an opening by the Head of the Implementation Team, then introductions by the Community Service Team and training participants. The next core Community Service activities are the provision of related materials, discussions and practice *bar* Kalabu. Details of the implementation of community training activities through Community Service are presented in Figure 2 below.



Figure 2. Opening Activities for Community Service Events

Figure 2 shows the Community Service activities starting with an opening by the head of the Community Service Team and an introduction by the Community Training team members to the parties involved in the Community Service activities.

The second activity in implementation is providing material about snack bar Kalabu. The material begins by explaining the findings regarding the high prevalence of diabetes sufferers, especially in Bengkulu City. The solution that can be offered is in the form of food processing through snack bar Kalabu, which is based on local food ingredients that are healthy and suitable for consumption by people with diabetes in general, and at the same time is an alternative business idea for MSMEs, helps improve the family economy (Tutuarima et al., 2021). Apart from the explanation provided by the Community Service Team, training participants also received Management Booleet snack bar Kalabu as in figure 3.



**Figure 3.** Joint discussion activities with the help of Making Booklets *Snack Bar* Club

After providing the material, training participants gain direct knowledge through demonstration activities by the Community Service Team as in Figure 4. During the demonstration activities, training participants can conduct questions and answers.



**Figure 4.** Demonstration by the Community Service Team

Implementation of Community Service activities regarding manufacturing *snack bar* Kalabu as an alternative healthy snack for Diabetes sufferers was closed with a group photo activity as in Figure 5. As a follow-up to this Community Service activity, the team gave assignments so that the training participants could try again at their respective homes regarding what they had learned today.



**Figure 5.** Closing of the implementation of the activity, namely a group photo of the Community Service Team with the Training Participants

**(1) Average Mother’s Knowledge About DM**

**Table 1.** Mean Mother’s Knowledge About DM and Snack Bar Club

Variable	n	Mean ± SD	Min - Max	CI95%
Knowledge				
Before (Pretest)	20	80.40 ± 7.177	65 – 94	77.04;83.76
After (Posttest)	20	94.60 ± 4.728	82 – 100	92.39;96.81

The table above shows that before being given an explanation with the module, it was found that the average knowledge of mothers was 80.40 (Good Category). After being given an understanding of the module, there was an increase in the mother's knowledge about DM to 94.60 (Very Good Category)

**(2) Distribution of Taste Receptivity Snack Bar Club**

**Table 2 .** Distribution of Taste Receptivity Snack Bar Club

	Frequency	Percent (%)
Less Likes	3	15.0
Criticism	10	50.0
Very Like	7	35.0
Total	20	100.0

In the table above, it shows that most mothers (50%) chose to like the taste of snack *bar* Kalabu, almost all mothers (35%) chose to really like it. Meanwhile, a small portion (15%) chose not to like the taste of Snack Bar Kalabu, a combination of purple sweet potato and kalamansi orange, is a combination that is suitable to be enjoyed, because the unique and new taste of Kalabu has the potential to become snack It is a contemporary food that is liked by various groups so this snack is not difficult to be accepted by society (Sun et al., 2022).

**Evaluation**

Evaluation activities are carried out to find out whether the Community Service activities that have been carried out can still provide long-term benefits for training participants. In evaluation activities, training participants carry out the production snack bar Kalabu independently as in Figure 6.



**Figure 6.** Independent practice by training participants

Based on the evaluation results, the training participants were able to make a comeback snack *bar* Kalabu independently. This means that the training participants have played an active role in participating in community service activities and the training participants have also been able to pass on training information to people around their neighborhood (Figure 7).



**Figure 7.** Training participants have been able to create *Snack bar* Kalabu independently

Evaluation of Community Service activities regarding manufacturing *snack bar* Kalabu as an alternative healthy snack for diabetes sufferers closed with a group photo activity as in Figure 8.



**Figure 8.** Closing activity in the activity evaluation, namely a photo with the Community Service Team and Training Participants

#### D. Conclusion

During community service activities, there was an increase in mothers' knowledge regarding DM disease from an average knowledge of 80.40 to 94.60. In the activities, it can be seen that the training participants are listening or following the activities seriously and responsibly, this is because the training participants feel motivated by the experience of new knowledge that they have not received directly from experts, this is also shown by the distribution of receptivity. to *Snack Bar* Kalabu, where the majority of mothers (50%) like the combination of purple sweet potatoes and kalamansi oranges and only a small number of mothers (15%) don't like the taste *Snack Bar* Kalabu. During the practical demonstration of making *snack bar* The participants have also been followed very well with changes in behavior by being able to demonstrate again the steps for making *snack bar* Kalabu. This community service activity is expected to provide long-term benefits related to the use of training certificates as one of the requirements for P-IRT licensing and the knowledge gained can continue to be implemented optimally in the form of sustainable MSME businesses by producing products. *Snack bar* Kalabu is based on healthy local food ingredients for diabetes sufferers, especially in Bengkulu City.

#### E. Acknowledgement

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