Volume 7 Number 1 (2026)
January- June 2026
Page: 103-120

E-ISSN: 2716-0750
P-ISSN: 2715-7997
DOI: 10.37680/amalee.v7i1.9304

Amalee
Indonesian Journal of Community Research and Engagement

Community Partnership Empowerment (PKM) Ready-to-drink Teak Leaf Tea Product in Kebontunggul Village, Mojokerto

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Article history Submitted: 2026/02/26; Revised: 2026/03/09; Accepted: 2026/03/28

Abstract

Kebontunggul Village has significant potential for medicinal herbs that have not yet been fully utilized. This Community Partnership Empowerment (PKM) program aims to strengthen the capacity of BUMDes Gajah Mada in Kebontunggul Village to develop value-added herbal products derived from local resources. The program focuses on improving community knowledge, technical skills, and business management in herbal product development to support sustainable village economic activities. The program was implemented through several integrated activities, including socialization, training, and education on herbal processing, technology implementation for product packaging, and monitoring and evaluation to ensure program sustainability. The primary objective was to develop a ready-to-drink teak leaf tea product while establishing a more systematic stock management system for raw materials and finished products within the BUMDes. The results indicate a substantial improvement in participants' knowledge, as reflected by the increase in training evaluation scores from 24.3 ± 13.8% before training to 97.2 ± 3.73% after training. The adoption of packaging technology and inventory management practices also enabled BUMDes to initiate the production of ready-to-drink teak leaf tea as a value-added herbal product. These outcomes demonstrate the potential of participatory community empowerment programs to strengthen village-based enterprises and enhance the economic value of local herbal resources.

Keywords Community partnership empowerment (PKM); Herbal-based products; Medicinal plants; Ready-to-drink tea; Village-owned enterprise (BUMDes)

1. INTRODUCTION

Kebontunggul Village, located in Gondang Subdistrict, Mojokerto Regency, East Java, Indonesia, possesses considerable natural resource potential, particularly in the cultivation and utilization of herbal plants (Tungary et al., 2022). The village is characterized by extensive, fertile agricultural land and a community structure in which the majority of residents work as farmers (Sutanto et al., 2024). This agricultural background provides a strong foundation for the development of local resource–based economic activities (Supriyanto et al., 2022)(Kumalasari, 2022). Among the various natural resources available in the village, teak trees (Tectona grandis) are widely found in the surrounding area (Tungary et al., 2022). While teak is generally recognized for its timber value, its leaves also contain bioactive compounds with potential health benefits that can be developed into herbal products. Previous studies have reported that teak leaves contain phytochemical compounds with antioxidant and medicinal properties, indicating their potential use as functional herbal beverages (Sutanto et al., 2024); (Sutanto et al., 2024) (Kok & Susilo, 2024).

In many rural areas of Indonesia, the use of herbal plants is often limited to traditional or household-scale practices, as in Kebontunggul Village. Although teak leaves are abundantly available, their use is still largely traditional and has not been transformed into value-added products with commercial potential (Kok et al., 2024). Most community members are not yet familiar with modern herbal processing techniques, product standardization, packaging, labeling, and market-oriented product development. As a result, the economic potential of teak leaves remains underutilized (Kok et al., 2023). This situation demonstrates a clear gap between the availability of natural herbal resources and the community's capacity to process these resources into innovative and marketable products (Kok & Susilo, 2024).

The transformation of raw herbal resources into functional beverage products represents an important opportunity for rural economic development (Mutiara et al., 2022). In recent years, herbal beverages have gained increasing attention as public awareness of health, wellness, and natural ingredients grows. Functional drinks derived from natural plants are increasingly favored as alternatives to synthetic beverages because they offer both nutritional and medicinal benefits (Goeltom et al., 2014). In this context, teak leaves have promising potential for development into ready-to-drink herbal tea products. Compared with traditional herbal preparations, ready-to-drink herbal beverages provide practical consumption, improved product consistency, and better market acceptance (de Jesus & Kok, 2024). Therefore, the

development of ready-to-drink teak leaf tea can serve as a strategic innovation for enhancing the economic value of local herbal resources.

The development of herbal-based products in Kebontunggul Village is also aligned with the village's development policies. According to the Village Medium-Term Development Plan (RPJMDes), the utilization of local herbal resources is identified as one of the village's priority sectors for economic development. This policy direction emphasizes strengthening community-based economic activities by processing and commercializing local natural resources. By promoting the development of herbal products, the village government aims to create sustainable economic opportunities for the community while increasing locally generated village revenue.

In supporting the implementation of village economic development programs, the Village-Owned Enterprise (BUMDes) plays an important role as a community-based economic institution. In Kebontunggul Village, BUMDes Gajah Mada serves as the primary institutional partner responsible for managing and commercializing village-based economic products. BUMDes Gajah Mada serves as a facilitator and manager of village economic activities, including the development of local products with income-generating potential for both the community and the village. Through this institution, village resources can be organized and managed more systematically and sustainably.

However, despite the strategic role of BUMDes Gajah Mada in supporting village economic activities, several operational challenges remain. One of the main challenges is the limited capacity of the institution and the community in developing standardized herbal products with market potential. The processing of herbal materials into commercially viable products requires knowledge of appropriate production techniques, hygienic processing standards, product formulation, and packaging technology. In addition, effective management of raw materials and finished products is essential to ensure product availability, quality consistency, and efficient production processes. At present, the management system for herbal raw materials and processed products within BUMDes Gajah Mada is still relatively simple and has not yet implemented systematic stock management practices.

Another challenge is developing innovative herbal products that can compete in the growing herbal beverage market. While raw materials are abundant, the lack of product diversification and innovation limits the market reach of herbal products produced at the village level. Without proper product development and branding strategies, local herbal resources may not realize their full economic potential.

Therefore, strengthening both production capacity and managerial capability becomes a crucial step in transforming herbal resources into competitive village-based products.

Given these conditions, community empowerment through a structured assistance program is needed to enhance the capacity of both the community and BUMDes Gajah Mada to manage herbal resources. The Community Partnership Empowerment Program (PKM) is designed as an intervention strategy to address these challenges by integrating production training, product development, and improvements to the management system. Through this program, teak leaves will be processed into a ready-to-drink herbal tea product that can serve as a flagship for Kebontunggul Village. The program also emphasizes improving product quality, packaging design, labeling, and stock management systems to support sustainable production and commercialization.

Specifically, the objective of this PKM program is to strengthen the capacity of BUMDes Gajah Mada and the local community in developing value-added herbal products derived from teak leaves. This objective is achieved through training and assistance in herbal processing techniques, product packaging and labeling, and the implementation of a simple but effective stock management system for both raw materials and processed products.

The expected outputs of the program include the development of a new variant of ready-to-drink teak leaf tea as a village-based herbal product, improved product packaging and labeling that meet basic market standards, and the establishment of a more organized stock management system within BUMDes Gajah Mada. These outputs are intended to support the sustainability of herbal product development and strengthen the institutional capacity of the village enterprise.

In the long term, the program's expected outcomes include increased production efficiency and improved economic value of local herbal resources. Through improved production techniques and management practices, the production capacity of herbal products is expected to increase significantly, while production time can be reduced by approximately 25%. Furthermore, the development of ready-to-drink teak leaf tea as a village flagship product is expected to strengthen community-based economic activities, increase income opportunities for residents, and support the sustainable development of Kebontunggul Village’s herbal resource potential.

2. METHODS

This Community Partnership Empowerment Program (PKM) employed a participatory empowerment approach that emphasizes community involvement, capacity building, and institutional strengthening of local economic actors. The program was implemented in collaboration with BUMDes Gajah Mada in Kebontunggul Village, Gondang Subdistrict, Mojokerto Regency, which served as the primary institutional partner responsible for managing and developing village-based herbal products.

The program was conducted from May to September 2025 and involved 15 participants, including members of BUMDes Gajah Mada and local community representatives involved in herbal product processing. The implementation stages were designed to address both production-related challenges and management capacity development through structured training, technology implementation, and continuous monitoring.

2.1. Program Socialization

The initial stage involved program socialization to introduce the objectives, implementation stages, and expected outcomes of the Community Partnership Empowerment Program. This stage also helped establish a shared understanding between the implementing team and program participants about the development of ready-to-drink teak leaf tea as a village-based herbal product.

The socialization activities were conducted through interactive presentations and group discussions, allowing participants to express their expectations and identify key challenges in herbal product development. The program stages presented during this session included training and education, technology implementation, monitoring and evaluation, and sustainability strategies.

Figure 1. Socialization stage of the program.

Evaluation of this stage was conducted using pre- and post-session discussions to assess participants' understanding of the program objectives and their readiness to participate in subsequent activities.

2.2. Training and Education on Herbal Product Processing

The second stage focused on strengthening participants' knowledge and skills in herbal product processing, particularly the development of ready-to-drink teak leaf tea. The training activities involved demonstrations, hands-on practice, and focus group discussions (FGD) to ensure active learning and practical skill acquisition.

The training sessions were conducted over two days and covered several topics, including preparation of herbal raw materials, formulation development, hygienic processing techniques, and product standardization.

The formulation of ready-to-drink teak leaf tea was developed using dried Tectona grandis leaves as the primary bioactive ingredient, combined with powdered red seaweed (Kappaphycus alvarezii) to enhance functional value and physical stability. In the optimal formulation (3:1 ratio), each 250 mL aluminum can contains 1.125 g of dried teak leaves, 0.375 g of red seaweed powder, and 0.375 g of cinnamon, with 8.125 g of palm sugar added to enhance flavor acceptability.

The ingredients were infused in hot water, stirred until homogeneous, and processed at high temperatures to ensure microbiological safety. This formulation was selected based on organoleptic evaluation, which demonstrated the highest acceptability in terms of color, aroma, taste, mouthfeel, and aftertaste compared with other tested formulations. In addition, the product exhibited stable pH, acceptable microbiological quality (Total Plate Count within safe limits), and antioxidant activity as measured by the DPPH assay, indicating its potential as a functional herbal beverage.

Figure 2. Training in product processing.

Figure 3. Education on health product processing

PParticipants were directly involved in all processing steps, including ingredient preparation, formulation mixing, heating processes, and product handling, thereby acquiring practical production skills. Evaluation of the training stage was conducted through participant performance observation and post-training discussions to assess understanding and practical skill development.

2.3. Technology and Innovation Implementation

The technology implementation stage aimed to enhance the efficiency and consistency of herbal product packaging by introducing a semi-automated aluminum can sealing machine. The equipment enables the packaging of ready-to-drink herbal tea in sealed aluminum cans, thereby improving product safety, shelf life, and marketability.

The machine has a production capacity of approximately 150–200 cans per hour, depending on operator efficiency and preparation processes. During this stage, participants received technical guidance and hands-on practice in operating the sealing machine, including can preparation, sealing procedures, and quality checking of sealed products.

Figure 4. Aluminum can sealer

The evaluation of this stage focused on participants' ability to independently operate the packaging equipment and apply the technology in their production activities.

2.4. Monitoring and Evaluation

Monitoring and evaluation were conducted to assess the effectiveness of the implemented activities and to ensure that the technology and knowledge transferred during the program were properly applied by the participants.

Evaluation indicators included several measurable aspects to assess the program's implementation effectiveness. These indicators included increases in herbal product production capacity, reductions in processing time, and consistent product quality and formulation achieved during production. In addition, the evaluation examined the implementation of raw-material and finished-product stock recording systems to improve inventory management and production planning. Another important indicator was the participants' competence in operating production equipment, particularly the packaging technology introduced during the program. These indicators were used to determine the extent to which the training, technology implementation, and management assistance contributed to improving the operational capacity and sustainability of BUMDes-based herbal product development. Data collection during monitoring activities was conducted through direct observation, production documentation, and group discussions with participants. The evaluation results were used to identify potential challenges and provide recommendations for improving production and management practices.

2.5. Program Sustainability

Program sustainability was designed using a community-based empowerment model that emphasizes capacity building, institutional strengthening, and independent production management. After completing the formal PKM activities, BUMDes Gajah Mada is expected to continue producing and commercializing ready-to-drink teak leaf tea as a village flagship product.

To support sustainability, continuous communication between the implementing team and program partners is maintained through online consultations and periodic field visits conducted twice a year. These activities aim to identify emerging challenges, provide technical guidance, and ensure the continuity of herbal product development initiatives in Kebontunggul Village.

2.6. Management Capacity Building

In addition to improving production capacity, management capacity building was conducted through structured training on inventory and stock management systems for herbal raw materials and processed products.

The training introduced a simple stock recording system using spreadsheet-based documentation and manual logbooks, enabling participants to monitor raw material availability, production output, and product distribution. Participants were also guided in developing basic Standard Operating Procedures (SOPs) for raw material storage, product processing, and stock recording.

The evaluation of this training was conducted through practical exercises and discussions, assessing participants' ability to apply the stock management system in their daily operational activities. The implementation of this system is expected to improve production planning, reduce raw material shortages, and enhance overall production efficiency.

3. FINDINGS AND DISCUSSION

The implementation of the program improved the understanding and practical skills of BUMDes Gajah Mada members in utilizing and processing herbal resources to produce ready-to-drink teak leaf tea products. The training involved 20 participants, comprising BUMDes members and local community representatives, engaged in herbal product development. To evaluate the effectiveness of the training, participants' knowledge levels were assessed using pre-test and post-test questionnaires.

The results showed a substantial increase in participants' understanding after the training activities. The average knowledge score increased from 24.3 ± 13.8 (pre-test) to 97.2 ± 3.73 (post-test) on a scale with a maximum possible score of 100.0. A paired t-test indicated that the increase in knowledge scores was statistically significant ($p < 0.05$). These results demonstrate that the training program effectively improved participants' knowledge and understanding of herbal processing techniques, particularly in the production of ready-to-drink teak leaf tea (**Figure 5**).

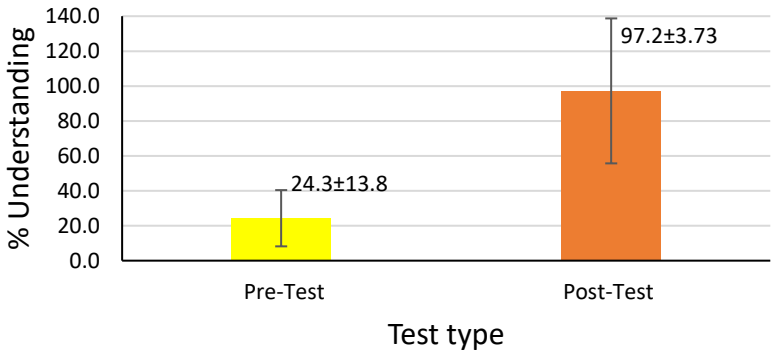

Figure 5. Percentage of understanding in pre-test and post-test (Maximum score = 100.0). The results are expressed as average ± standard deviation.

The session was continued with technical training on primary packaging for ready-to-drink teak leaf tea (**Figure 6**).

Figure 6. Technical training on primary packaging for ready-to-drink teak leaf tea.

The implementation of the Community Partnership Empowerment Program in Kebontunggul Village successfully demonstrated the effectiveness of integrated capacity-building activities in improving both the production and management capabilities of BUMDes Gajah Mada. The training involved 20 participants, comprising BUMDes members and local community representatives, who developed herbal products. The results revealed a significant improvement in participants' understanding and practical skills related to herbal product development, particularly in the formulation, processing, and packaging of ready-to-drink teak leaf tea.

Based on the pre-test and post-test questionnaire results, the average knowledge score increased substantially from 24.3 ± 13.8% (pre-test) to 97.2 ± 3.73% (post-test) on a scale with a maximum score of 100. A paired t-test showed that this increase was statistically significant ($p < 0.05$). The sharp improvement in participants' scores (Figure 5) indicates that the training modules, which combined theoretical explanations with hands-on practical sessions (Figure 6), were effective in

strengthening participants' comprehension and technical proficiency in producing ready-to-drink teak leaf tea products.

The introduction of technology and innovation, particularly the use of a primary packaging machine for aluminum cans, provided participants with practical experience in operating modern processing equipment. This technological intervention contributed to improvements in product packaging quality, hygiene standards, and production efficiency. After implementing the technology, BUMDes members were able to package ready-to-drink teak leaf tea more efficiently than in the previous manual process.

Based on observations during program implementation, the aluminum can sealing machine enabled participants to package approximately 150–200 cans per hour, representing a considerable improvement in packaging productivity. In addition, the sealing technology ensured more consistent packaging quality and improved product safety by minimizing contamination during packaging. These results indicate that adopting appropriate processing technology can significantly enhance the operational capacity of village-based enterprises.

The findings support previous community empowerment studies, highlighting that integrating technology adoption and technical skill development is important for strengthening the productivity and competitiveness of local economic institutions.

From a management perspective, the training on raw material stock control and inventory management helped establish a more systematic, traceable production process at BUMDes Gajah Mada. As part of the program implementation, a simple inventory recording system was introduced, consisting of a manual logbook and a spreadsheet-based stock monitoring sheet to record the availability of raw materials, production output, and product distribution. In addition, participants were guided in developing basic Standard Operating Procedures (SOPs) for raw material storage, stock recording, and product inventory management.

The implementation of these tools enabled BUMDes members to monitor the flow of raw materials and finished products more accurately, thereby reducing the risk of raw material shortages and minimizing production inefficiencies. The adoption of a structured inventory system also improved transparency and traceability in the production process, ensuring more consistent product availability. This improvement represents an important step toward the professionalization of BUMDes operational management and supports the long-term sustainability of its village-based business model.

Furthermore, the development of a new product variant, namely ready-to-drink teak leaf tea, represents an important innovation that aligns with Kebontunggul Village's vision of becoming a center for herbal-based products. Product diversification through the utilization of locally available herbal resources can significantly increase the economic value of agricultural by-products while strengthening rural economic resilience. Previous studies have shown that the development of functional herbal beverages derived from natural plant materials can provide added value and create new opportunities for small-scale community enterprises (Sutanto et al., 2024; Kok et al., 2024).

In addition, the growing global demand for natural, plant-based, and functional beverages has encouraged the development of ready-to-drink herbal products as healthier alternatives to conventional beverages (Granato et al., 2020); (Corbo et al., 2014). The diversification of herbal products, therefore, not only improves the economic utilization of local resources but also enhances the competitiveness of BUMDes products in broader herbal markets. With increasing consumer awareness of health, sustainability, and eco-friendly products, ready-to-drink herbal beverages such as teak leaf tea have promising market potential as functional drinks that combine convenience with natural health benefits.

The monitoring and sustainability stages of the program play an important role in ensuring that the knowledge, skills, and technologies introduced during the activities continue to be applied independently by the community. This stage was implemented through continuous mentoring, including online communication and periodic on-site evaluations, which enabled the program team to monitor progress and provide additional technical guidance when needed. From a conceptual perspective, this approach reflects a participatory empowerment model, in which community members are actively involved in the learning process and gradually develop the capacity to manage production activities independently. Such participatory engagement strengthens participants' sense of ownership and responsibility toward the program outcomes.

In addition, the sustainability strategy supports the strengthening of community-based enterprises, particularly through the institutional role of BUMDes Gajah Mada in managing and commercializing herbal products developed during the program. By integrating capacity building, technology adoption, and institutional strengthening, the program contributes to the long-term sustainability of village-based economic activities. Previous studies on community empowerment emphasize that sustainable local economic development can be achieved when community members are actively

involved in decision-making processes and when local institutions are strengthened to manage productive economic activities independently (Zimmerman, 2000); (Perkins & Zimmerman, 1995). Therefore, continuous monitoring and participatory engagement are essential to ensuring that the program's empowerment outcomes remain sustainable over time.

Overall, the implementation of the Community Partnership Empowerment Program has proven effective in addressing several key challenges previously faced by BUMDes Gajah Mada, including limited technical knowledge, inadequate production technology, and weak management capacity. The program adopted a holistic approach, integrating education, technological innovation, and management training, which collectively contributed to measurable improvements in participants' empowerment levels. The improvement in technical skills, supported by the adoption of packaging technology and structured inventory management, enabled BUMDes members to produce herbal products more efficiently and systematically. These findings highlight the importance of community-based participatory empowerment programs as an effective strategy for strengthening local economic enterprises, particularly in rural areas with valuable natural resources, such as medicinal plants.

One of the key outcomes of the program is the development of a ready-to-drink teak leaf tea product, which represents a value-added innovation derived from locally available herbal resources. Transforming teak leaves into a functional beverage significantly increases the economic value of the raw material. Based on online marketplace price data in 2025, several production components have measurable market values, including red seaweed powder at approximately IDR 89,500 per kg, dried teak leaves at approximately IDR 150,000 per kg, palm sugar at approximately IDR 33,000–35,000 per kg, cinnamon at approximately IDR 39,900–42,000 per kg, and empty aluminium cans at approximately IDR 3,800–4,000 per unit. Although these raw materials individually have relatively modest market prices, their processing into a functional, ready-to-drink herbal beverage substantially increases their economic value. Through this value-added process, a 250 mL canned teak leaf tea product can be marketed at approximately IDR 9,000 per unit, demonstrating the potential profitability of developing local herbal products.

From a production perspective, BUMDes Gajah Mada currently targets a production capacity of approximately 5,000 cans per week, corresponding to 1,000 cans per day over five working days. This production capacity yields an estimated output of 20,000 cans per month, or 240,000 per year. Assuming a selling price of IDR

9,000 per unit, the estimated annual gross revenue reaches approximately IDR 2,160,000,000.

Based on the calculated production cost components—including raw materials, packaging, labor, and operational costs—the estimated annual production cost is approximately IDR 1,778,897,000. Consequently, the projected annual net profit is approximately IDR 381,103,000, equivalent to about IDR 31,758,583 per month, with an estimated net profit margin of approximately 17.6%. These results indicate that the ready-to-drink teak leaf tea business is economically feasible and has the potential to generate sustainable income for the community through BUMDes-based enterprise development.

In addition to the economic benefits, the program strengthens BUMDes' managerial capacity by implementing stock recording systems, production planning, and standardized processing practices. Such improvements are essential for ensuring business sustainability and maintaining product consistency in the market. The integration of capacity building, technology adoption, and institutional strengthening, therefore, plays a crucial role in transforming village-based herbal resources into competitive commercial products.

In the future, further efforts are required to expand market access and strengthen product branding in order to increase the competitiveness of the ready-to-drink teak leaf tea product in regional and national herbal beverage markets. Continuous product development, quality control improvement, and marketing strategies will be essential to ensure the long-term sustainability of the BUMDes-based herbal business and to maximize its contribution to local economic development in Kebontunggul Village.

The analysis of the increased empowerment level in two activity aspects is as follows:

1. Production Aspect

A new variant of a processed herbal product was developed: a ready-to-drink teak leaf tea.

Figure 7. Ready-to-drink teak leaf tea

2. Management Aspect

The establishment of a stock management system for raw materials.

Figure 8. Stocks of teak leaf powder

Consequently, production capacity can be doubled while production time is reduced by 25%. In the future, it is planned to market additional ready-to-drink tea products in aluminum cans, displayed in a cold showcase, for their health benefits.

4. CONCLUSION

The Community Partnership Empowerment (PKM) program implemented in Kebontunggul Village has demonstrated significant progress in strengthening the production and management capacity of BUMDes Gajah Mada in developing herbal-based economic activities. Through a series of integrated activities, including training, technology implementation, and management capacity-building, the program successfully improved participants' knowledge and technical skills in processing herbal resources into value-added products. The results of the training evaluation showed a substantial increase in participants' knowledge scores, from 24.3 ± 13.8% before the training to 97.2 ± 3.73% after, indicating the effectiveness of the program's capacity-building approach.

The introduction of packaging technology and inventory management systems has also improved production efficiency and operational organization within BUMDes. As a result, BUMDes Gajah Mada has initiated production of ready-to-drink teak leaf tea, targeting approximately 5,000 cans per week and an estimated annual output of 240,000 cans. The economic feasibility analysis further indicates that the product has promising market potential, with an estimated annual net profit of

approximately IDR 381,103,000, demonstrating the potential of value-added herbal product development to increase the economic value of local resources.

Despite these positive outcomes, further efforts are required to strengthen business legality, expand marketing networks, and improve product branding to enhance market competitiveness and ensure long-term business sustainability. Continuous mentoring and institutional strengthening of BUMDes are therefore essential to support the development of herbal-based village enterprises.

These findings highlight the effectiveness of participatory community empowerment models in transforming local natural resources into sustainable rural economic enterprises.

Acknowledgement

We acknowledge Direktorat Penelitian dan Pengabdian kepada Masyarakat (DPPM), Direktorat Jenderal Riset dan Pengembangan (Ditjen Risbang), Kementerian Pendidikan Tinggi, Sains, dan Teknologi (Kemdiktisaintek) for the financial support of this program.

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