

Socialization of the Making of PARUS (Ruminant Feed from Sago) and PASI (Utilization of Sago Dregs for Fish) Through the Sago Waste Utilization Integration System (SIPLIS) Towards the Plantation Industry Concept of Sustainability in Green Economy

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Abstract

Feed is an important thing for the sustainability of livestock, feed limitations can affect livestock production and reproduction. One solution to overcome feed limitations is to utilize agricultural waste. The potential of sago pulp can be used as an economical and easy-to-obtain material so that sago pulp can be used as PARUS and PASI. Sago waste is obtained from a sago refinery located in a partner area where the sago refinery disposes of waste left over from direct river production. This service activity was carried out with the aim of providing socialization and procedures for processing sago pulp into PARUS and PASI. This activity was carried out in Bagan Melibur Village, Merbau District, Meranti Islands Regency, Riau Province. The results obtained from the socialization activities of Optimizing the Making of PARUS (Ruminant Feed from Sago) and PASI (Utilization of Sago Pulp for Fish) within the framework of the Integrated System for the Utilization of Sago Waste (SIPLIS) is to increase public knowledge about the utilization of sago pulp waste so that it can be processed into ruminant animal feed and fish in the form of pellets at affordable prices. This initiative not only contributes to increasing community income and environmental sustainability, but also creates new job opportunities in the local area.

Keywords: feed, socialization, sago dregs

Abstrak

Pakan merupakan hal penting untuk keberlangsungan ternak, keterbatasan pakan dapat mempengaruhi produksi dan reproduksi ternak. Salah satu solusi untuk mengatasi keterbatasan pakan adalah dengan memanfaatkan limbah hasil pertanian. Potensi ampas sago dapat dipakai sebagai bahan yang ekonomis dan mudah didapatkan sehingga ampas sago dapat dimanfaatkan menjadi PARUS dan PASI. Limbah sago didapat dari kilang sago yang berada di wilayah mitra yang mana kilang sago tersebut membuang limbah sisa produksi langsung sungai. Kegiatan pengabdian ini dilakukan dengan tujuan memberikan sosialisasi dan tata cara pengolahan ampas sago menjadi PARUS dan PASI. Kegiatan ini dilakukan di Desa Bagan Melibur, Kecamatan Merbau, Kabupaten Kepulauan Meranti Provinsi Riau. Hasil yang didapatkan dari kegiatan sosialisasi Optimalisasi Pembuatan PARUS (Pakan Ruminansia dari Sagu) dan PASI (Pemanfaatan Ampas Sagu untuk Ikan) dalam kerangka Sistem Integrasi Pemanfaatan Limbah Sagu (SIPLIS) adalah menambah pengetahuan masyarakat tentang pemanfaatan limbah ampas sago sehingga dapat diolah menjadi pakan ternak ruminansia dan ikan berupa pelet dengan harga yang terjangkau. Inisiatif ini tidak hanya berkontribusi terhadap peningkatan pendapatan masyarakat dan keberlanjutan lingkungan, tetapi juga menciptakan peluang kerja baru di daerah setempat.

Kata kunci: pakan, sosialisasi, ampas sago

1. INTRODUCTION

Feed has a very important role in the life of livestock. Limited feed can cause a decrease in livestock capacity and can disrupt normal production and reproduction. Research conducted by (Ding et al., 2024) Proper nutrition is essential to maintain optimal reproductive function in mammals. This problem can be overcome if agricultural/industrial potential and waste are taken into account in animal husbandry. Animal feed supplies must be easily available and in large quantities so that it is not difficult and does not require significant costs. Various agricultural and forestry by-products can be used as a source of raw materials for feed, such as plantation waste

and agricultural industrial waste that do not compete with human needs, for example sago pulp (Iftitah A S, 2017). Research conducted by (Muchlis et al., 2023) and (Maghfuri, 2023) shows that the utilization of existing agricultural waste is not optimal, causing problems in the environment. In fact, agricultural waste can be used as a variety of supporting products for the community, both to improve the quality of the environment and as one of the sources of additional income for the community. One of the products that can be made to optimize the use of agricultural waste is animal feed.

The sago plant is a typical plant owned by the Meranti Islands Regency and has become an icon for the Regency. According to (Siswati et al., 2023) Meranti Islands Regency is one of the largest Sago (*Metroxylon* sp) producing areas in Indonesia, after Papua. The area of people's sago plantations in Meranti Islands Regency is around 41,051 ha and has 96 sago industries or refineries spread across Meranti Islands Regency (Dinas Perkebunan dan Hortikultura Kabupaten Kepulauan Meranti, 2021). The sago processing industries spread across Meranti Islands Regency process sago into wet sago flour and dry sago flour. Most of the wet sago flour is processed to make sago noodles and other processed food products such as cakes, while the dry sago flour is exported to Malaysia, Batu Pahat (Dinas Perdagangan, Perindustrian, Koperasi dan UMKM Kabupaten Kepulauan Meranti, 2021). The sago dregs produced from the refinery can reach 15.13 tons/day and all the sago refineries in Meranti Islands Regency waste is only dumped into nearby rivers or collected in one bed (Siswati et al., 2023). These wastes pose a problem because they require a larger storage location. The sago residue produced during the production process in Makbon District reaches 15-20% of the total wet weight. The accumulation of sago waste occurs continuously due to the lack of public understanding of how to manage or utilize the waste into products of economic value. This creates the potential for waste of resources that are actually used more efficiently (Mega et al., 2024). Research by (Rosalina & Maipauw, 2021) It shows that community skills in managing agricultural waste are closely correlated with the level of education and deeper understanding through extension activities. Therefore, it is important for the public to get education and a deeper understanding of crop cultivation and land management, including effective ways to manage agricultural waste such as sago waste.

Sago dregs is a type of waste produced during the processing of sago flour. Sago processing produces sago starch and sago dregs. Sago dregs contain 65.7% starch; crude fiber 14.8%; crude protein 1.0%; and ash 4.1% (Fajar Syadik, Satria, 2022) and this is in line with research conducted by (Serli et al., 2022) and (Muhsafaat et al., 2015) namely that sago dregs contain carbohydrates (crude fiber and extracts without nitrogen) is high, namely 89.02%, so it can be used as an energy source feed ingredient. According to (Haedar & Jasman, 2017) sago processing waste is included in the wet by-products category because it still contains 70 - 80% water content, so it can be damaged quickly if it is not processed immediately. Treatment through drying requires relatively high costs so it needs to be developed through other alternative technologies so that the product can be utilized more efficiently. It is hoped that the use of sago pulp waste as feed can be an alternative to overcome the problem of environmental pollution and the problem of feed availability for livestock (Das et al., 2015). One technology for processing feed from sago waste is sago dregs fermentation technology using a chemical method, namely by adding urea (Fajar Syadik, Satria, 2022) and The use of fermentation technology can increase the nutritional value and reduce the crude fiber of agricultural waste materials and industrial waste (Eoh, 2022). Produk fermentasi dapat diberikan pada ternak ruminansia seperti sapi atau kerbau dalam jumlah 5-30% tergantung dari jenis substrat terfermentasi dan jenis ternak ruminansia, tanpa menyebabkan kematian. Proses fermentasi limbah pertanian dapat dikembangkan di seluruh wilayah Indonesia karena tidak sulit untuk dilaksanakan, asal dilakukan pengontrolan yang baik (Budiarto et al., 2023).

According to (Daliani et al., 2011), feed is the largest input in livestock businesses, in fact feed costs reach 60-70% and this statement is the same as stated by (Edi, 2020), namely that feed is the most important factor that supports the smooth running of a business. livestock, as much as

60 – 70% of livestock business production costs come from feed procurement. To get quality feed, it must meet quality requirements which cover several aspects, including: feed safety, animal health, food safety and economic aspects. Balanced and quality feed is influenced by the type of feed ingredients used in preparing the ration formula (Ali et al., 2023). In 2020, the Head of Bagan Melibur Village, the Head of Mayang Sari Village and the Head of Mekar Sari Village made Joint Regulation No. 2 of 2020 concerning the Establishment of a Joint Village-Owned Enterprise, Rumbio Nusa Mandiri. Through this village regulation, a Bumdes was formed issued by the Ministry of Justice and Human Rights No. AHU-00031.AH.01.35 of 2022 which is engaged in providing raw materials, feed production and animal husbandry.

So far, Bumdes Together with Rumbio Nusa Mandiri produces animal feed from shredded and dried sago or what is known as Dry Grated Sago (SAPURING), however the costs required to make this animal feed are quite expensive from SAPURING so the selling price offered is expensive. and in the end Bum Des Bersama Rumbio Nusa Mandiri is not operating to date. The problem faced by partners is that there is no knowledge about the manufacture and processing of sago dregs as a raw material for making feed. Sustainability of PARUS and PASI production activities means having composition test data, increasing PARUS and PASI productivity. The quality of the feed produced refers to feed quality standards according to SNI 01-2901-2011. For this reason, this community service activity is carried out to provide understanding to the community/Bum Des about how to use sago dregs as animal feed.

2. METODE

The method used in this activity is lectures and providing direct practical examples to the target community. Implementation of this activity is divided into several stages:

1. Preparation

The preparation stages for implementing socialization about PARUS (Ruminant Feed from Sago) and PASI (Utilization of Sago Dregs for Fish) usually include several steps aimed at ensuring that the socialization is effective and the material presented is well received by participants. The following is a description of the preparation stages:

a. Determining Socialization Goals

- Goal Identification: Determine the aim of this socialization, such as increasing participants understanding of sago-based ruminant feed and the use of sago dregs for fish.
- Target Participants: Determine who will be the participants, namely members of Bumdesma and PPL throughout Merbau District.

b. Material Collection

- Content Development: Develop outreach materials that include information about PARUS and PASI, including their benefits, how to make them, and their positive effects on animal husbandry and fish cultivation.
- Supporting Materials: Prepare supporting materials such as presentations, posters, brochures, or videos that visualize relevant data and information.

c. Scheduling and Location

- Timing: Determine the appropriate date and time for socialization so that the optimal number of participants can attend.
- Location Selection: Determine the location for the socialization, such as a village hall, farming community, or a location that is easily accessible to participants.

d. Extension and Stakeholder Involvement

- Stakeholder Involvement: Invite related parties, such as agricultural departments or research institutions, to collaborate in outreach.

e. Promotions and Invitation

- Distributing Invitations: Sending invitations to selected participants and conducting follow-up to ensure their attendance.

f. Logistics Preparation

- Equipment and Facilities: Prepare equipment such as projectors, laptops and sound systems if needed, and ensure that all facilities at the socialization location are in good condition.
- Providing food: Prepare food for participants so they feel cared for and comfortable during the event.

g. Training for Speakers

- Briefing: Holding an introductory meeting for speakers or instructors to discuss material and delivery methods so that they are consistent and interesting for participants.

This preparation stage is vital to ensure that socialization about PARUS and PASI runs smoothly, effectively, and is able to have a positive impact on participants. With a thorough preparation process, it is hoped that the information presented can increase public understanding and acceptance of the use of sago as a useful food source.

2. Socialization stage

The socialization stage regarding PARUS (Ruminant Feed from Sago) and PASI (Utilization of Sago Dregs for Fish) is the first step in introducing the concept and benefits of this innovation to partners and interested parties. The following are the stages of socialization carried out:

a. Preparation of Lecture Material

- Information Collection: Collect relevant information about sago as a basic ingredient for feed, techniques for processing sago into ruminant feed, and the benefits of sago dregs as fish feed.
- Preparation of Material: Prepare lecture material which includes the background, benefits and method of making PARUS and PASI. This material must be adapted to the audience, both in terms of language, level of understanding and information needs.
- Learning Media Development: Preparing visual aids such as presentation slides, videos or posters that can help clarify the information conveyed.

b. Implementation of the lecture

- Opening: Start by introducing yourself and providing a general overview of the purpose of the lecture, namely to introduce and explain the PARUS and PASI innovations.
- Presentation of material:
 - Explanation of PARUS: Explains the concept of Ruminant Feed from Sago, including the reasons for choosing sago as a feed ingredient, the manufacturing process, and its benefits for ruminant farming (such as cows, goats, etc.).
 - Explanation of PASI: Describes how to use sago dregs as fish feed, processing techniques, and the economic and ecological benefits of using sago dregs.
- Demonstration: Showing examples of PARUS and PASI products, or videos of the manufacturing process, to give the audience a more concrete picture.

c. Discussion

- Interaction with the Audience: Invite the audience to discuss, ask questions and convey their opinions or experiences regarding the use of sago or other alternative feed.
- Answering Questions: Responding to questions and concerns from the audience with accurate and relevant information, to ensure they understand the material presented.

d. Closing and Follow-up

- Closing: Summarizes the important points of the lecture and reiterates the main benefits of PARUS and PASI.
- Providing Additional Materials: Providing printed or digital materials containing guidelines for making PARUS and PASI, as well as contact information for further consultation.
- Follow-up: Inform about the possibility of further training or site visits to see firsthand the process of making PARUS and PASI.

With this socialization stage, it is hoped that the community or target group can understand the benefits and ways of using sago more widely, and will be moved to adopt this technology in their activities.

3. Example Giving Text

The stage of providing examples of making PARUS (Ruminant Feed from Sago) and PASI (Utilization of Sago Dregs for Fish) to the community and Village-Owned Enterprises (Bumdes) is a practical step that aims to provide knowledge and skills directly. This stage is important to ensure deeper understanding and increase people's confidence in implementing the innovation.

a. Site and Material Preparation

- Location Selection: Determining the appropriate location for the demonstration, in this case carried out at a Bumdes production house that has adequate space and equipment.
- Preparation of Materials and Equipment: Collect the ingredients needed to make PARUS and PASI, including sago dregs and additional ingredients (if needed), as well as equipment such as a stove.

b. Opening Activities

- Welcoming Participants: Welcoming participants consisting of community members and Bumdes administrators. Starting the activity with a brief explanation of the purpose of the demonstration and the benefits of making PARUS and PASI.

c. PARUS Making Demonstration

- Ingredients Introduction: Introduces the main raw material, namely sago dregs, and explains the criteria for good quality of sago dregs to be used as ruminant feed.
- Manufacturing Steps: Shows the PARUS manufacturing process directly, including:
 - Processing Sago Dregs: Shows how to process sago dregs into another form suitable for use as feed, in this case the sago dregs must be steamed for 1 hour to remove the ammonia content contained in the sago dregs.
 - Mixing additional ingredients: mixing is done by adding urea and premix (vitamins for ruminants) and then fermented for 3 days.
 - Drying: The process of drying the feed is carried out until the water content is 10% so that the sago dregs can be processed into pellets.
 - Pellet Making: This process is carried out by putting the dried sago dregs into a pellet press.

d. Making PASI Demonstration

- Introduction to Sago Dregs: Explains the origin of sago dregs and its nutritional content which is useful for fish.
- Manufacturing Steps: Shows how to use sago dregs as fish food, including:
 - Processing Sago Dregs: Shows how to process sago dregs into another form suitable for use as feed, in this case the sago dregs must be steamed for 1 hour to remove the ammonia content contained in the sago dregs, including the fermentation process to increase the nutritional value. Fermentation is carried out by adding urea and premix (vitamins for fish)
 - Formation of Fish Food: The process of forming fish food, whether in pellet form or other forms that are easy for fish to consume.
 - Storage and Feeding: Explains how to properly store and how feed is given to fish for optimal results.

e. Independent Practice by Participants

- Group Practice: Ask each group of participants to practice making PARUS and PASI based on the demonstration that has been given. The instructor provides guidance and answers questions that arise during practice.
- Evaluation of Results: After practice, the instructor and participants jointly evaluate the results of making the feed to ensure good understanding and identify areas for improvement.

6. Discussion

- Discussion Sessions: Hold open discussion sessions to discuss challenges participants face during practice, potential solutions, and share experiences.
- Answering Questions: Provides opportunities for participants to ask further questions about the creation process, benefits and application of PARUS and PASI in their local context.

7. Closing and Follow-up

- Closing: Conclude the activity by emphasizing the importance of using sago and sago dregs as an economical and sustainable alternative feed.
- Distribution of Training Materials: Provide additional training materials, such as written guides or video tutorials, to participants to use as references when they try making feed at home.
- Follow-up Plan: Organize follow-up actions, such as further training or monitoring visits to support the independent implementation of PARUS and PASI by Bum Des.

By providing direct examples of making, the community and Bumdes can better understand the correct techniques and feel more confident in applying this technology in their daily activities, which in the end can increase food security and local economic prosperity.

3. RESULTS AND DISCUSSION

Community service activities carried out in the Meranti Islands can increase the knowledge and skills of the community as well as Bumdesma Rumbio Nusa Mandiri to utilize sago dregs as raw material for making animal feed. Making animal feed can use sago dregs which are easily obtained by the people of the Meranti Islands, this is because the sago dregs in the Meranti Islands are not utilized optimally by the community. The activity of making feed from sago dregs is considered to provide benefits for Bumdesma because so far Bumdesma has been making feed from grated sago so that the selling price offered is expensive and in the end Bumdesma is not operating until now.



(a)



(b)



(c) (d)
Figure 1. (a) Socialization activities through the delivery of material; (b) Application of sago dregs processing technology, (c) marketing strategy planning for sago products, and (d) design thinking

Application of Sago Processing Technology

It is hoped that the socialization activities and practice of making PARUS and PASI for Bumdesma can make animal feed using sago pulp as raw material optimally and can increase animal feed productivity. Sago dregs which were initially not processed at all in Bagan Melibur village, Merbau sub-district, Meranti Kepulauan district can be used as a source of economical and highly nutritious animal feed. According to (Muhsafaat et al., 2015) fermented sago dregs can increase feed nutrition, and are considered easy for livestock to digest and increase feeding efficiency. The fermentation process also reduces the water content contained in sago dregs (Haedar & Jasman, 2017). Reducing water content can increase shelf life so that feed is stored longer.

Fermentation treatment by adding urea and premix can increase levels of protein, fat, crude fiber and other vitamins needed by ruminant and fish. Where initially Bumdesma processed sago into animal feed or what is better known as SAPURING (dry grated sago) but economically, if SAPURING was used as animal feed, the resulting food would be expensive.

Marketing Strategy Planning for PARUS and PASI Products

This material discusses marketing strategy planning for PARUS and PASI products. Bumdesma from Bagan Melibur Village was invited to look at the opportunities that emerged from sago pulp production activities in their village. Apart from that, Bumdesma members are also encouraged to pay attention to various opportunities such as making product packaging, labeling with nutritional value information, and obtaining PIRT permits for PARUS and PASI products that will be marketed. These steps are important to attract consumer interest, increase sales value, and make it easier to market products to various places, including shops and supermarkets.

Design Thinking

Apart from being given an explanation about appropriate marketing strategies, partners also received material about effective ways of thinking (Design Thinking) in finding solutions to every problem that arises during the sago dregs processing process. Partners are expected to be able to develop more innovative ways of thinking in solving problems. Next, partners are invited to discuss in small groups (FGD) to exchange ideas and discuss problems that occur during the sago dregs processing process. After that, they jointly formulated an action plan that needed to be carried out in the future so that the sago dregs production process for ruminant and fish feed becomes more effective, efficient and innovative. This activity is the first step in socialization, where the team is currently providing sago dregs processing equipment for animal feed which will later be donated to partners, as well as designing several mentoring programs. The partner community, which in this case is Bumdesma from Bagan Melibur Village, Merbau District, Meranti Islands Regency, hopes that this activity does not stop here, but can continue through other funding from the local government or third parties who can work together to provide tools and equipment. tools like this as well as providing training on processing sago dregs. The aim is to increase the quality and quantity of sago dregs production for animal feed, from the processing process to the final product, one of which is animal feed products which will be branded "PARUS and PASI". Sago pulp in animal feed production is one of the efforts to overcome the limitation of feed resources which is a challenge in the livestock business.

Sago pulp has a high nutritional value, especially carbohydrates, so it has the potential to be a source of energy for animal feed (Serli et al., 2022). This service activity shows the collaboration of Academics, Village Government, Bumdes Together with Nusa Mandiri and the local community so that it has a positive impact both economically and environmentally. It is also hoped that the positive impact of this program will be sustainable by increasing community skills in waste processing and increasing independent animal feed production.

Production of PARUS and PASI Processing Equipment

a. PARUS and PASI Pellet Making Equipment

Ruminant and fish pellet making equipment is a machine specifically designed to convert raw materials such as sago dregs, fish meal, bran and other ingredients into pellets that are ready to be consumed by ruminants (such as cows, goats and sheep) and fish. This tool usually consists of several main components:

1. Grinder or Crusher: This section functions to grind or crush raw materials into smaller and uniform particles, which makes the mixing and pellet formation process easier.

2. Stirrer or Mixer: After the raw materials are ground, they go into the stirrer or mixer, where all the ingredients are mixed evenly. This mixing process ensures that nutrients and additives such as vitamins, minerals, or binding agents are evenly distributed throughout the ingredients.

3. Extruder or Pelletizer Machine: This is the core component of the pellet maker. This machine compresses a mixture of ingredients that have been stirred into pellets of a certain size and shape. The extruder works by applying pressure and heat, so that the raw materials become solid pellets that can be used as animal or fish feed.

4. Cooler: Pellets that have just come out of the extruder are usually still hot and damp. The cooling section helps lower the temperature of the pellets so they are stable and ready to be packaged or used directly.

5. Sifter or Screener: After cooling, the pellets are usually screened to ensure uniform size and shape. Pellets that are too small or too large can be separated and returned for reprocessing.

6. Packaging System: Once the pellets are finished, they are packed in bags or containers as required. Good packaging will help maintain the quality of pellets during storage and distribution. This pellet making tool is made of resistant and sturdy materials, such as steel, to ensure durability and long service life. The size and capacity of the equipment can vary, ranging from small-scale for home farmers to industrial scales capable of producing large quantities of pellets.



Figure 2. Mixer and screener

b. Dryer (Drying Floor)

The drying floor for making "PARUS and PASI" pellets is an area used to dry pellets naturally after the forming process. Drying is one of the important post-harvest activities. Limited drying locations, labor and during the rainy season resulted in delays in drying. Delay in drying and improper layer thickness can reduce the quality produced (Suryawati & Sutoto, 2019). This drying floor is designed to maximize sunlight exposure and air flow, so that pellets can be dried efficiently and evenly. The following is a description of the drying floor:

1. **Material and Surface:** Drying floors are usually made of strong and durable materials such as cement, concrete or paving blocks. The floor surface must be flat and smooth to facilitate the drying process and prevent dry pellets from being damaged due to rough or uneven surfaces.
2. **Size and Capacity:** The size of the drying floor may vary depending on the number of pellets to be dried. For small to medium scale production, the drying floor usually has an area of several square meters, while for large scale production, the drying floor can reach hundreds of square meters. The capacity of the drying floor is adjusted to production needs and the volume of pellets produced.
3. **Position and Orientation:** The drying floor is placed in an area exposed to direct sunlight throughout the day to speed up the drying process. Usually, the drying floor is oriented towards the sun and is not blocked by buildings or large trees to get maximum sunlight.
4. **Use of Nets or Covers:** To protect pellets from dust, dirt or insect contamination during the drying process, the drying floor can be equipped with a transparent net or cover. This cover also helps maintain moisture and protects the pellets in case of sudden rain.
5. **Temperature measuring equipment:** On the drying floor, it plays an important role in the drying process of pellets, such as "PARUS and PASI" pellets. Use of this tool helps ensure that the temperature on the drying floor is at the optimal level for efficient and safe drying. The following is a description of the use of temperature measuring instruments on drying floors.
6. **Air Circulation:** Drying floors are designed to allow good air circulation. This is important to remove moisture from the pellets evenly and prevent the growth of mold or bacteria. Some drying floors may also be equipped with fans or other aids to increase air circulation, especially in areas with high humidity.
7. **Management and Maintenance:** The drying floor must be cleaned regularly to avoid the accumulation of dirt or residue which could affect the quality of the pellets. Maintenance is also needed to keep the floor in good condition and free from cracks or damage that could interfere with the drying process.
8. **By using a good drying floor, "PARUS and PASI" pellets can be dried optimally, producing a final product that is high quality, free from excess moisture, and has a longer shelf life.**



Figure 3. Drying Floor

4. CONCLUSION

The conclusions obtained from this service activity are:

1. Target partners and the community understand and comprehend how to make PARUS and PASI so that the community can utilize sago waste into products that have economic value in the hope of increasing community income.
2. Through Community Service activities, Bumdesma has its own product brand and is ready to be marketed.
3. Through Community Service activities, Bumdesma's financial books can be arranged properly and correctly.
4. Through Community Service activities by making PARUS and PASI products, the Community is committed to continuing these activities until a Sago Waste Utilization Integration System (SIPLIS) is formed.

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