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Development of Sustainable Industrial Economic Growth on the Potential of Rhizome Plants for the Aromatherapy Industry: A Study of Empirical, Scientific and Halal Aspects

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A B S T R A C T

The development of rhizome plants as raw materials for traditional medicine in South Sulawesi has not been widely developed, compared to other regions such as Java. In South Sulawesi, lemongrass, jeringau, betel, and ginger plants have not been managed professionally, especially when associated with the Petik Olah Jual (PELAJU) concept. This study aims to examine and determine the development of the industrial economy through cultivation and picking and selling of rhizome plants (Jeringau, Lemongrass, and Betel) as raw materials for traditional medicine / aromatherapy production at the farm level and also to analyze the application of the Petik Olah Jual concept to the potential of the green economy in processing rhizome plant extracts as raw materials for traditional medicines in the Makassar, Gowa, Maros and Takalar (Mamminasata) region. Conclusion: the mapping of rhizome plants in South Sulawesi and efforts to empower the Industrial economy and the welfare and skills of rhizome farmers to process into halal-based traditional medicine products are quite prospective. Economic development of the rhizome plant industry as a raw material for traditional medicine production at the farm level is used as a raw material for traditional medicine, can increase farmers' income

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INTRODUCTION

Green economy is an economic ideal that aims to improve the welfare and social equality of society, while significantly reducing the risk of environmental damage. In another sense, a green economy is an economy that does not produce carbon emissions to the environment, saves natural resources and has social justice. Green economy indicators can be examined from three aspects, namely sustainable agriculture, natural resource conservation, and renewable energy. In order to realize the three green economy indicators, the Indonesian government has made progressive efforts in planning the Low Carbon Development Initiative (LCDI) since the initiative was initiated at UNFCC COP 23. The LCDI initiative aims to explicitly incorporate environmental considerations, such as greenhouse gas reduction targets and carrying capacity into the national development planning framework. Indonesia's Green Economy Learning Assessment (GELA). As a follow-up to the development of the study, the Indonesian government allocated a budget through the Matching Fund which aims to develop a training program on green economy, especially in the framework of the implementation of Low Carbon Development (LDC) that is comprehensive and can be implemented nationally, so one of the themes to be studied in this research is: Green Economy Development through Cultivation and Pick and Sell of Rhizome Plants: Lemongrass, Jeringau, Ginger and Betel for Traditional Medicine Production in South Sulawesi. The development of rhizome plants as raw materials for traditional medicine in South Sulawesi has not been widely developed, compared to other regions such as Java. In fact, the economic potential of rhizome plants in South Sulawesi has a great opportunity to support national economic growth, especially the green economy. In the South Sulawesi region, lemongrass, jeringau, betel and ginger plants have not been managed professionally, especially when associated with the concept of Petik Olah Jual (PELAJU). Petik olah jual (pick up spelling) was once the idea of the former Governor of South Sulawesi, Prof. Ahmad Amiruddin, where as far as possible after picking crops, agricultural products must be processed before being sold. For example, fermentation to produce jeringau, betel leaf and citronella extracts is still very rare in South Sulawesi, even though the market demand is very large. This research activity is expected to contribute to human resource capacity building programs in order to promote more inclusive and sustainable economic development in Indonesia.

Problem Formulation

There is no pattern of industrial and green economic development through standardized cultivation and pick up spelling (pick and sell) of rhizome plants: Jeringau, Lemongrass, ginger and Betel for traditional medicine raw materials; There is no application of the pick up spelling concept to the economic potential of the Industry and the green economy in processing extracts of Jeringau, Lemongrass, ginger and Betel rhizome plants in South Sulawesi. Objectives, to examine and determine the pattern of industrial and green economic development through cultivation and pick up spelling of rhizome plants (jeringau, lemongrass, and betel) as raw materials for traditional medicine production at the farm level and to analyze the application of the concept of pick up spelling to the economic potential of the industry and green economy in

processing rhizome plant extracts as raw materials for traditional medicine in the Makassar, Gowa, Maros and Takalar (Mamminasata) region. Benefits of Research. expected to be useful for the development of science and khazanah in the academic field in particular, as well as for policy makers and society in general; Provide motivation and practical knowledge to farmers in order to develop cultivation and processing of Jeringau, Lemongrass, and Betel plant extracts before being sold to the market. Become a reference for rhizome farmers and UMOT business actors in producing traditional medicines in South Sulawesi.

Feasibility Study

The study is usually reviewed from a number of aspects such as Technical and Operational Aspects, where Rhizome plant farmers will rise up and have the potential to utilize rhizome plant cultivation into something of high value by processing the plant so that the potential of the Rhizome plant is very significant, Management Aspects; the need for rhizome plants to be introduced is more valuable than just utilizing what it is, so that with good and efficient processing it will generate greater income from rhizome plant farmers to be more professional in terms of management and Financial Aspects; very potential to be managed to increase the income and welfare of the surrounding community.

LITERATURE REVIEW

Rhizome plants are plants that can be developed for low-carbon development, but in this effort the community does not know how to develop an industrial economy and green economy through cultivation and picking and selling rhizome plants: such as Lemongrass, Jeringau, and Betel to be produced into traditional medicines. That to develop rhizome plants as raw materials for traditional medicine in South Sulawesi has not been widely developed, compared to other regions such as in Java. Whereas the economic potential of rhizome plants in South Sulawesi has great opportunities in supporting national economic growth, especially the green economy.

Figure 1. Rhizome Plants as Raw Materials for Traditional Medicine

In South Sulawesi, lemongrass, jeringau, betel nut and ginger have not been managed professionally, especially when associated with the concept of Petik Olah Jual (PELAJU). Petik olah jual (pick up spelling) was once the idea of the former Governor of South Sulawesi, Prof. Ahmad Amiruddin, where as far as possible after picking crops, agricultural products must be processed before

being sold. This research activity is expected to contribute to human resource capacity building programs in order to promote more inclusive and sustainable economic development in Indonesia. The innovation solution offered in the processing of rhizome plants is the growth of new awareness for farmers that the prospects for the cultivation of Jeringau, Lemongrass and Betel are not directly sold, but must be processed first (pick up selling), which in the concept of the South Sulawesi government 30 years ago, was known as the concept of picking and selling (Pelaju). The existence of new understanding and skills for South Sulawesi farmers to improve their standard of living through Training Extract (distillation) of Jeingau, Lemongrass and Betel nut oil has medium and long-term alternative economic potential. Encouraging traditional medicine micro-entrepreneurs in South Sulawesi to continue to utilize the oil extract potential of the three plants for the traditional medicine industry. Promoting a green economy ethos through the development of the traditional medicine industry as one of the most important industries in South Sulawesi. Our ancestors used to know rhizome plants or known as empon-empon or spices that are commonly used as food flavoring. With the awareness of the principle of living back to nature, now empon-empon from rhizome plants is again a mainstay in life not only as a food flavoring ingredient but is used as herbal medicine or traditional ingredients / herbal medicine. The use of traditional medicine derived from rhizome plants is not only used for those who live in rural areas, but now it has begun to be in demand by urban communities. This is evidenced by the number of urban people who consume traditional medicine in the form of instant herbs ranging from ginger, kencur, temulawak and others from various types of rhizomes. Even though they know that the use of traditional medicine, the healing period is relatively slow, but it is certain and does not damage or has no side effects drastically. Rhizome plants are widely spread in various places in South Sulawesi, so it is necessary to make a mapping to find out the distribution that will be used as a center for the development of rhizome plants.

Farmer Interest and Potential

The use of traditional medicine, the healing period is relatively slow, but certain and does not damage or does not have drastic side effects.

Prospects for Rhizome Crops

The development that began to appear in the farmer groups was the growth of enthusiasm and new awareness for farmers that the prospects of the cultivation of Jeringau, Lemongrass and Betel are not directly sold, but must be processed first (pick up selling), which in the concept of the South Sulawesi government 20 years ago, was known as the concept of picking and selling (Pelaju). There is new knowledge for rhizome farmers in South Sulawesi, that the oil extracts of jeringau (kariango: Bugis-Makassar), lemongrass and betel have sustainable economic potential for traditional medicine raw materials, then there is a new understanding and skills for South Sulawesi farmers to improve their livelihoods through Training Extract (refining) Jeingau, Lemongrass and Betel oil has medium and long-term alternative economic potential, as well as the growth of green economic activity through the development of the traditional medicine industry as an alternative medicine for Indonesia's original wealth and culture.

Figure 2. Medicinal Raw Materials from Rhizome Plants

There are several stages of programs that have been, are being and will be carried out: First, programs that have been carried out include: observations and trials of distillation of jeringau root oil, citronella stems, and betel leaves (2019-2020). Second, programs that are being/will be implemented (2021-2022), including research on green economy development patterns through mass cultivation by rhizome farmers, conducting surveys and mapping of rhizome plant development areas in several districts in South Sulawesi. FGDs on the economic potential in the development of rhizome plant cultivation that has not been carried out in South Sulawesi. Survey on the potential of raw materials for making therapeutic oils and traditional medicines based on Halal raw materials. Third, a sustainable program (2023-2025): is the development and downstreaming in the form of pickup selling in the form of picking processing / refining and making traditional medicines (UMOT) and product marketing. Manufacture of traditional medicine products and therapeutic oils, marketing training for therapeutic oil products and traditional medicines based on halal.

METHODOLOGY

Methods of Data Collection and Processing. For the completeness of systematic data in this research, it is necessary to collect data, among others, through the Observation method or commonly called observation, including activities of focusing attention on an object using all sensory organs (Suharsimin Arikunto, 2006). So, in this study, it is data collection by observing and using direct communication with information sources (informants), namely rhizome plant farmers and traditional medicine business actors in the Mamminasata area, South Sulawesi. Interviews, In this case the team conducted questions and answers or conversations with informants (farmers, traditional medicine business actors) to obtain data, either by using a list of questions or open conversations related to previously formulated problems. Documentation, In this case, the research team took several steps to obtain data, namely: a) Primary data, collected through the interview method or direct interview to the object of research, namely rhizome farmers and traditional medicine micro businesses in South Sulawesi province; Secondary data, which is directly related to research problems, such as scientific journals, scientific writings, discussions, branchtorming, dissertations, theses, books, scientific speeches, and those related to research material.

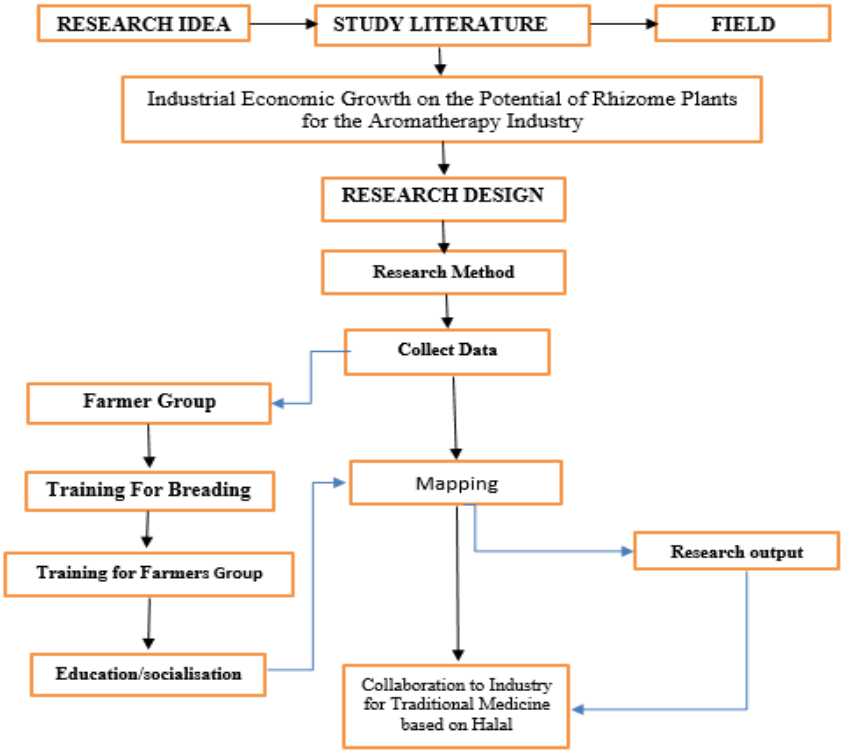

Figure 3. Flow Chart of the Research

Working Procedure

The implementation of this research was carried out in stages: 1), starting with the search and mapping of rhizome plant farmers; 2) mapping traditional medicine micro-enterprises; 3) organizing training for rhizome plant farmers and UMOT actors on distillation procedures to produce jeringau, lemongrass, betel and ginger oil extracts; and 4) establishing cooperation/partnership with Traditional Medicine Micro-enterprises (UMOT) for the development of the traditional medicine industry (pick up selling).

Flowchart of Faculty Excellence Research

Data Analysis, To manage the data in this study, a qualitative descriptive analysis technique was carried out, namely trying to describe the data obtained from the results of the study by means of analysis: Inductive, which is a way of analyzing data that starts from a specific discussion and then draws a general conclusion. Deductive, which is to analyze data starting from a general discussion and then draw a specific conclusion. Menganut model pengumpulan data yang dianjurkan Miles dan Huberman, yaitu: a) pengumpulan data (data collection), b) reduksi data (data reduction), c) penyajian data (data display). The purpose of data reduction in this study is to select and sort and detail, while data disaplay is intended here, which is done in the form of descriptions or narratives based on informants' narrative associated with the cultivation and pick up selling of rhizome plants (jeringau, lemongrass, betel, and ginger). To manage the data in this study, a qualitative descriptive analysis technique was carried out, namely trying to describe the data obtained from the results of the study by analyzing: 1. Inductive is a way of analyzing data that starts from a specific discussion and then takes a general conclusion. 2. Deductive, namely analyzing data starting from a general discussion and then drawing a specific conclusion. This research

is a development research from previous studies in order to develop a green economy (green economy) to support the achievement of MDG's (Millennium Development Goals) standards, conducted in South Sulawesi by selecting sample locations in the Makassar City area, Bone Regency, Kab. Gowa and Takalar Regency. This research took an area sample and an informant sample. The area sample was taken by purposive sampling with the consideration that the area concerned was closely related to the research theme. Then the informant sample was taken randomly (random sampling) with the consideration that the number was very large, so it had to be sampled as a representation of the entire population.

RESULTS AND DISCUSSION

Farmers' Interest and Distribution of Rhizome Plants in Mamminasata Area with the following reasons: Economic Value: Rhizome plants have significant economic value. Some rhizomes, such as ginger and turmeric, have high demand in local and international markets. This encourages farmers to plant rhizome crops because they can provide a good income. Consumer Demand: Products that use rhizome plants, whether as cooking ingredients, spices, or traditional medicine ingredients, have a stable and growing demand. Farmers' interest in rhizome crops is influenced by high consumer demand, so they see opportunities to produce products desired by the market. Hardiness and Environmental Suitability: Rhizome plants tend to grow well in a wide range of soil types and climates. Some rhizomes, such as ginger, turmeric and galangal, can grow well in areas with high rainfall such as South Sulawesi. The ability of rhizomes to grow well in diverse environments makes farmers interested in growing them. Role in Sustainable Agriculture: Rhizome plants are often considered as environmentally friendly crops. They can help improve soil fertility, prevent soil erosion, and reduce the use of pesticides. Farmers' interest in rhizome crops can also be linked to the principles of sustainable agriculture and concern for the environment. Value-added Potential: Rhizome crops have high value-added potential. Apart from being used as ingredients in cooking and traditional medicines, rhizome plants can also be processed into various products such as beverages, cosmetics, and health supplements. Farmers' interest in rhizome crops is linked to the potential to produce value-added products that can increase their income. However, it is important to note that farmers' interest in rhizome crops may vary depending on local factors, such as access to markets, seed availability, cultivation technology, and support from the government or local agricultural institutions.

The Role of a Rhizome Crop Farmer Group

A rhizome crop farmer group is a group of farmers who join forces to collectively develop, produce, and market rhizome crops. They work together in various agricultural-related activities, such as planting, maintaining, harvesting, processing, and marketing rhizome plants. The main objectives of rhizome farmer groups are to increase production yields, obtain better economic benefits, and support each other in agricultural activities.

The following are some of the characteristics and benefits of rhizome farmer groups:

1. **Collaboration and Knowledge Exchange**: In rhizome farmer groups, farmers can share experiences, knowledge, and best practices in growing rhizome crops. They can learn from each other about effective cultivation techniques, pest and disease management, and successful marketing strategies.
2. **Greater Economies of Scale**: By joining a group, farmers can achieve greater economies of scale. They can make joint purchases of seeds, fertilizers, and other materials, thereby obtaining better prices. In addition, farmer groups can carry out processing and marketing collectively, increasing the efficiency and competitiveness of their products.
3. ***Akses ke Sumber Daya dan Pembiayaan***: Kelompok tani tanaman rimpang dapat memberikan akses yang lebih baik ke sumber daya pertanian, seperti peralatan, irigasi, dan teknologi. Selain itu, mereka juga dapat mencari dukungan pembiayaan yang lebih mudah dengan bekerja sama dengan lembaga keuangan atau lembaga pertanian setempat.
4. **Joint Pest and Disease Management**: In farmer groups, farmers can work together to address pest and disease problems that may threaten rhizome crops. By sharing experiences and adopting appropriate control methods, they can reduce losses and improve production quality.
5. **More Effective Marketing**: Rhizome farmer groups can undertake marketing activities collectively. This can involve joint brand development, price negotiation with buyers, access to a wider market, and development of effective distribution channels. As such, they can earn higher profits and increase the competitiveness of their products.
6. **Social Strengthening and Political Influence**: Through farmer groups, farmers can have a stronger voice in social and political matters. They can fight for common interests, gain access to government programs, and participate in decision-making that affects their lives and livelihoods.

Some of the common rhizome plants found in this region include:

1. **Ginger (Zingiber Officinale)**: Ginger is a fairly common rhizome crop in this area. It is usually grown by local farmers and used as an ingredient in traditional cooking and traditional medicines.
2. **Turmeric (Curcuma Longa)**: Turmeric is also a known rhizome plant in the Mamminasata area. Turmeric rhizomes are used in traditional dishes, such as curry dishes, and have a variety of health benefits.
3. **Galangal (Alpinia Galanga)**: Galangal, also known as laos, is a rhizome plant that is often used in traditional dishes in the area. Galangal lends a distinctive aroma and flavor to local dishes.
4. **Temulawak (Curcuma Xanthorrhiza)**: Temulawak plants can also be found in the Mamminasata area. Temulawak rhizomes are used in traditional medicine and are known to have certain health benefits.
5. **Kencur (Kaempferia Galanga)**: Kencur is another rhizome plant commonly found in the area. Kencur rhizomes are used in traditional cooking and traditional medicines.
6. **Lempuyang Wangi (Curcuma Zerumbet)**
7. **Lemongrass (Cymbophogun Nordus)**

However, keep in mind that the distribution and availability of rhizome plants in a particular area can be influenced by various factors, including climate, soil conditions, and local cultural preferences. For more specific information on the distribution of rhizome plants in Mamminasata, it is recommended to contact local agricultural authorities, farmer groups, or other local sources of information. Number and potential of rhizome plants in Mamminasata

The number and potential of rhizome plants in the Makassar, Maros, Gowa, and Takalar areas are large enough for cultivation and production of rhizome plants based on local climatic and environmental conditions. South Sulawesi generally has a tropical climate with high rainfall and relatively warm temperatures throughout the year. Some of the rhizome crops mentioned earlier, such as ginger, turmeric, galangal, temulawak, and kencur, grow well in such a climate.

As an agricultural region, Makassar, Maros, Gowa and Takalar have the potential to develop rhizome crop cultivation. Fertile soil and suitable climatic conditions support the growth of rhizome plants well. In addition, rhizome plants also have high economic and culinary value, thus providing opportunities for local farmers and producers. For more accurate and up-to-date information on the number of rhizome crops developed and their cultivation potential in these areas, it is recommended to contact local agricultural agencies, agricultural research institutes, or farmer groups operating in the region. They will be able to provide more detailed and up-to-date information on rhizome crop potential in the Makassar, Maros, Gowa, and Takalar areas.

Industrial Economic Development and Potential of Rhizomes

Industrial economics refers to the study of the production, distribution and consumption of goods and services in an industrial context. The focus is on economic activities related to processing, manufacturing and mass production of goods. In general, industrial economics involves analyzing how production processes are carried out, how markets are organized, and the role and impact of industry on the economy as a whole.

The scope of industrial economics includes several important aspects:

1. **Production**: Industrial economics analyzes the production process in industry, including technology, production methods, efficiency, and productivity. It involves the study of how goods are produced in large quantities and how firms manage their resources to produce optimal output.
2. **Industry Structure**: The study of industrial economics involves the analysis of industry structure, such as the number of firms, market type (monopoly, oligopoly, perfect competition, etc.), and barriers to entry into a particular industry. These factors can affect the behavior of firms and markets, and their impact on efficiency and economic welfare.
3. **Markets and Competition**: Industrial economics involves the analysis of how markets are organized and how competition occurs within industries. The study covers firms' competitive strategies, market forces, regulation, and their implications for industry sustainability and consumer welfare.
4. **Innovation and Technology**: The aspect of innovation and technology is also important in industrial economics. This study involves research on how

innovation and technological advancements affect the industry, including production efficiency, product quality improvement, and the development of new products that can increase the competitiveness of the industry.

5. **Employment and Economic Welfare**: Industrial economics also pays attention to labor issues in industry, including analysis of wage levels, working conditions, and income distribution. In addition, it also involves research on the industry's impact on economic growth, community welfare, and environmental impact.

Overall, industrial economics covers various aspects related to production, market structure, competition, innovation, employment, and economic welfare in an industrial context. This discipline helps understand and analyze the role and impact of industry on the economy as a whole. In the event you're looking for the most effective way to get the most out of your home, then you've come to the right place. Includes nursery and seeding activities of medicinal plants or rhizome biopharmaceuticals. Utilization of Rhizome plants for the traditional medicine industry Rhizome plants have been used as key raw materials in traditional medicine for thousands of years in various cultures around the world. They contain active compounds that have various pharmacological properties, including anti-inflammatory, antimicrobial, antioxidant, and analgesic.

Analysis of rhizome plants as the main raw material for traditional medicine / aromatherapy:

1. **Diversity of Rhizome Plants**: Rhizome plants have a wide diversity, including ginger, turmeric, galangal, temulawak, kencur, and many more. Each plant has a unique chemical profile and contains different active compounds. For example, ginger contains gingerol and shogaol, turmeric contains curcumin, and galangal contains the substance alpinin. This diversity allows the use of various rhizome plants in traditional medicine.
2. **Pharmacological Properties**: Rhizome plants have long been used in traditional medicine for their properties. They have various pharmacological properties that are beneficial to human health. Some rhizome plants, such as ginger and turmeric, have anti-inflammatory properties that can help relieve inflammation in the body. Rhizome plants also have antimicrobial properties that help fight infections and antioxidant properties that protect cells from oxidative damage.
3. **Use in Traditional Medicine**: Rhizome plants have been used extensively in traditional medicine to treat various health conditions. For example, ginger is often used to relieve nausea, vomiting, and indigestion. Turmeric is used to reduce inflammation, strengthen the immune system, and help with digestive issues. Curcuma longa is used as a digestive tonic and to help with liver problems. Galangal is used to treat indigestion and increase appetite.

Table 1. Ginger Production of South Sulawesi Province (Kg)

District/City	Production (kg)		
	2018	2019	2020
Kepulauan Selayar	607	826	728
Bulukumba	58.112	9.112	77.187
Bantaeng	2.090	4.179	3.809
Jeneponto	0	0	75.776
Takalar	0	0	22
Gowa	171.287	110.937	219.573
Sinjai	648	448	400
Maros	2.855.542	9.710.280	3.215.793
Pangkep	150.845	89.214	106.867
Barru	40.252	90	28
Bone	6.002.183	2.723.819	3.297.484
Soppeng	23.124	13.559	14.272
Wajo	1.491	3.497	3.155
Sidrap	2.600	2.397	2.241
Pinrang	1.051	1.309	1.296
Enrekang	1.091.965	684.030	1.095.931
Luwu	20.420	10.296	7.303
Tana Toraja	30.069	30.035	129.866
Luwu Utara	3.620	19.674	20.686
Luwu Timur	1.681	1.458	2.058
Toraja Utara	31.463	58.185	166.892
Makassar	534	465	2.295
Pare Pare	0	0	0
Palopo	0	0	0
SULAWESI SELATAN	10.489.584	13.473.810	8.443.663

Source: BPS (2022) Agriculture Office through Horticultural Agriculture Survey

4. **Scientific Research Support:** The benefits of rhizome plants in traditional medicine are also supported by scientific research. Several studies have shown that the active compounds in rhizome plants have significant pharmacological effects. For example, curcumin in turmeric has been intensively studied and has anti-inflammatory, anticancer, and neuroprotective effects. Research has also shown that compounds in ginger, galangal, and other rhizome plants have potential for the treatment of various health conditions.
5. **Potential as a Source of Modern Medicine:** Rhizome plants are also a focus of research in the development of modern medicine. Active compounds in rhizome plants have been used as the basis for the development of more effective conventional medicines. For example, the compound curcumin from turmeric has been used in drugs used in the treatment of cancer, inflammation, and neurodegenerative disorders.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Economic development The rhizome plant industry as a raw material for traditional medicine production at the farm level is used as a raw material for traditional medicine, which can increase farmers' income. This plant has high economic value because it is in great demand by the traditional medicine industry, so it can be a stable source of income for farmers who will be able to empower local communities, especially small farmers.
2. The application of the Petik Olah Jual concept to the economic potential of the Industry in the processing of rhizome plant extracts as raw materials for traditional medicines in the Mamminasata region is a sustainable rhizome plant cultivation program with organic methods to ensure high quality raw materials.
3. Modern processing of traditional medicine ensures clean, safe, and halal processing and meets traditional medicine production standards. And of course involving local farmers and workers in the processing process to increase community involvement and distribution of economic benefits, forming partnerships with distribution and marketing companies to ensure rhizome plant extract products are accessible in local, national, and even international markets by promoting on social media, local story-based promotions, and branding that highlights its uniqueness.

Recomendation

Synergy in Development is needed in building partnerships between local governments, industries, farmers, and research institutions to create a conducive business environment. Design support policies that encourage the growth of the traditional medicine economic sector in the region. Innovation-based Product Development: Diversification and Added Value by encouraging the development of new innovative rhizome-based products, both in the form of medicines and other health products.

FURTHER STUDY

This research still has related limitations, so it is necessary to carry out further research on the topic of Development of Sustainable Industrial Economic Growth on the Potential of Rhizome Plants for the Aromatherapy Industry: Study of Empirical, Scientific and Halal Aspects in order to perfect this research and increase insight for readers.

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