From Kitchen To Agriculture – Transforming The Wealth of Natural in Egg Shells Into Organic Fertilizer

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Abstract
Eggshells are a common type of kitchen waste that are often left unused, despite their high calcium content. Calcium plays a vital role in supporting plant growth, particularly in the agricultural sector. Based on this potential, the present study aims to investigate the use of eggshells as the primary ingredient in the production of nutrient-rich, organic fertilizer. Organic fertilizer made from eggshells provides an environmentally friendly alternative to meet the nutritional needs of food crops, particularly amid the growing demand for organic fertilizers. This research adopts a qualitative approach, with data collected through interviews with MSME (Micro, Small, and Medium Enterprises) plant sellers in Jakarta to understand their needs and the potential for using organic fertilizers. The production process involves relatively simple steps but requires a lengthy fermentation period. The findings indicate that eggshells can be transformed into effective organic fertilizer with high practical value for the agricultural sector. This study is expected to provide an innovative solution to address the demand for organic fertilizers while simultaneously reducing unprocessed household waste, thereby contributing to the reduction of domestic waste in Indonesia.

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Abstrak
Kulit telur merupakan jenis limbah dapur umum yang seringkali tidak dimanfaatkan, meskipun kandungan kalsiumnya tinggi. Kalsium memainkan peran penting dalam mendukung pertumbuhan tanaman, terutama di sektor pertanian. Berdasarkan potensi ini, penelitian ini bertujuan untuk menyelidiki penggunaan kulit telur sebagai bahan utama dalam produksi pupuk organik yang kaya nutrisi. Pupuk organik yang terbuat dari kulit telur memberikan alternatif ramah lingkungan untuk memenuhi kebutuhan nutrisi tanaman pangan, terutama di tengah meningkatnya permintaan akan pupuk organik. Penelitian ini mengadopsi pendekatan kualitatif, dengan data dikumpulkan melalui wawancara dengan penjual tanaman UMKM (Usaha Mikro, Kecil, dan Menengah) di Jakarta untuk memahami kebutuhan mereka dan potensi penggunaan pupuk organik. Proses produksi melibatkan langkah-langkah yang relatif sederhana tetapi membutuhkan periode fermentasi yang lama. Temuan menunjukkan bahwa kulit telur dapat diubah menjadi pupuk organik yang efektif dengan nilai praktis yang tinggi bagi sektor pertanian. Penelitian ini diharapkan dapat memberikan solusi inovatif untuk mengatasi permintaan pupuk organik sekaligus mengurangi limbah rumah tangga yang tidak diproses, sehingga berkontribusi pada pengurangan limbah domestik di Indonesia.

I. INTRODUCTION

Currently, organic fertilizers can serve as an alternative to reduce the use of chemical fertilizers that are harmful to the environment. However, the excessive use of chemical fertilizers has negative impacts; in addition to killing pests and insects, chemical fertilizers can also kill animals that aid in the pollination process and earthworms in the soil (Abror, 2023). In the modern era, fertilizer use has become a priority in the agricultural, forestry, and flora sectors. The use of liquid organic fertilizer is an effective alternative in increasing agricultural productivity and maintaining land sustainability (Febrianti, 2024). Currently, organic fertilizers are still dominated by those made from animal manure or food waste such as fruit peels and vegetable scraps. Eggshell waste is one type of food waste that is still massively neglected in large quantities, which instead has a negative impact on the environment, such as a pungent odor and accumulation as dirty and unhygienic waste. On the other hand, the amount of eggshell waste increases significantly every year. This increase is supported by the increasing amount of egg production and egg consumption in Indonesia, and according to data from the Central Statistics Agency (BPS, 2025), egg production in Indonesia in 2024 reached 6,342,705.04 tons.

However, the high egg production in Indonesia is still accompanied by the lack of effectiveness in processing eggshell waste, which has a massive negative effect, considering that discarded and neglected eggshells will cause an unpleasant odor and make the environment uncomfortable, especially if they accumulate in large quantities. With that in mind, EGGcology is now present through research on the nutritional content of eggshells, resulting in an innovation where eggshells, which continuously become waste, can now be processed into nutritious organic fertilizer for plants. The function of using eggshell waste as organic fertilizer is to improve the chemical, physical, and biological properties of the soil (Deswanto, 2024). This innovation enables EGGcology to transform eggshells, which are rich in nutrients such as calcium, which is very beneficial for plant growth. Eggshells contain calcium carbonate and also contain magnesium, sodium, potassium, zinc, manganese, iron, and copper (Maduwu, 2023). Eggshells contain approximately 94% calcium carbonate, along with magnesium and phosphate, making them suitable for organic fertilizer.

"EGGcology" fertilizer is a liquid organic fertilizer made from chicken eggshells and lime, which has good nutritional content for plant cell growth and can help regulate soil pH. The increasing demand for chicken eggs from year to year encourages the creation of this eggshell utilization idea. The majority of Indonesian people only use the egg contents, while the shells are discarded and become organic waste. The excess demand for eggs, which leads to an increase in eggshell waste, also has a negative impact because it means there is an excessive accumulation of organic waste. In addition, these days, farmers prefer to use chemical fertilizers, which do guarantee production results but have a negative impact on the balance of the natural and soil ecosystem, compared to organic fertilizers, which are more natural but whose effects are not as instant as chemical fertilizers. Therefore, EGGcology is here, providing an option in the form of liquid organic fertilizer made from high-calcium natural ingredients that are beneficial for plants and have good long-term effects. EGGcology is also expected to help increase public awareness to maintain the balance of the natural ecosystem by carrying out reuse activities, namely reusing existing organic waste to become something else that is useful. Through EGGcology fertilizer, it is also hoped that the public will better understand that the long-term use of organic fertilizer not only helps reduce organic waste but can also be useful for plants that lack calcium, because by using EGGcology fertilizer, especially plants that lack calcium, can get the nutrients they need.

The use of organic fertilizer based on eggshells also has many benefits for the growth of a plant, such as forming cell walls, helping the growth of plant roots, and increasing nutrient absorption in plants. This is in line with EGGcology's main mission to create nutritious organic fertilizer through quality natural ingredients. EGGcology also has a mission to be a platform for processing eggshell waste, which still dominates without effective handling, and EGGcology also has the same goal and direction as the program run by the government to create food self-sufficiency through the procurement of quality organic fertilizer that can support farmers in the agricultural sector.

In the context of organic fertilizer product development, several previous studies have demonstrated the potential of household waste such as coffee grounds, banana peels, and rice washing water to be processed into effective fertilizers (Mahardika, 2021; Hasibuan et al., 2021). However, research on organic fertilizers based on eggshells is still limited, both in terms of scientific studies and their application in social entrepreneurship models. This is where the research gap lies, which is the main foundation of this study: the absence of an integrated approach between household waste management and community empowerment through the production of organic fertilizer from eggshells.

Therefore, this study proposes an innovative solution through the liquid organic fertilizer product "EGGcology," which is mainly based on eggshells and lime. Not only does it emphasize its agricultural benefits, but EGGcology is also designed as a sustainability-based business model that targets the environmental awareness of urban communities, especially micro-entrepreneurs such as ornamental plant sellers, urban farmers, and housewives. This study uses a mixed-method approach, with data obtained through in-depth interviews with plant MSME actors to assess the level of knowledge, perceptions, and interest in organic fertilizer from eggshells. Through this scientific approach, it is hoped that the research results will be able to answer two things at once: first, offer a solution to the management of kitchen waste that has not been effectively handled; and second, present an alternative organic fertilizer that is nutritious and easily applied by the wider community. Thus, this study contributes to the

development of sustainable agriculture while educating the public about the great potential of household waste that has been neglected so far.

II. METHOD

This study employs a mixed-methods approach to obtain comprehensive results to support marketing strategies and market segmentation. The qualitative method was chosen for in-depth observation and thorough understanding of the phenomena under study. Meanwhile, the quantitative method, based on the philosophy of positivism, is used to analyze numerical data from a specific sample selected randomly, testing the hypotheses that have been formulated (Sugiyono, 2009).

Data collection for the EGGcology research used a mixed-methods approach. The qualitative method was carried out through field observations and direct interviews related to eggshell liquid fertilizer. The quantitative method used questionnaires distributed through g-forms. In qualitative research, the place chosen to conduct interviews was Bunda Mulia University, with sources being students from Bunda Mulia University who have an interest in urban agriculture and environmental sustainability issues. Higher education institutions have an important role in encouraging awareness and innovation in utilizing household waste into something valuable, including the transformation of eggshells into organic fertilizer (Rembulan, 2018). As for quantitative research, data collection was carried out online by distributing questionnaires through social media such as Instagram, WhatsApp, and Telegram. This study successfully captured as many as 120 respondents who were willing to fill out questionnaires about public knowledge, interest, and perceptions of the use of organic fertilizer from eggshell waste. The majority of respondents came from students and housewives, with a dominance of female respondents. In addition to data collection, this study also includes the process of collecting eggshell raw materials from various small food stalls and food vendors around the Mangga Besar area, West Jakarta. The research team directly collaborated with stall owners to collect leftover kitchen eggshells that were still in good and clean condition. This process was carried out routinely for two weeks, focusing on the quality of the eggshells, such as not smelling rotten and not being too fragile, to ensure their effectiveness when processed into organic fertilizer.

This study utilizes a mixed-methods approach to comprehensively assess the potential of EGGcology. A qualitative methodology, involving in-depth interviews with MSME actors in the ornamental plant sector, is employed to investigate their knowledge, perceptions, and interest concerning organic fertilizer derived from eggshells. Concurrently, a quantitative methodology, utilizing questionnaires, is used to gauge the broader public's level of knowledge and interest, and to examine relationships between key variables. This mixed-methods design allows for data triangulation, whereby the insights gleaned from the interviews can be reinforced and broadened by the quantitative data, thereby enhancing the validity and reliability of the research findings.

III. RESULT AND DISCUSSION

A. Result

Business Profile and Business Plan Discussion
Business Name : EGGcology
Type of business : Environmental Friendly Product
Product : Liquid organic fertilizer
Social Media Platform : Instagram @eggcology_id
Marketplace Platform :
Shopee and Tokopedia: Eggcology Official Store
Tiktok: @eggcology_id

Figure 2. Eggcology Logo
Source: Researchers (2025)

The EGGcology logo (Figure 2) is a visual representation of the commitment to sustainability and the utilization of organic waste, especially eggshells, as an ecological solution. The name "EGGcology" itself is a combination of the words "egg" and "ecology," which reflects the mission to transform kitchen waste into environmentally friendly products, such as organic fertilizer. The foliage elements forming the letters in the word "EGG" symbolize life, growth, and natural sustainability, while the illustration of a broken eggshell affirms the transformation of waste into something beneficial for plants. The small twig at the bottom of the logo suggests the close relationship between soil, natural nutrients, and strong root growth,

while the dominance of the color green reinforces the impression of freshness, naturalness, and ecology. Overall, this logo represents the spirit that from the household kitchen, we can start small changes to create greener and more sustainable agriculture.

Based on the application of qualitative and quantitative methods, data obtained from 120 respondents who completed questionnaires regarding the utilization of kitchen waste—specifically eggshells—as organic fertilizer, indicate that the majority of respondents have an interest in environmentally friendly products, with the largest percentage coming from women. This is a positive indication given the significant role of women in household management, including in kitchen waste management. If more households start managing eggshell waste and turning it into organic fertilizer, this has the potential to reduce the amount of inorganic waste disposed of in landfills. In addition, the EGGcology team has also conducted interviews and direct observations in the field, one of which was on the campus of Bunda Mulia University, where it was found that most students were aware of the importance of environmental sustainability. In these observations, EGGcology found that quite a few students were enthusiastic about the idea of utilizing eggshells as fertilizer, especially those involved in urban farming activities on campus. Even some food stalls around the campus are willing to cooperate in collecting eggshells left over from their cooking. This shows that collective awareness of kitchen waste management is beginning to grow, and the utilization of eggshells as organic fertilizer can be well received by people from various backgrounds.

Some of the questions used to conduct qualitative research (Kross & Giust, 2019) include:

1. What type of fertilizer do you often use?
2. Why do you choose that fertilizer?
3. Are you aware of the side effects of chemical fertilizers on plants and the environment?
4. Are you aware of the advantages of organic fertilizer compared to chemical fertilizer?
5. Did you know that eggshells contain calcium carbonate (CaCO3), which is excellent for strengthening plant roots and stems?
6. In your opinion, is it important for plant sellers to start using environmentally friendly and natural fertilizers?
7. Fertilizer from eggshells also contains magnesium, phosphorus, and calcium in small amounts. In your opinion, is this content enough to encourage you to try organic fertilizer?
8. If there is an organic fertilizer from household waste, such as eggshells, that is cheap, environmentally friendly, and safe for plants, would you be interested in trying it?

The following are the results of in-depth discussions with respondents who are micro, small, and medium-scale business actors selling ornamental plants located in Jakarta.

Figure 3. Questionnaire Result 1
Source: Researchers (2025)

Based on the questionnaire results, 62.5% of respondents more often use chemical fertilizers, 25% use organic fertilizers, and 12.5% use a mixture of both. This data shows that chemical fertilizer is the main choice, but there is already an emerging interest in organic fertilizer. This could be an opportunity to introduce natural organic fertilizers such as eggshells. Based on in-depth discussions with plant sellers, the effectiveness of chemical fertilizers is indeed faster because nutrients are directly absorbed by plants, so plant growth is faster and yields are maximized in a short time. In addition, the price is also cheaper and more affordable compared to most organic fertilizers. However, on the other hand, chemical fertilizers, as felt by plant sellers, can damage the soil structure in the long term, resulting in having to replace the soil in order to maintain plants in the long term. Not only that, chemical fertilizers also disrupt the balance of the soil ecosystem, namely killing beneficial soil microorganisms. Even though millipedes, or what are known as millipedes, are animals that play an important role in plant growth

and development. However, they are often unable to withstand the side effects of chemical fertilizers, which cause soil exposed to chemical fertilizers to be difficult for millipedes to inhabit.

Moreover, according to plant sellers, the chemical residues left by chemical fertilizers also have the potential to endanger human health and the environment if consumed excessively. This results in dependence on chemical fertilizers, making the soil less fertile. Therefore, the potential market that has chosen to use organic fertilizers is EGGcology's focus in the future. Because many sellers in Jakarta already care about the sustainability of the plants they sell by using safer organic fertilizers.

Figure 4. Questionnaire Result 2
Source: Researchers (2025)

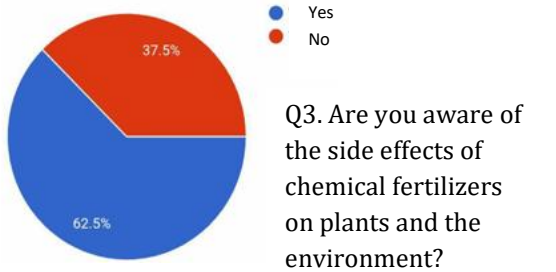

Figure 5. Questionnaire Result 3
Source: Researchers (2025)

From Figure 4, it can be seen that 62.5% of respondents chose fertilizer because it is more affordable, indicating that economic factors are the most influential. 12.5% chose it because it is easy to obtain, indicating that product availability is important; another 12.5% because the fertilizer is effective in accelerating plant growth, which means respondents pay attention to results. 12.5% of respondents are already accustomed to using the fertilizer, indicating the influence of habit. Meanwhile, 12.5% chose it because it is environmentally friendly, indicating concern for environmental impacts. That way, researchers can better understand that what business actors in the agricultural sector want is affordable fertilizer. This is because most of the plant sellers who were respondents in this study mostly sell plants that range on average at Rp. 50,000 per pot. So, with a range of plant selling prices that are not too expensive, the use of cheaper fertilizer is a major consideration for plant sellers. Likewise with plant buyers. Plant sellers explain that plant buyers with an average price range of Rp. 50,000 also greatly consider the price of fertilizer to maintain the plants they buy, so the cheapest option is usually chosen.

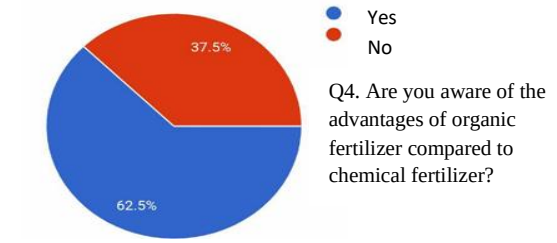

Figure 6. Questionnaire Result 4
Source: Researchers (2025)

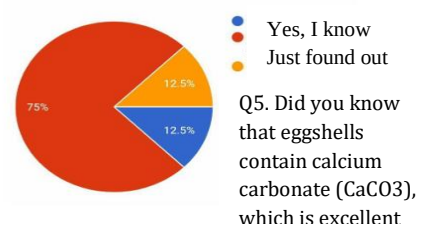

Figure 7. Questionnaire Result 5
Source: Researchers (2025)

Based on the 3rd questionnaire result, which can be seen in Figure 5, show that 62.5% of respondents are aware of the side effects of chemical fertilizers on plants and the environment, indicating a fairly high level of awareness. However, 37.5% of respondents are not yet aware of this, which means that further education is still needed regarding the negative impacts of chemical fertilizers.

In the question about knowledge of the advantages of organic fertilizer compared to chemical fertilizer, 62.5% of respondents answered no, while only 37.5% knew. This data shows that there are still many people who do not understand the benefits and advantages of organic fertilizer. Organic fertilizer can improve soil fertility by increasing the soil's ability to store water and nutrients. Not only that, organic fertilizer also provides a food source for beneficial soil microorganisms, thereby increasing soil biological activity and long-term soil fertility. Organic fertilizers also do not contain harmful chemical residues and are more

environmentally friendly. Plants fertilized with organic fertilizers tend to be healthier, stronger, and more resistant to disease. Moreover, the yields from plants fertilized with organic fertilizers tend to have better quality, more delicious taste, and higher selling value. The lack of knowledge about the benefits of organic fertilizer in the long term could be a concern for increasing education about the importance of using organic fertilizer.

In the fifth question, the majority of respondents, namely 75%, admitted to only now knowing that eggshells contain calcium carbonate ($CaCO_3$), which is beneficial for strengthening plant roots and stems. Only 12.5% already knew beforehand, and the remaining 12.5% stated that they did not know. This shows that information about the benefits of household waste such as eggshells is still not well known to the public, even though it has great potential to be used as natural fertilizer.

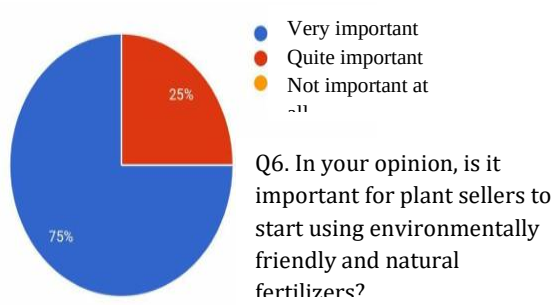

Figure 8. Questionnaire Result 6
Source: Researchers (2025)

In the sixth question, the majority of respondents, namely 75%, considered that the use of environmentally friendly and natural fertilizers by plant sellers is very important. The remaining 25% considered it quite important. No one chose the "not important at all" option. This indicates a fairly high level of awareness of the importance of sustainability and environmentally friendly agricultural practices among the community.

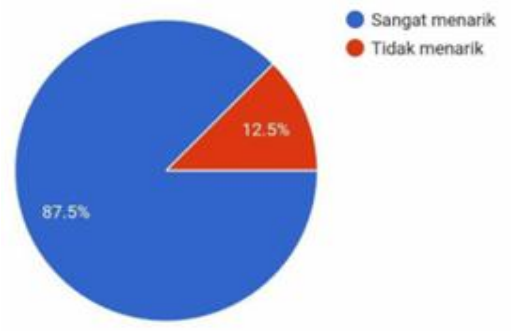

Figure 9. Questionnaire Result 7
Source: Researchers (2025)

In the seventh question, the majority of respondents, namely 87.5%, stated that the magnesium, phosphorus, and calcium content in fertilizer from eggshells sounded very interesting to try as an organic fertilizer. Only 12.5% of respondents did not find it interesting. These results indicate that the utilization of household waste, such as eggshells as organic fertilizer is receiving a positive response and has great potential to be developed further.

Figure 10. Questionnaire Result 8
Source: Researchers (2025)

The majority of respondents, namely 87.5%, stated that they were very interested in trying organic fertilizer from household waste, such as eggshells, that is cheap, environmentally friendly, and safe for plants, while only 12.5% were not interested. These results indicate that the public has a high interest in using natural and sustainable materials in plant cultivation. Eggshells, which are often considered waste, actually contain calcium, magnesium, and phosphorus, which are beneficial for plant growth. This high level of interest is a great opportunity to educate the public while encouraging the utilization of household waste as an effective and easily accessible organic fertilizer.

Table 1 presents the validity and reliability measures for the key variables examined in this study: "Eggshell Utilities" and "Entrepreneurial Opportunities." Validity was assessed through factor loadings, which indicate the extent to which each variable's indicators (survey questions) truly represent the underlying construct. The factor loadings for both variables are above 0.6, suggesting that the indicators are valid measures of their respective constructs. Specifically, "Eggshell Utilities" has factor loadings ranging from 0.688 to 0.735, indicating that the survey questions designed to measure the perceived

usefulness and value of eggshells are well-aligned with the underlying concept. Similarly, "Entrepreneurial Opportunities" exhibits even stronger factor loadings, ranging from 0.800 to 0.868, suggesting a high degree of validity in capturing the perceived potential for sustainable entrepreneurship related to eggshell utilization.

Reliability, which refers to the consistency and stability of the measures, was assessed using Cronbach's alpha. The Cronbach's alpha for "Eggshell Utilities" is 0.8143, which shows consistency within the statements that represent the variable. The Cronbach's alpha for "Entrepreneurial Opportunities" is 0.8572, indicating excellent internal consistency. These results suggest that the constructs were measured with a high degree of reliability, ensuring that the findings related to these variables are robust and trustworthy. Overall, the validity and reliability results presented in Table 1 provide confidence in the quality and accuracy of the data used to investigate the potential of eggshells for sustainable entrepreneurial ventures.

Table 1. Validity and Reliability of Sustainable Entrepreneurial Opportunities from Eggshells

Variables	Factor Loading	Alpha
Eggshells Utilities	0.688 – 0.735	0.8143
Entrepreneurial Opportunities	0.800 – 0.868	0.8572

Source: Author's data processing results

Table 2. Single regression result

Model		Standardized Coefficients	T	Sig. (2-tailed)
		Beta		
1	(Constant)		,375	,543
	Utilities	,611	4,443	,000
R-square = 0,824				
F-value = 27,796				
Sig = 0,000[a]				
VIF = 1,125 – 1,531				

[a]Predictors: (Constant), Utiilities
Dependent Variable: Business Opportunities

Table 2 presents the results of a single regression analysis examining the relationship between "Utilities" (the perceived usefulness and value of eggshells) and "Business Opportunities" (the perceived potential for sustainable entrepreneurship). The model shows a significant positive relationship between these two variables, as indicated by the statistically significant p-value (Sig. = 0.000). The standardized coefficient (Beta) for "Utilities" is 0.611, suggesting that a one-standard-deviation increase in the perceived utilities of eggshells is associated with a standard deviation increase in the perceived business opportunities. This finding supports the idea that when people see eggshells as useful and valuable, they are more likely to perceive potential for entrepreneurial ventures based on them.

The model also explains a substantial portion of the variance in "Business Opportunities," as indicated by the R-squared value of 0.824. This means that 82.4% of the variation in the perceived business opportunities can be explained by the perceived utilities of eggshells. The F-value of 27.796, which is statistically significant (Sig. = 0.000), further supports the overall significance of the regression model. The Variance Inflation Factor (VIF) values, ranging from 1.125 to 1.531, are well below the commonly used threshold of 5 or 10, indicating that multicollinearity is not a concern in this regression model. In summary, the regression analysis provides strong evidence that the perceived utilities of eggshells are a significant and positive predictor of the perceived business opportunities associated with them.

B. Discussion

The findings from both quantitative and qualitative analyses converge to strongly support the hypothesis that the utilization of eggshell waste as a raw material for organic fertilizer has the potential to create sustainable entrepreneurial opportunities in the agricultural sector. The regression analysis (Table 2) demonstrates a significant and positive relationship between the perceived utilities of eggshells and the perceived business opportunities (Beta = 0.611, $p < 0.001$). This indicates that individuals who recognize the value and usefulness of eggshells are more likely to see potential for entrepreneurial ventures based on them. The high R-squared value (0.824) further suggests that perceived utilities are a strong predictor of business opportunity perceptions.

The data analysis conducted in this study shows a strong relationship between the level of knowledge of respondents and their

interest in organic products based on eggshells. Most respondents initially did not know about the benefits of eggshells as fertilizer, especially the nutritional content, such as calcium, magnesium, and phosphorus, which are very important for plant growth. However, after information was presented through survey questions, 87.5% of respondents stated that they were very interested in trying the organic fertilizer. This fact shows that simple but informative education has a significant impact on shaping consumer perceptions and interest in environmentally friendly products.

These quantitative findings are corroborated by the qualitative data gathered through in-depth interviews with ornamental plant MSMEs. These interviews revealed a growing awareness of the negative impacts of chemical fertilizers and an openness to exploring organic alternatives. This suggests that there is a market demand for organic fertilizers made from eggshells. Furthermore, the validity and reliability assessment (Table 1) confirms the robustness of the constructs used to measure these variables. Taken together, these results provide compelling evidence that the utilization of eggshell waste aligns with both market demand and the principles of sustainable entrepreneurship, thereby supporting the hypothesis that it can create viable and sustainable business opportunities in the agricultural sector.

This data synthesis emphasizes that although the level of public knowledge about organic fertilizer from household waste is still low, the potential for adoption is high if supported by the right community approach. Respondents also showed concern about the impact of using chemical fertilizers, where most stating the importance of switching to natural fertilizers. In addition, the survey results highlight that most respondents view the use of natural fertilizers by plant sellers as important, which indicates ecological awareness at the consumer level as well as small business actors.

Production Process

The production process of EGGcology liquid organic fertilizer is not difficult but requires a considerable amount of time to effectively utilize the benefits contained in the fertilizer. The production series and the tools and materials needed for the production process are as follows:

Table 3. Production Process

No.	Description	Details
1.	Equipment	Blender, scales, measuring cup
2.	Production raw materials	Chicken eggshells, lime, clean water
3.	Production process	1. Collection of chicken eggshells from restaurants, food stalls or household waste 2. Chicken eggshells are washed clean, then sterilized by boiling in boiling water for 10-15 minutes 3. The sterilized chicken eggshells are dried by drying directly in the sun or in the oven until completely dry 4. The next step is to blend the chicken eggshells until completely smooth and set aside 5. Next, slice the lime and blend until smooth 6. Mix 100 gr of chicken eggshell flour with 100 gr of blended lime with 1 litre of water and blend again, after that the liquid is put in a container for the fermentation process, it can be for 24 hours. It can be used directly on plants, but for more effective results, it should be fermented for 3 months.
4.	Production cost	Fixed Cost is the overall cost to produce one item, including a portion of the fixed costs Fixed Cost = Rp. 600.000,- Variabel costs are changing depending on how many items that will be made. Variabel costs, consist of: • Lime : Rp. 4000,- (per item) • Bottle Packaging : Rp. 2.800,- (per item) • Label and logo : Rp. 3.200,- (per item) Total Variabel Costs : Rp. 10.000,- (per item) is the sum of Lime, bottle, and label
5.	Cost Assumption	1. We assume a zero cost for eggs, our primary raw material, through partnerships with waste banks, food businesses, and households 2. We assume that the cost of equipment will remain low due to our use of basic, household equipment in a simplified production line.
6.	BEP Projection	In order to achieve a Break-Even Point (BEP) with a target production volume of 50 units (bottles), the following cost analysis has been conducted. The calculation is based on the premise that achieving sales of 50 units will allow the business to cover all fixed and variable costs. The initial calculation presented an inaccurate representation of BEP. The correct approach to determine the required selling price per unit to reach BEP is as follows: • **Total Fixed Costs:** Rp. 600.000,- • **Total Variable Costs (for 50 units):** 50 units x Rp. 10.000/unit = Rp. 500.000,- • **Total Costs (for 50 units):** Rp. 600.000 (Fixed) + Rp. 500.000 (Variable) = Rp. 1.100.000,- • **Required Revenue (to reach BEP):** Rp. 1.100.000,- • **Required Selling Price per Unit:** Rp. 1.100.000 / 50 units = Rp. 22.000/unit Therefore, to reach the Break-Even Point at a production and sales volume of 50 bottles, each bottle must be sold at a price of Rp. 22.000. This price point will ensure that total revenue covers all fixed and variable costs associated with the production and sale of the 50 units.
7.	Profit Projection	EGGcology projects a target profit of IDR 750,000 within the first month of operation, based on the sale of 50 units of organic fertilizer. The following analysis outlines the required selling price per unit to achieve this profit target: The calculation is based on the standard profit equation: **Profit = Total Revenue (TR) - Total Costs (TC)** Where: • **Target Profit:** IDR 750,000 • **Quantity Sold:** 50 units • **Total Costs (for 50 units):** As previously calculated, Rp 1.100.000 • **Price:** The selling price per unit, which we aim to determine. Therefore, the equation can be rearranged as follows: Rp 750,000 = (50 x Price) - Rp 1.100.000 Rp 750,000 + Rp 1.100.000 = 50 x Price Rp 1.850.000 = 50 x Price Price = Rp 1.850.000 / 50 **Price = Rp 37.000** Based on this projection, to achieve the target profit of IDR 750,000 from the sale of 50 units, EGGcology must sell each 1-liter unit of organic fertilizer at a price of IDR 37,000.

The EGGcology initiative exemplifies a circular economy approach, transforming a waste stream (eggshells) into a valuable agricultural input (organic fertilizer). This aligns with the principles of sustainable entrepreneurship, which emphasize creating businesses that address social and environmental problems while generating profit (Wicaksono et al, 2025). From a management perspective, the project demonstrates effective resource utilization, a core tenet of Resource-Based View (RBV) theory. By recognizing the inherent value of eggshells when their calcium and nutrient content and leveraged with readily available, low-cost equipment, this idea also creates a competitive advantage (Saputra et al, 2021). Furthermore, the study's findings highlight the importance of understanding consumer perceptions and adapting marketing

strategies accordingly (Anatasia et al, 2025). The initial lack of awareness regarding the benefits of eggshell fertilizer underscores the need for targeted education and community engagement, crucial elements in successful market penetration for innovative products.

The research also reveals the potential for EGGcology to disrupt the existing fertilizer market. While chemical fertilizers currently dominate due to their affordability and rapid results, growing awareness of their negative environmental impacts is creating a demand for sustainable alternatives. This shift reflects a broader trend towards conscious consumerism, where individuals prioritize environmentally friendly products and practices. EGGcology's value proposition, which is a cost-effective, organic fertilizer derived from recycled waste, resonates with this trend, positioning the venture for success. However, the study also acknowledges the challenges associated with organic fertilizers, such as the slower nutrient release rate. Overcoming these challenges through innovation and effective communication will be critical for EGGcology to gain a significant market share.

The success of EGGcology hinges on its ability to build strong relationships with both suppliers (restaurants, households) and customers (urban farmers, plant sellers). This aligns with network theory, which emphasizes the importance of collaboration and partnerships in entrepreneurial ventures (Anatasia et al, 2023). By establishing a reliable supply chain for eggshells and fostering trust with its target market, EGGcology can create a sustainable ecosystem that benefits all stakeholders (Rahmadina et al, 2017). Moreover, the project's focus is on community empowerment to engage students and local businesses in order to strengthen its social impact and enhance its legitimacy. This holistic approach, combining environmental sustainability, economic viability, and social responsibility, is a hallmark of successful social enterprises.

IV. CONCLUSION AND SUGGESTION

A. Conclusion

This study demonstrates the viability of transforming kitchen waste into a valuable agricultural resource through the EGGcology initiative. By applying management and entrepreneurship theories such as RBV, sustainable entrepreneurship, and network theory, EGGcology can create a competitive advantage, disrupt the existing fertilizer market, and build strong relationships with its stakeholders. The project's success lies in its ability to address both environmental and economic challenges while promoting community empowerment.

The findings suggest that EGGcology has the potential to contribute significantly to sustainable agriculture by reducing reliance on chemical fertilizers, promoting waste reduction, and fostering a circular economy. The high level of interest in organic fertilizer among respondents, coupled with the growing awareness of the negative impacts of chemical fertilizers, indicates a favorable market environment for EGGcology. However, further research is needed to optimize the production process, develop effective marketing strategies, and assess the long-term environmental and economic impacts of the initiative.

Ultimately, EGGcology serves as a compelling example of how innovative thinking and entrepreneurial action can transform waste into wealth, benefiting both the environment and the community. By continuing to prioritize sustainability, collaboration, and community engagement, EGGcology can pave the way for a more resilient and environmentally responsible agricultural sector.

B. Suggestion

The discussion related to this research is still very limited and requires a lot of input, suggestions for future authors are to study this more deeply and comprehensively about From Kitchen To Agriculture – Transforming The Wealth of Natural in Egg Shells Into Organic Fertilizer.

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