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Innovative Value Added to Aquatic Weed for use as Packaging to Promote Identity and Increase Good Agricultural Practice Products Value of Homkhajorn Farm in Accordance with the Green Economy Guidelines

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Abstract

Innovative value added to Aquatic Weed as Packaging to promote identity and increase the value of Good Agricultural Practice Products of Homkhajorn Farm in accordance with the Green Economy guidelines is a study of the facts and knowledge by specifying some variations for the rational results with related variations, including the independent variation that affects the dependent variation. The purpose of this study was to understand the value-added method for aquatic weeds as a packaging to promotes identity and adding values to Good Agricultural Practice Products of Homkhajorn Farm in accordance with green economy, to create packaging prototypes that promotes identity and adding values to Homkhajorn Farm's Good Agricultural Practice Products with green economy and to suggest guidelines for increasing the values of aquatic weeds as a packaging that promotes the identity and adding values to Homkhajorn Farm's Good Agricultural Practice Products with green economy. The research is therefore based on the question as following: (1) Is there a way to increase the value of aquatic weeds as a packaging that promotes the identity and value adding to Homkhajorn Farm's Good Agricultural Practice Products with the green economy?, (2) What kind of Packaging that promotes identity and adding values to Homkhajorn Farm 's Good Agricultural Practice Products with the green economy and (3) How to use aquatic weed packaging to promote identity and add values to Homkhajorn Farm's Good Agricultural Practice Products? by collecting data of 81 samples for the Preliminary study and 188 samples for the main study. The research tools were testified by Cronbach's alpha coefficient to find the credibility of the research tools, Data analysis using frequency, percentage, mean, standard deviation, t-test independent, and Regression analysis to study the relationship between Independent variation and Dependent variation, which will show the results of relational levels between the tested variations. Most of the sample groups agreed that the outside packaging should initially focus on covering, protecting, and indicating product information. In terms of inside packaging or shockproof it should be emphasized on preventing products, convenience to reuse, aesthetic and attractive appearance, the product's uniqueness as well as increasing the values of the product. The regression analysis results of outer packaging utilization indicate that the variation of product's covering, protection, extension, reuse, appearance and identity tend be the factors that can increase the values of Homkhajorn Farm's melon products. Also, the regression analysis of shockproof packaging utilization showed that the variations of packaging convenience, aesthetics, attractiveness and product identity are all factors that can also increase product values.

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The Origin of the Research

Water hyacinth is an aquatic weed problem in Suphanburi Province, which is causing problems in the utilization of water sources and affecting the economic situation, social and environmental conditions in the community causing damage (Department of Public Works and Town & Country Planning, 2020). Many government sectors in the area are discussing about the problem and are also trying to take advantage of the aquatic weeds by processing them into various products (Smart SME, 2020). The research team realised an important opportunity that would lead to the development of aquatic weeds to increase their values by developing the research entitle Innovative value added to Aquatic Weed for use as Packaging to promote identity and increase Homkhajorn Farm's Good Agricultural Practice (GAP) products value in accordance with the Green Economy guidelines, surrounding communities, service areas of Suan Dusit University Suphanburi Campus. To serve all as the starting point for creating knowledge in using seemingly worthless aquatic weeds as packaging that promotes identity and adds value to Good Agricultural Practice Products. Moreover, knowledge can be applied in a way that is consistent with creating cooperation within and outside the community, to encourage entrepreneurs in the community to have additional careers other than agriculture, raise the level of social and economic conditions in the area and including solving environmental problems in the community itself.

This research has set the objectives to 1. Study ways to increase the value of aquatic weeds for use as packaging. 2. To prepare a prototype packaging that promotes the identity and adds value to Good Agricultural Practice Products and 3. To suggest guidelines for adding value to aquatic weeds for use as packaging that promotes the identity and adds value to Homkhajorn Farm's GAP Products according to green economic guidelines. The Orange man strain melon is the main Homkhajorn Farm's GAP product, which has a sweet aroma, the weight per fruit is approximately 1.7 - 2.0 kilograms. Each melon is packed in a box. There is a base for placing the melon in a box that can be easily carried.



Figure 1. Melon fruit packaging and base.

From the way the melons are packed, inside the box place there is only a base to keep the melons, and cushioning foam net will be used to wrap the melon fruit before placing it on the base. To reduce foam use, therefore this research focuses on developing shockproof packaging from water hyacinth instead of using foam. (Figure 1 and 2)



Figure 2. Cushioning foam net.

Research Conceptual Framework

The Innovative value added to Aquatic Weed for use as Packaging to promote identity and increase of Homkhajorn Farm's GAP product value in accordance with the Green Economy guidelines, is a project that arose from the joint creation of Suan Dusit University's staff and the communities in the service area of Suan Dusit University. The aims of this study are to take agricultural waste, local raw materials and abundant resources in Suphanburi Province to develop them into packaging that promote the identity and add value to Homkhajorn Farm's GAP Products to show a uniqueness, interestedness and respond to the needs of the consumers. The concept is based on The Design paradigm which consists of (1) Communication of the meaning of the place refers to the identity of the area of Homkhajorn Farm, a learning center for Good Agricultural Practice Products of Suan Dusit University. Khok Kho Thao Subdistrict, Mueang District, Suphan Buri Province by using the resources and cultural capital available in the area, including wisdom, practices, local plants, as well as the identity of Suan Dusit University. Applied to develop creative products that have different value than before. (2) Participation in the community both directly and indirectly created from the collaboration of designers, farmers, local philosophers, academics, consumers, and outside agencies. In jointly creating packaging that promotes the identity and adds value to Homkhajorn Farm's Good Agricultural Practice Products in line with the green economy. To be a guideline for creating a learning center Including tourism links and (3) Sustainability from self-reliance, preservation of resources and the environment, maximum use of resources available in the area, leading to career sustainability. That will create new careers from developing the area into a learning center that gathers knowledge in various fields that transform worthless resources into valuable products. and will lead to sustainability in the academic field by creating new knowledge, collecting knowledge, developing products, developing research, promoting academic services, and preserving arts and culture and will lead to sustainability in the academic field by creating new knowledge, collecting knowledge, developing products, developing research, promoting academic services, and preserving arts

and culture. Respond to the creative industries according to the current National Economic and Social Development Plan.

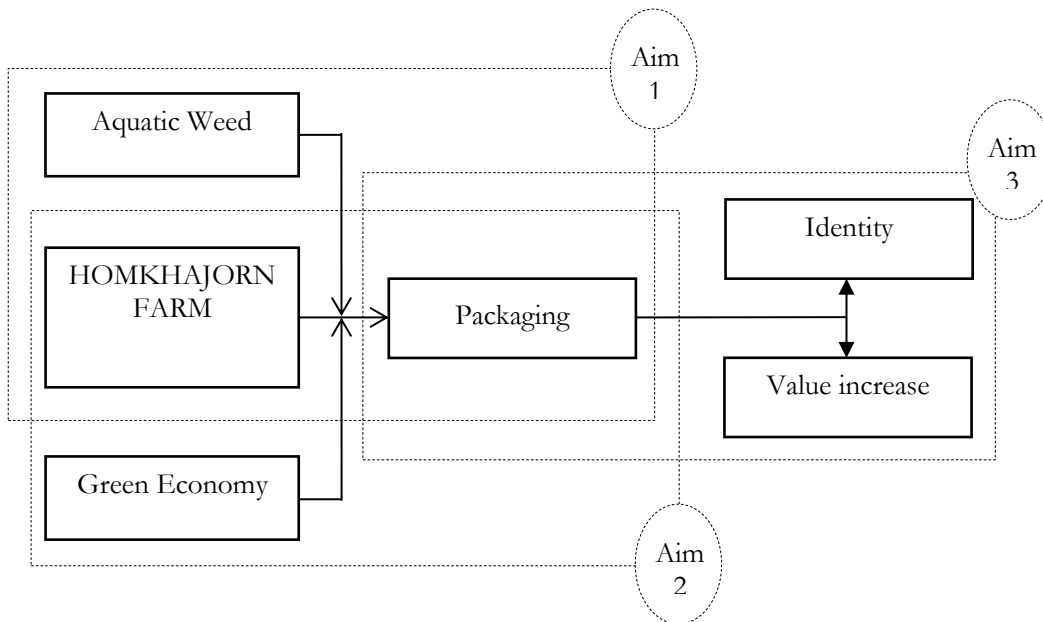


Figure 3. Conceptual framework.

The structure of the research consists of various variables, starting with the Homkhajorn Farm's GAP product combined with the development of packaging from aquatic weeds to be used as a replacement for foam cushioning, that will increase the value of products and aquatic weeds available in the area, which will be conformed to the green economy concept and consumer's needs. The research data aims to be presented in 3 issues: (1) What are the guidelines for increasing the value of aquatic weeds for use as packaging that promotes the identity and adds value to Homkhajorn Farm's GAP product according to the green economy guidelines? (2) What are the characteristics of packaging that promotes the identity and adds value to Homkhajorn Farm's GAP product according to the green economy? and (3) How packaging from aquatic weeds can promote the identity and add value to Homkhajorn Farm's GAP product? (Figure. 3)

The data were collected from 188 samples and the research tools were tested by finding the Cronbach's alpha coefficient. The criteria will consider by a high confidence level questionnaire, Cronbach's alpha value should be greater than 0.7 or higher (Thananan Numsaeng and Thanita Tantrarungroj, 2018). The results of the questionnaire yielded an alpha coefficient of 0.884, indicating that the questionnaire is reliable and has sufficient confidence for the further collected data to refer to the population. The results of general data analysis of the sample group show that the most respondents were 68.1 percent female, males were 31.9 percent, with most of ages being in the range of 20 - 39 years were 41.5 percent, followed by those in the range 40 - 59 years, over 60 years, and 13 - 19 years were at 39.9 percent, 11.7 and 6.9, respectively. By the education level of the sample showed that the bachelor's degree level, was 57.4 percent, followed by the post-graduate level was 16.0 percent, and lastly, the level below the bachelor's degree level were at 11.7 and 6.9, respectively. is 16.0 percent (Table 1)

Table 1 General information of the sample

No.	General information	Description	Frequency	Percent
1	Sex	Male	60	31.9
		Female	128	68.1
2	Age	13 – 19 years	13	6.9
		20 – 39 years	78	41.5
		40 – 59 years	75	39.9
		Over 60 years	22	11.7
		Below bachelor's degree	30	16.0
3	Education level	Bachelor's degree	108	57.4
		Post-graduate	50	26.6

Aim 1 What are the guidelines for increasing the value of aquatic weeds for use as packaging that promotes the identity and adds value to Homkhajorn Farm's Good Agricultural Practice Products according to the green economy guidelines?

The study began with a survey of local resources that could be used as raw materials for use as packaging materials. The raw materials that can be found in large quantities, including water hyacinth, which is an aquatic weed that can multiply quickly in water sources and affect farmers both directly and indirectly to water traveler and nearby residents (Wit Thiangburanatham, 1999).

In addition, water hyacinth can be processed into paper sheets or woven into fibers. The properties of water hyacinth that are processed into paper, which mixed with mulberry pulp have tough and strong mechanical properties, like mulberry paper and can be processed into product packaging very well (Songwut Ekwutthawongsa, 2014 and Wuttinan Kongtad et al. 2007). Especially in the community areas surrounding the university. The Khok Ko Tao community is mostly a farming area, but there is a flood every year for about 4 months, causing problems for various agricultural plots in the area (Suphanburi Provincial Governor's Office, 2019). In the other hand, there will be a lot of raw materials that can be used for beneficial purposes during the high tide, which is a lot of floating water hyacinth that can be processed into paper. The abundance of natural resources is an important reason why the research team focusing on the importance of being able to develop packaging materials from water hyacinth to be cushioning decompost instead of foam (Ratchanee Charoen et al, 2016).



Figure 4. Paper from dried and fresh water hyacinth pulp (dark and light color)



Figure 5. The process of making water hyacinth paper



Figure 6. Stretch packaging molding for shockproof wrapping

Aim 2 What are the characteristics of packaging that promotes the identity and adds value to Homkhajorn Farm's Good Agricultural Practice Products according to the green economy?

Packing melons into cardboard boxes are also used cushioning foam between the melons and the paper base inside the box. In that case, the research team has been trying to find a way to develop packaging materials for cushioning decompot instead of foam. This new material is naturally biodegradable and need to provide cushioning for the melon fruit, replacing the use of foam. In addition, there is the development of tote bag packaging that is obtained by cutting and punching a single sheet of paper. It can be carried, but remain the limitations in weight capacity. It was also resulted that the packaging in form of a single paper bag was suitable for 1 melon.

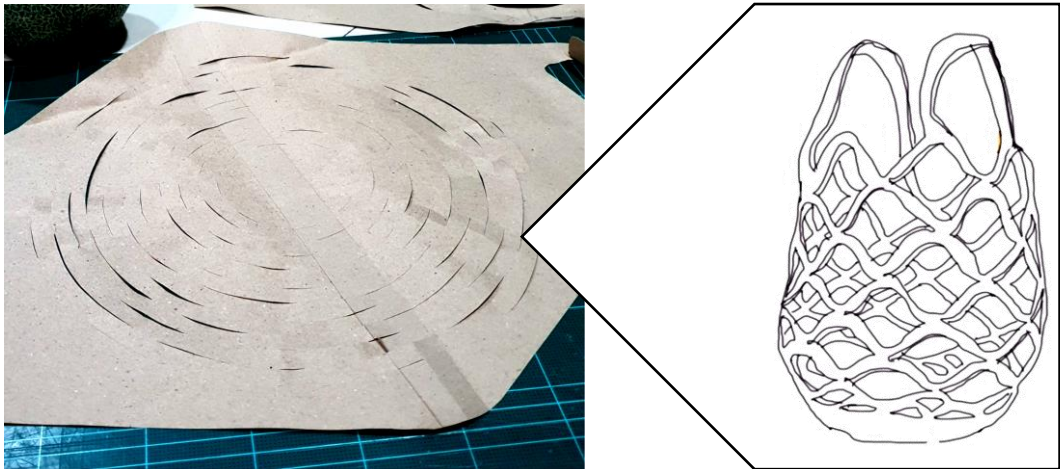


Figure 7. Bag made from a single sheet of paper.

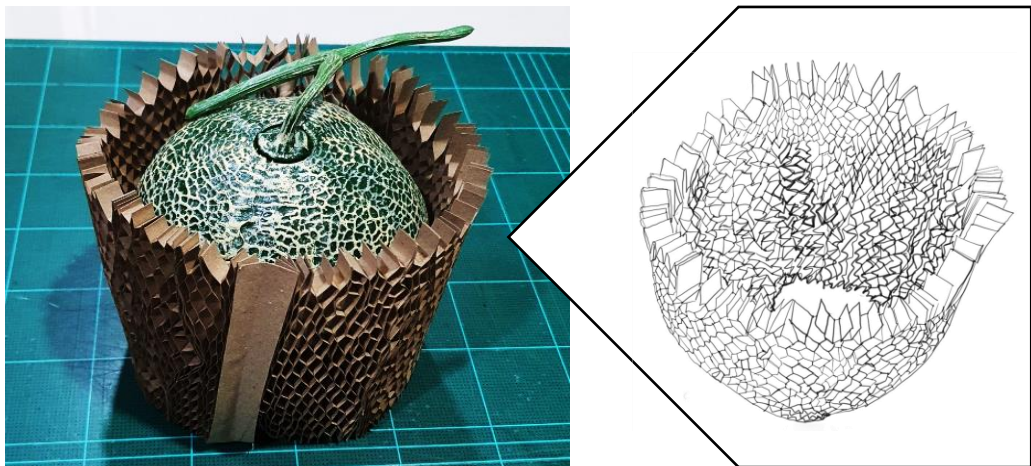


Figure 8. Stretch packaging, shockproof wrap.

However, in this study, the pulp was not yet thick and strong. Therefore, it is still unable to support the weight of melons that weigh more than 1.5 kilograms, causing the tears between the cuts that make holes for basket bags as it is less strong than other points. Therefore, if packaging is developed in this way, it should be considered in increasing the thickness or mixing it with other materials to increase the properties of the material, such as the toughness and strength of paper.

The issue of evaluating the usability of melon packaging shows that most respondents focus on the importance of the issue of (1) Wrapping the product, (2) Protecting the product, and (7) Displaying product information are at the highest average level. Followed by (4) Being able to carry, (6) Being able to be reused, and (11) Being able to add value to the product are with averages at a high level. For the least importance to sample group, the average was at a moderate level, including (3) Helping to extend the life of the product (5) Product can be stored longer when opened (8) Showing the product itself (9) Showing the uniqueness of the product and (10) Showing product's location uniqueness (Table 2).

Table 2 the issue in evaluating the usability of melon packaging

No.	Issues in assessing box packaging (Cronbach's Alpha .846)	Average opinion of 188 samples		
		Mean	S.D.	Definition
1	Wrapping the product	4.80	0.39	highest
2	Protecting the product	4.73	0.44	highest
3	Helping to extend the life of the product	3.10	0.46	moderate
4	Being able to carry	4.15	0.69	high
5	Product can be stored longer when opened	2.46	0.69	low
6	Being able to be reused	4.03	0.82	high
7	Displaying product information	4.51	0.64	highest
8	Showing the product itself	2.47	0.72	low
9	Showing the uniqueness of the product	3.03	0.72	moderate
10	Showing product's location uniqueness	3.15	0.80	moderate
11	Being able to add value to the product	4.18	0.76	high

Evaluating the developed shockproof packaging, most respondents agreed that shockproof packaging can protect the product well from shocking, convenience to reuse, beautiful and attraction, presenting the product's uniqueness and can also increase product value were at the average highest level. As a secondary issue, most respondents agreed that shockproof packaging is appropriate for product packaging, convenience for packing, easy to use, shockproof packaging is easily to decomposing and promoting the product image, with an average of high level. For the strength to support the weight of the product well and being of an appropriate size, most respondents gave the average level as moderate (Table 3).

Table 3. Evaluation of shockproof packaging

No.	Issues in assessing shockproof packaging (Cronbach's Alpha .783)	Average opinion of 188 samples		
		Mean	S.D.	Definition
1	Protect the product from shocking	4.23	0.63	highest
2	Appropriate for product packaging	3.93	0.77	high
3	Good strength for product supporting	3.47	0.63	moderate
4	Convenience for packing	3.81	0.75	high
5	Easy to use	4.16	0.68	high
6	Appropriate size	3.40	0.56	moderate
7	Easily to decompose	4.21	0.57	high
8	Easy to reuse	4.55	0.49	highest
9	Easy to destroy	4.34	0.60	high
10	Beautiful and attraction	4.73	0.47	highest
11	Promoting product image	4.23	0.62	high
12	Presenting the product's uniqueness	4.69	0.49	highest
13	Increasing the product value	4.72	0.48	highest

Aim 3 How can packaging from aquatic weeds promote the identity and add value to Homkhajorn Farm's Good Agricultural Practice Products?

From summarizing the suitable format and size for use with graphics showing the identity of the Homkhajorn Farm's melons, it was found that the single-piece paper bag packaging is suitable for 1 melon. For the stretched paper packaging, indicated that it has flexible properties to wrap around melon, by the length of 15 cm. for covering the melon fruit with a strip for showing product information. The covering of the melon fruit depends on the height of the package. There will be 4 sizes; Size 1 has a length of 5 cm. for covering the middle of the melon fruit. Size 2 has a length of 10 cm. for supporting at the base of the melon fruit. Size 3 has a length of 15 cm. for covering half the melon fruit and size 4 has a length of 20 cm. for covering the whole melon.

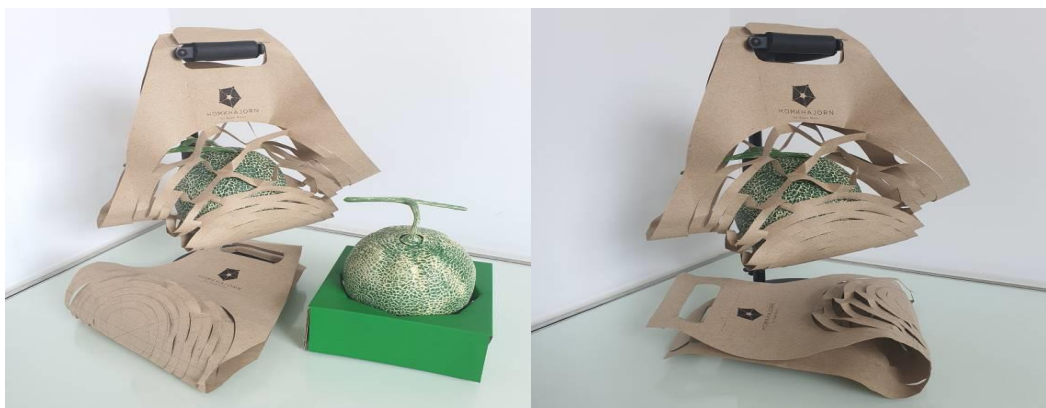


Figure 9. One-piece paper bag packaging model



Picture 10. Stretch wrapping packaging model

The Regression analysis is the relationship of independent variables study which can be used to estimate the value of the dependent variable to know the correlation of relationship between the variables. In terms of the correlation coefficient (r) ranges from -1 to 1 with negative values are showing the opposite relationship, and for positive values are showing the same relationship. The interpretation of the r value can be interpreted as follows: $r = .50$ to 1.00 is considered high correlation between the data, $r = .30$ to $.49$, the data are in a moderate relationship, $r = .10$ to $.29$ is considered a low level of correlation between the data, and $r = .00$, the data are considered unrelated. In this study, the variables were determined: (1) data analysis of the usability of melon packaging that affects product value addition and (2) data analysis of the usability of shockproof packaging that affects value addition.

Table 4. Utility of melon packaging that affects product value addition.

Independent variable	Dependent variable (11) Being able to add value to the product			
	B	Beta	t	Sig.
(1) Wrapping the product	.482	.250	2.160	.032
(2) Protecting the product	-.532	-.307	-2.634	.009
(3) Helping to extend the life of the product	-.277	-.168	-2.219	.028
(4) Being able to carry	-.057	-.052	-.468	.640
(5) Product can be stored longer when opened	-.039	-.035	-.256	.798
(6) Being able to be reused	.311	.339	3.856	.000
(7) Displaying product information	.022	.019	.236	.813
(8) Showing the product itself	-.414	-.396	-2.433	.016
(9) Showing the uniqueness of the product	.466	.444	4.768	.000
(10) Showing product's location uniqueness	.155	.164	1.495	.137
R = 0.538 R ² = 0.289 Sig. < 0.05				

An analysis of the usability of melon packaging that affects product value addition from table 4 has determined the independent variables: (1) Wrapping the product (2) Protecting the product (3) Helping to extend the life of the product (4) Being able to carry (5) Product can be stored longer when opened (6) Being able to be reused (7) Displaying product information (8) Showing the product itself (9) Showing the uniqueness of the product (10) Showing product's location uniqueness and the dependent variable is (11) Being able to add value to the product. The results of the regression analysis show that the correlation coefficient is equal to .289, indicating that the data set that was analyzed, has a low level of relationship. It was found that the variables that have a relationship with the ability to add product value include: (1) Wrapping the product (2) Protecting the product (3) Helping to extend the life of the product (6) Being able to be reused (8) Showing the product itself and (9) Showing the uniqueness of the product.

Table 5. Benefits of shockproof packaging that affect product value addition.

Independent variable	Dependent variable (13) Increasing the product value			
	B	Beta	t	Sig.
(1) Protect the product from shocking	.001	.001	.047	.962
(2) Appropriate for product packaging	-.027	-.043	-1.893	.060
(3) Good strength for product supporting	-.008	-.011	-.928	.355
(4) Convenience for packing	.034	.054	2.278	.024
(5) Easy to use	.007	.010	.358	.721
(6) Appropriate size	-.002	-.002	-.124	.902
(7) Easily to decompose	.003	.003	.290	.773
(8) Easy to reuse	-.008	-.008	-.720	.473
(9) Easy to destroy	.002	.002	.191	.849
(10) Beautiful and attraction	.860	.855	30.670	.000
(11) Promoting product image	-.012	-.016	-.705	.482
(12) Presenting the product's uniqueness	.145	.149	5.334	.000
R = 0.990 R ² = 0.981 Sig. < 0.05				

The data analysis of benefits of shockproof packaging that affect product value addition (Table 5) the independent variables are shown: (1) Protect the product from shocking (2) Appropriate for product packaging (3) Good strength for product supporting (4) Convenience for packing (5) Easy to use (6) Appropriate size (7) Easily to decompose (8) Easy to reuse (9) Easy to destroy (10) Beautiful and attraction (11) Promoting product image (12) Presenting the product's uniqueness and the dependent variable is (13) Increasing the product value. The results of the regression analysis showed that the correlation coefficient was equal to .981, indicating that the data sets that were analyzed had a high level of relationship. It was found that the variables that are related to the ability to add product value include: (4) Convenience for packing (10) Beautiful and attraction and (12) Presenting the product's uniqueness.

Discussion and Conclusion

The Innovative value added to Aquatic Weed as Packaging to promote identity and increase the value of Good Agricultural Practice Products of Homkhajorn Farm in accordance with the Green Economy guidelines is an initial project for building a knowledge in using worthless aquatic weeds as packaging that promotes identity and value added. Including the applying of a knowledge to create cooperation in the community to enhance the social and economic condition's potential beyond farming, promote a new way of tourism and also to solve environmental problems in the local area. The objectives are 1. Study ways to increase the value of aquatic weeds for use as packaging. 2. To prepare a prototype packaging that promotes the identity and adds value to Good Agricultural Practice Products and 3. To suggest guidelines for adding value to aquatic weeds for use as packaging that promotes the identity and adds value to Homkhajorn Farm's GAP Products according to green economic guidelines in a form of passing on knowledge, organizing training, presenting the research articles, which are for economic benefits and the transfer of empirical knowledge.

The use of aquatic weeds as shockproof packaging is processed through various ways; starting with collecting and drying weeds, then chopped and boiled until weeds are soft to make a fine pulp before being molded into paper as shockproof packaging. However, the mentioned process can be carried out within the household and lead to job increasing in the area, uplifting the community for new careers, as well as supporting main raw materials to transfer to relevant industrial sectors. The study began with (1) Studying ways to increase the value of aquatic weeds for packaging by surveying various waste resources from agriculture or aquatic weeds to test their physical properties in order to know the suitability of using for packaging development. Then, collecting consumer's behavior data, an alignment with general market for development guidelines; including, creating materials for producing packaging and features and feasibility test. Step (2) Surveying consumer's opinions on packaging to use as a guideline for developing sample packaging prototypes for physical and marketing testing. After the test with a sample of 188 people, it was found that most consumers agreed that inside the shockproof packaging of melon box should be developed using natural materials. In addition, the things that affect customer's interest and purchasing decisions the most are being unique, aesthetic, and convenient to use, reasonable price, reducing the use of foam and also protecting an environment. In the field of evaluation of shockproof packaging that has been developed, most respondents agreed that the packaging is good at protecting the product from the shock, convenient to reuse, aesthetics and attractiveness, reflects the uniqueness of the product and also be able to increase product values. The results of analyzing external packaging data that affects product value addition, which the variables that are related to the ability to increase

product values include product wrapping, product protection, and product life extension, ability to be reused, showing the appearance and the uniqueness of the product. As for the analysis of shockproof packaging data; it was found that there are variables regarding convenience of packaging, aesthetics and attractiveness, and communicating the uniqueness of the product, which are all effectively increasing product values. Therefore, the development process must consider the issues which are important in making higher value products. Step (3) Transferring knowledge to the community by organizing training in packaging development that promotes product's identity and adds value to whom are interested, focusing on farmers in the area. Including the academic articles that can convey empirical knowledge to apply for development or expand relevant knowledge for social and economic benefits in the future.

The results of the study show the possible trends for increasing the career and academic sustainability, promoting academic services and preserving arts and culture, responding to the creative industries according to The Twelfth National Economic and Social Development Plan. According to the sustainability in the profession, this will create new careers by developing the local area into a learning center, which gathers knowledge in various fields related to the use of valueless resources in the area for worthwhile benefits, conveys the story of an origin of the place, including promotes and enhances society, the environment, and distribute income to the community. As for the sustainability of academic field, this will a way to support the new knowledge creation which conforms to the product design paradigm that focuses on the essence of design reflecting the local identity, participatory design and also design for sustainability. The results from packaging development to promote identity and increases product values that are unique, attractive and respond to the needs of nowadays consumers, which shows the opportunity to build an occupational class, Learning Center and new tourist attractions. From the strengths of the community that will collect water hyacinth, which are aquatic weeds, to create the unique identity products with cooperation from people both inside and outside the community, including the determination of government policies that will help promoting and pushing such businesses to grow to enhance the social sustainability from self-reliance as well as cooperation from outside people. This also promotes environmental sustainability by managing environmental problems in the community, less utilizing the available resources in the area for the highest efficiency. Additionally, to support economic sustainability which helps people in the community and nearby to create additional income from their present jobs.

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