Innovation on food product development for local commodity with design thinking approach (Case study: tengkawang fruit (Shorea stenoptera Burck.) Commodity in Bengkayang, West Kalimantan)

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Abstract. Tengkawang (Shorea stenoptera Burck.) is a tropical flora that thrives and largely available in West Kalimantan. So far, the postharvest activity of the fruit is still not optimal and further utilization efforts is needed to result in a local commodity as local champion. The utilization was organized to gain high success with a more inclusive approach using Design Thinking. Tengkawang derived from a region with unique characteristics: 1) the natural environment that needs to be preserved, 2) grows among community areas with strong local culture, 3) very typical local commodity, and 4) located in remote areas. Through the process of observing, defining, ideation, prototyping, and storytelling or testing this research resulted in final product design derived from Tenkawang through the ideation process. The designed product developed to be a locomotive commodity-based economy for the community and also aimed to preserve the environment through the development of Tengkawang derivative products. The results of this study are action plans for the development of Tengkawang fruit food products, Tengkawang fruit post-harvest processing methods, food product formulations, packaging and branding designs of the local products that were developed, as also the marketing plan process.

Keywords: product development, Design Thinking, tengkawang fruit, local commodity, West Kalimantan

1. Introduction

Sahan Village is located in Seluas District, Bengkayang Regency West Kalimantan Province, directly adjacent to the north with Serawak-East Malaysia and Sambas District. This village is quite difficult to reach because it is not yet supported by adequate public transportation. It takes around 7–9 hours by road from Pontianak. The villager’s activity are dominated by agricultural and forestry activities, the community spends around 7–9 hours doing agricultural activities in forests such as harvesting bamboo shoots, cultivating corn, pepper, yams, cassava, mustard greens and beans. Sahan Village also has a
potential tourism activity in the form of traditional houses and natural tourism such as waterfalls and caves that are often visited by tourists [1].

In Sahan Village there is a fairly well-known indigenous forest called Pikul Pengajid Indigenous Forest covering an area of 100 hectares. This indigenous forest was confirmed on October 15, 2002 through Regent Decree Number 131 year of 2002. The Ministry of Environment and Forestry issued a Decree on the Establishment of Pikul Pengajid indigenous forest Number SK 1300/MENLHK-PSKL/PKHYA/PSL.1/3/2018 [2]. This decree was the beginning of the effort of the community to protect the forest as a mandate of the state and ancestors.

Pikul Pengajid Indigenous Forest has many uniqueness, one of which is the tengkawang tree which is Bengkayang’s local wisdom. Tengkawang tree in Bengkayang is very unique. If elsewhere can be harvested once every four years, in Pikul Pengajid Indigenous Forest it can be harvested every year. In fact, some can be harvested every six months. Tengkawang in Pikul Pengajid Indigenous Forest has been cultivated since 1881 with the main goal as a means of environmental preservation of Pikul Pengajid. This tree has a good economic value that could be processed into oil. In Sahan Village itself, through the Tengkawang Layar farmer group, there were Tengkawang derivative products that have been developed into Green Butter [3].

With the abundant availability of Tengkawang, community groups have the potential to produce a lot of Green Butter, this is also supported by various training in butter processing that has been given as well as the construction of factories and processing machines that have been around for almost 2 years. But so far, the production of green butter is still limited because the level of product sales is still low. This is because the community or consumers do not know Green Butter and also the sense of this product was still not acceptable because the smell of Tengkawang is too strong and the taste of the leaves dominates the taste of Green Butter.

Moving on from this background, it is necessary to make an effort to invite the community to maintain the preservation of indigenous forests while at the same time increasing the economy of the community through developing Tengkawang-based derivative products.

2. Method

This study uses participatory rural appraisal (PRA) and Participatory Action Research (PAR) methods. The intervention was carried out in the research activities, so as to produce solutions that could be applied in accordance with the socio-cultural and socio-economic aspects of the community that made the object of this research. The community is actively involved, not just being the target group as a ‘subject’ in the activity process, and not as an ‘object’.

Researchers in this matter designed tools, instruments, data collection, processing, and data analysis until compiling reports always with the community/target groups using Participatory Action Research. This model is used so that empowerment interventions grow and have an impact on: a) The emergence of processes of active participation, both technical and political from the people who are the target groups in the overall program of activities. b) The growing atmosphere of partisanship for those who have felt marginalized, neglected in the development process, in this case the community involved. More in this PAR, sharpened by Tools and the stages used in this study refer to the Design Thinking Approach [4] namely 1) Observe, a process that allows you to gain an empathetic understanding of the problem you’re trying to solve, typically through user research. 2) Define, a process that accumulate the information created and gathered during the Observe stage. This process analyze the observations and synthesize them to define the core problems, 3) Ideate, a process that generate ideas to solve problems that have been identified in Define stages, 4) Prototyping, an experimental phase that the aim is to identify the best possible solution for each of the problems identified during the first three stages and 5) Storytelling, a process to test the complete solution using the best solutions identified in the Prototype phase. These stages are used because Insists are focused on humans and human needs, relies on both creativity and logic, Promotes a learn-by-doing approach. Suggests that failure is a good way to learn and it's crazy collaborative. The PAR and Design Thinking approach is expected to be more effective in producing good solutions that can be applied in the community.
3. Results and discussion
The activity began with an observation process, exploring the empathy and hidden patterns of the surrounding communities through mapping challenges, opportunities, fears, and hopes of the business process of processing of tengkawang from upstream to downstream. Those data were needed as the basis for intervention for tengkawang-based product development to be more optimal.

3.1. User experience mapping
Technical observations were carried out in the form of visits and interacting directly with officials of the Sahan Village apparatus as well as representatives of villagers involved in tengkawang fruit utilization activities. From the observations it is known that a group of villagers have used tengkawang fruit and processed it into semi-finished products, namely green butter. Green butter is called because the color of butter produced from the tengkawang fruit is green. In this stage of the observation, a mapping of the experience of the group of citizens was also conducted to capture the obstacles and the advantages possessed by the community groups in the process of processing raw tengkawang fruit to become green butter.

From this mapping, we found important points categorized into pain and gain related to the development of tengkawang-based derivative products. The results of this mapping are then made into the user experience map below:

| NO | PROCESS | USER EXPERIENCE |
|----|---------|----------------|
| 1. | Planting | The area of the plant is wide |
| | | Availability of seed |
| | | Fertile soil |
| | | The people's perspective on tengkawang is not a superior commodity |
| | | There is no sorting of superior seeds |
| | | No Fertilization |
| | | the period grows long enough |
| 2. | Harvest | Availability of raw materials is sufficient |
| | | there is no data on the number of harvests |
| | | Distance of settlements to harvest locations |
| | | Limited fruit capacity when harvesting |
| | | Transporting crops is difficult |
| | | The shelf life of the fruit is not long, germinate quickly |
| | | The harvesting process is only waiting for the fruit to fall |
| 3. | Drying | There is already a drying house |
| | | Average temperature setting |
| | | The drying house is less spacious |
| | | Drying is still manual and it takes up to 3 days |
| | | Weather unstable (weather dependent) |
| 4. | Milling | There is already a grinding machine |
| | | Small Scale |
| | | Too much smoke, Influence on quality |
5. Steaming
- Using a plastic bag
- Don't wear gloves
- Hot
- Steaming is not maximal
- Small capacity steaming machine

6. Pressing
- Already have a press machine
- Concern about chemical contamination because using a sack when pressing
- Slippery
- Small Scale
- Fear of exploding
- Manual Machine

7. Filtering
- There is still sludge or small dirt

8. Shaping
- Use bamboo frozen faster
- The aroma of bamboo gives a distinctive fragrance
- Bamboo is not sterile
- Traditional packaging techniques using aluminum foil are less neat

9. Marketing
- Market opportunities already exist
- Household scale production
- The prices of tengkawang is cheap
- Disable to fulfill market demand
- There is no aspect of product identity (name, packaging, legal aspects of the product)

10. Derivative Products
- Tengkawang raw material is abundant
- There is a tengkawang processing facility to become green butter
- Green butter stock is maintained
- Access far supporting raw materials
- Limited product processing capabilities
- Limited time availability, the main activity is gardening
- The taste of tengkawang is distinctive and strong
- Financial/capital limitations

3.2. Product design

The formulation of product begins with determining the "job to be done" that can be solved or achieved through the development of this Tengkawang-based derivative product. The results of discussion show that the Job To Be Done was "How to Optimize Tengkawang-Based Product Development?" To achieve these objectives, then identified the challenges that inhibit (Pains) and advantages that can support the achievement of the job to be done (Gains) and solutions that can be done to solve challenges (Pains Reliever) and improve the advantages (Gains Creator).

The mapping results show that the challenges of developing Tengkawang-based products are the stinging aroma of Tengkawang, the safety and hygiene of the butter production process which has not been maintained, the level of knowledge and skills in processing derivative products is still low, access to raw materials, access to supporting raw materials is relatively difficult to obtain, and limited availability of time for housewives. In addition to those challenges, the tengkawang-based product development process has several advantages such as the availability of sufficient Tengkawang raw materials, existing Tengkawang butter processing, butter production house and production facilities.
were already available, the availability of local food that can be utilized as an additional ingredient in product processing. The solutions that can be generated to solve the challenges and improve the advantages are creating diversified derivative products that were capable by these criteria: easy mastery of skills by local citizens, relatively short development time, high added value, availability of raw materials, utilization of local wisdom, simple processing technology and has selling power and elevates the distinctiveness of Tengkawang from Bengkayang Regency.

3.3. Product formulation
Tengkawang-based derivative product diversification which hopes to be able to utilize local wisdom, easily made with simple processing technology and uplifting the peculiarities of Tengkawang from Bengkayang Regency, are:

1. **Soft ginger cookies**
Soft Ginger cookies are sweet cookies, it is a combination of ginger, cinnamon, clove and tengkawang. This cookie can be added to various toppings as well as beans, sweets, or sparkling. This product development is based on the need to have a long, delicious, and acceptable by for consumers taste. Therefore in this product added local spices whose main function is to add flavor and to disguise the aroma of tengkawang which is too stinging but still highlight the distinctive taste of tengkawang.

![Figure 1. Soft ginger cookies.](image1.jpg)

2. **Stick Tengkawang**
Tengkawang stick is one of the tengkawang derivative products that has a healthy snack concept, has a crunchy texture and has a perfect blend between the taste of cheese and tengkawang butter. This tengkawang stick has a long shelf life.

![Figure 2. Stick Tengkawang.](image2.jpg)

3. **Pie Tengkawang**
Tengkawang Pie is a sweet snack made from Tengkawang by combining tengkawang and milk butter. This blend can make the creamy taste of a pie that has a distinctive sweet, savory flavor and has a tengkawang flavor but is not too stinging. Tengkawang is only used for pie filling because if it is used to make pie skin it will damage the texture of the pie skin itself.
4. **Donat Tengkawang**

Tengkawang donuts are produced using sweet potatoes in Sahan Village as a substitute for potatoes. Sweet donut taste, combined with savory milk and there is a distinctive taste of tengkawang making this donut different from other donuts.

![Pie Tengkawang](image1)

**Figure 3.** Pie Tengkawang.

![Donut Tengkawang](image2)

**Figure 4.** Donut Tengkawang.

5. **Mie Tengkawang**

In addition to making food with a long shelf life, there was also making foods with a short shelf life, a food that is consumed by many people, namely noodles. Making tengkawang noodles by considering the number of tourists who come to the village of Sahan and the lack of places to eat that can be visited by tourists when they feel hungry, it is hoped that with the recipe for making noodles this can open opportunities for local citizens to open business opportunities.

![Mie Tengkawang](image3)

**Figure 5.** Mie Tengkawang.
| No | Bold Steps | Human Resources Development | Infrastructure Development | Pillar of Development | Market Development | Institutional Development |
|----|------------|------------------------------|-----------------------------|-----------------------|--------------------|--------------------------|
| 1  | Capacity Strengthening | Tengkawang Potential Socialization | Making Production Operational Standards | Asosiasi Pengusaha Indonesia (Apindo) | Collaboration with Media for Publication and Promotion | Collaboration with Inspirit |
|    |            | Pelatihan Manajemen Produksi | | Collaboration with Academics (Untan, Etc.) | Collaboration with Media for Publication and Promotion | Collaboration with Pt Daniar Jabis |
|    |            | Production Management Training | Intensive Tengkawang Tree Planting | Collaboration with local community | Collaboration with The Local Enablers | Organizational Management Training |
|    |            | Marketing Training | | Tengkawang Inventory with the Faculty of Forestry Untan Collaborating with the Faculty of Forestry Untan to Create the Latest Tengkawang Processing Equipment Creating Collaborative Space with Various Communities (Arkom, Intan, Kameek Pontianak, Etc.) Study of Tengkawang Processed Technology Development with Untan Polytechnic | | |
|    |            | Branding Training | | | | |
| 2  | Increasing Green Butter Production | Packaging Training | Development of Tengkawang Processing Facilities | Development of Collaborative Networks with Product Design Experts | Collaboration with Jafra Inisasi Collaboration with The Body Soap | PIRT Certification |
|    |            | Inventory Management Training | Procurement of Automatic Management Machines | Development of Collaborative Networks with Other Farmers' Groups | Collaboration with PT. Dian Niaga | Halal Certification |
|    |            |                       | Middle Scale Production Machinery Development | Development of Collaboration with the City Government | Cooperation with The Body Soap | Designing Company Status |
|    |            |                       | Brand and Packaging Development Maintenance of Tengkawang Trees | | | |
| Stage | Diversification of Derivative Products | Procurement of Tools and Machines According to Defined Derivative Products | Development of Cooperation Networks with Product Development Experts | Brand Strengthening
|-------|--------------------------------------|-------------------------------------------------|-------------------------------------------------|------------------------
| 3     | Comparative Study to Community or Industry | Derivative Product Processing Facility | Development of Collaborative Networks with Bekraf | Internet Marketing
|       | Internship in Middle School or Industry | Brand | Development of Cooperation Network with Polhep | BPOM Certification
|       | Introduction of Products and Industries to Tengkawang Potential Areas | Establishment of Production Support Groups | Development of Collaboration with the Tengkawang Kalimantan Network | Initiation of Cooperation with Institutions or International Markets
|       | Technology Research and Production Improvement of Tengkawang | Group rules Small Business Group Initiation Forum | Cooperation with Riak Bumi | Business Model Development
|       | Development of Business Groups | Development of Collaboration with Intan | Cooperation with AOI | Market Development to National Level
|       | Development of Collaboration with Village Institutions (Bumdes) | Development of Product Sales Facilities | Collaboration with Bpom | Establishing Collaboration with Companies that Support Market Expansion
| 5     | Increasing Network Capacity | R&D Network Development with International Institutions | Collaboration with Investors and Banking | Cooperative Development
|       | Development of Tengkawang Processed Product Centers | | | Replication of Institutional Systems in Other Regions
3.4. Product naming
The design of the Tengkawang-based product name collaborates with product naming experts (Morfo-Socio Linguistic) from Universitas Padjadjaran. The design result for this Tengkawang derivative product name is Tatu Hiang. Tatu Hiang's philosophy is ancestor, this shows that Tengkawang seeds are Dayak tribe ancestors then when applied to these food products, shows that:

1. This is a great tengkawang-based food that has been passed down from generation to generation and is associated with originality of taste, quality of tengkawang and food of Dayak ancestors
2. In operational meaning is that pie products and cookies or other products that have the brand "Tatu Hiang" are the first products made from Tengkawang, so there is no doubt about their taste and quality.
3. Tatu Hiang's product is the "Signature" of the Dayak tribe, so it's not complete to visit the Dayak/Kalimantan tribe if you haven't bought souvenirs "Tatu Hiang"
4. Carrying souvenirs "Tatu Hiang" means that tourists have arrived at the Dayak tribe and are well received so they can bring souvenirs from their ancestors.

3.5. Action plan
Designing strategic plans for developing tengkawang-based derivative products is very important and intensively discussed by the related stakeholders in this research. Generally, the strategic plan leads to the development of Bengkayang as a processing center area for tengkawang derivatives. This development was carried out with several stages consisting of capacity strengthening, increasing green butter production, diversification of derivative products, development of business groups, and development of tengkawang processed product centers

4. Conclusion
The Design Thinking process led to the development of Tengkawang-based derivative products and used as a basis for product development that could be carried out by Tengkawang Layar farmer groups in Sahan Village, Seluas District, Bengkayang Regency, West Kalimantan. The products produced have typical characteristics of Sahan Village from the taste, shape, raw materials used, philosophy of naming the product to the packaging to be used. Marketing product development can be done through the initiation of cooperation with key partners from academia, business, community, government and the media

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