Investigating Buyer's Perceptions and Purchase Decisions for New Product Development: A Case of Feed Additive from Popped Rice

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Abstract
The aim of the study is to develop product innovation based on Thai rice. This research intends to further develop popped rice into zinc oxide-doped activated carbon for animal feed additive, to study buyer's perceptions and purchase decisions for new product development. The study used the mixed methodological approach. The first step began with idea generation to identify alternative advantage of the new product. The ideas of assessment phase led to a review of important criteria which showed that new product development for animal feed additive had the highest weighted score. The qualitative research was conducted through in-depth personal interviews with 10 participants working in the animal feed industry. The quantitative research was conducted through the questionnaire survey with 72 respondents working in swine farms, deciding the products bought for animal feeds. The combined results revealed that zinc oxide-doped activated carbon made from popped rice can potentially penetrate the feed additive market. However, the producer needs solid proof or certification in relation to the product's features and its efficiency with the competitive price. The results suggested that buyers of animal feed additive with the greater concern for price, brand, and reputation of manufacturer will lead to less chance for customers to consider buying the new product of zinc oxide-doped activated carbon from popped rice for animal feed additive. Thus, the developer may need to create a reputation by getting product qualification certificate.
Keywords: New Product Development, Purchase Decisions, Popped Rice, Activated Carbon, Feed Additive

Introduction
Rice is an important economic crop in Thailand for consumption and employment. The country's rice export was 10.97 million tons in 2014, valued at 1.75 trillion baht (Thai Rice Exporters Association, 2015). The major export markets of Thai rice include China, USA, Europe, Africa, and Oceania. Rice is the main farm product throughout the country and a source of income for Thai farmers from over four million households. It develops various related sectors and industries in the supply chain of rice production, transformation, and

exports. However, several internal and external factors influence the rice supply and demand, which involve quantity, price, and demand of Thai rice. Rice demand is typically affected by economic conditions and competition from other countries. Additionally, the price of other carbohydrate-containing crops, such as corn and wheat also affect the rice demand; particularly when the rice price is relatively high. Jermsittiparsert et al. (2013) identified the relationship between Thai paddy price, the cost of Thai rice production, the rice world market price, and the government-determined price. They suggested that the cost of Thai rice production does not influence Thai paddy price. The price of Thai paddy is significantly affected by the global market price, representing the power of globalization, followed by the government. Sriyakul and Jermsittiparsert (2017) further added that rice is considered as a political good associated with a large number of people. Therefore, the government needs to intervene in the domestic rice market to reduce the influence of the global market and balance the shared benefits generated by rice trading among the involved parties. They stated that adopting the populist policies such as the rice mortgage scheme, income-guarantee scheme, and the second rice mortgage scheme effectively mitigated the influence of the global market on the domestic rice price. Meanwhile, rice supply is influenced by farm conditions, such as soil quality, irrigation system, farm technologies, research and development, weather conditions and natural disasters, and the farmer's decision to produce other, higher priced crops. These factors cause price volatility of rice and, consequently, instability. Hence, it is essential to avoid such volatility by promoting the development of rice in many forms, to develop a variety of rice-processed product based on its functional benefits to meet the consumer demand in the contemporary market. This also helps sustainably add more value to Thai rice, not only for food industries, but also non-food industries. It creates the competitiveness of Thai rice by advancing science and technology for new product development.

One of the interesting ideas for adding more value to Thai rice is to process it into popped rice. It can be made by heating paddy-like making popcorn. Konharn (2016) examined the properties of popped rice and found that its structure is like sponge, porous and with channels sized between 80-100 microns. It is also highly adsorbent. Thus, it can probably be used for adsorbing and gradually releasing essential oils in spa products or aromatherapy. The highly adsorbent structure of popped rice also indicates product development into activated carbon using low-grade paddy for making popped rice. This research intends to develop popped rice into zinc oxide-doped activated carbon and identify the potential application of this new product. Developing zinc oxide-doped activated carbon from popped rice will innovate rice products and further develop rice benefits with more varieties and contemporary products. This sustainably adds value to Thai rice not only as a commodity but also as a high value product through research and development. Following the statistic report from the Custom Department (2018), Thailand was the net exporter of activated carbon. In 2017, Thailand imported 9,556 tons of activated carbon worth about 710 million baht, whereas it exported 10,869 tons of activated carbon worth about 603 million baht. Statistics show an upward trend in the import and export volume of activated carbon because it has a variety of applications such as air pollution control (Nor et al., 2013), wastewater treatment (Bhatnagar et al., 2013), catalyst (Ma et al., 2004), food (Qureshi et al., 2008), and pharmaceutical (Li, Qi, and Gao., 2015; Wu, Guo, and Fu., 2013) industry.

Activated carbon appears to be an interesting material for large scale application. The objective of this research is to ideate and develop a new product to screen and evaluate the idea of the consumers' product decisions about the innovative zinc oxide-doped activated carbon made from popped rice.

Literature Review

New Product Development: Several models or frameworks describing the new product development process have been widely recognized and used (Booz, Allen, & Hamilton, 1982; Cooper, 2001; Crawford & Benedetto, 2006; Ulrich & Eppinger, 2008). According to the generic model for new product development proposed by Booz, Allen, and Hamilton (1982), there are seven steps in the new product development process. It begins with new product strategy for development, followed by idea generation, idea screening and evaluation, business analysis, development, testing, and finally, commercialization. Cooper (2001) proposed the Stage-Gate model, describing a five-gate model to manage new product development. The first gate is verifying the idea screening after the developing it; the second gate is verifying the second screening after scoping; the third gate is verifying the development phase after building the business case; the fourth gate is verifying the product testing after the development; the last gate is verifying the commercial launch after testing and validation. Then, it moves to post-launch review. Crawford and Benedetto (2006) suggested five stages of new product development including opportunity identification and selection, concept generation, concept/project evaluation, development, and launch. Ulrich and Eppinger's (2008) model of new product development has six stages for the new product development process. First, planning process, followed by concept development, system-level design, detail design, testing and refinement, and production ramp-up. This research applied the process of new product development suggested by Booz, Allen and Hamilton (1982), Cooper (2001), Crawford and Benedetto (2006), and Ulrich and Eppinger (2008), as demonstrated in Table 1.

Table 1 Comparison of Processes in New Product Development

Authors	**New Product Development Stages**
Booz, Allen & Hamilton (1982)	New product strategy Idea generation Idea screening & evaluation Business analysis Development Testing Commercialization
Cooper (2001)	Discovery Scoping Build business case Development Testing and validation Launch
Crawford & Benedetto (2006)	Opportunity identification and selection Concept generation Concept/project evaluation Development Launch
Ulrich & Eppinger (2008)	Planning Concept development System-level design Detail design Testing and refinement Production ramp-up

The researcher divided the process of developing a new product for zinc oxide-doped activated carbon from popped rice into three main phases. The first phase is to study the consumers' purchase decisions that includes three processes-idea generation and screening, concept testing, and business analysis. The second phase is to develop and test the new product that consists of other three processes, including product development, product characterization, and product efficiency testing. Finally, the last phase is to commercialize the zinc oxide-doped activated carbon, which includes two processes-test marketing and business plan development. This research undertakes the first phase of new product development for zinc oxide-doped activated carbon to study the consumers' purchase decisions, focusing on ideating and screening, concept testing based on consumers' perspectives as the demand-driven process, and business analysis through a questionnaire-based survey.

Product Concept of Activated Carbon and Zinc Oxide: Activated carbon is an extremely versatile material. Generally, it can be produced from any carbonaceous materials. The selection of raw materials is primary based on cost, well developed porosity, pore size, and adsorptive capacities. It also presents good physicochemical stability, high adsorptive capacity, high mechanical strength, and high degree of surface reactivity (Cuhadaroglu & Uygun, 2008; Kolosova & Stroka, 2011; Sahu, Acharya, & Meikap, 2010; Yahya, Al-Qodah, & Ngah, 2015). Adeyi (2010) investigated the composition of some agricultural materials to produce activated carbon. Coconut husks, cocoa pods, kola nut pods, ripe plantain peels, and unripe plantain peels were determined. It was found that all agricultural wastes could serve as precursors for activated carbon. The researcher found that agricultural by-products have been widely used to make activated carbon for several purposes such as hazelnut shells and apricot stones were used for adsorbing Cu (II) (Ozcimen & Ersoy-Mericboyu, 2010), rice husks for adsorbing of Cu (II) (Yahaya et al., 2010), eucalyptus wood for removing phenol (Tancredi et al., 2004), coconut shells for adsorbing oxalic acid and maleic acid (Rahman et al., 2006), oil palm shells for methane adsorption (Arami-Niya et al., 2011), bamboo for adsorbing methylene blue (Hameed et al., 2006), etc. However, popped rice has not yet been used to make activated carbon.

Additionally, zinc oxide was widely used due to its unique characteristics such as antimicrobial activities (Pasquet et al., 2014), UV protection properties (Jesionowski et al., 2011; Ates & Unalan, 2012), and semiconducting properties (Jagadish & Pearton, 2011). According to Kolodziejczak-Radzimska and Jesionowski (2014), zinc oxide has several applications in the rubber, pharmaceutical, cosmetic, textile, electronics, photocatalysis, etc.

Theories Related to Consumers' Purchase Decisions: Engel, Blackwell, and Miniard (2001) suggested that the consumer's purchase decisions consist of five activities in a certain period of time - need recognition, information searching, evaluation of alternatives, purchase decision, and post-purchase evaluation. They also stated that several factors affect consumers' purchase decisions, which can be further divided into four major groups including stimulus inputs, information processing, decision-making process, and variables influencing the decision process. Furthermore, Kotler and Armstrong (2010) explained the consumer's behavior through stimulus-response model. The decision-making process is influenced by marketing stimuli (product, price, place, and promotion). Other stimuli including economics, technology, politics, and culture are also affected in the uncontrollable environment. Both marketing and other stimuli enter "Black Box" in the consumer's mind. As the result of response, the outcomes of consumer's decisions can be further classified into product choice, brand choice, dealer or store choice, purchase quantity, and purchase timing. Meanwhile, Schiffman and Kanuk (2014) categorized consumer behavior into 3 stages: the input stage, the process stage, and the output stage. The input stage includes the company's marketing efforts and external social environment. The process stage focuses on the consumer decision-making which includes need recognition, pre-purchase search, and

evaluation of alternatives. The output stage includes purchase behavior and post-purchase evaluation. Karnreungsiri and Praditsuwan's (2017) study about the factors influencing customer behavior and buying decision process proved that it is significantly influenced by the social and situational factors, while being highly influenced by marketing and psychological factors. Additionally, Son and Kijboonchoo's (2016) study about the impact of country image on the purchase intention suggested that the Korean wave positively affects its national image which positively impacts the purchase intention for Korean cosmetics. Jiang et al. (2018) explored "actors influencing Chinese consumers' purchase intention for Thai products and travel in Thailand from Thai dramas and films" and found a significant relationship between viewers' involvement and satisfaction while the satisfaction of Thai movies and dramas positively affected viewers' intention to buy Thai products and intention to visit Thailand. This creates a good opportunity for Thai products to further develop Chinese market.

Research Methodology

This research applied the mixed methodological approach by conducting both quantitative and qualitative research. First, the qualitative research was conducted through in-depth personal interviews with 10 participants, including 6 experts or academics and 4 industry insiders, who worked in the field of animal feed industry. The qualitative aim was exploring the decision making of potential buyers and the important characteristics or features of feed additive for commercial purposes. The interview had semi-structured questions, while the selection of participants was based on purposive sampling about their knowledge and experiences that could contribute to this study. The qualitative data from the interviews were combined, then grouped and presented under the theme of product concept and market potential. Subsequently, quantitative research was conducted through the questionnaire survey with 72 respondents who used and bought feed additive for swine farms. The questionnaires were distributed among the targeted group for 10 months - from June 2018 to March 2019. The statistical tool used for descriptive analysis and for hypothesis testing was SPSSv22.0, license of Chulalongkorn University. These included the presentation of frequency, percentage, and mean, as well as the results of inferential statistics including independent-samples t-test.

Results

The results are divided into three parts: the results of idea generation and screening, concept testing based on quantitative research, and business analysis of consumers' purchase decisions about the selected idea based on qualitative research.

Idea Generation and Screening : The researcher explored the concepts, theories, and previous relevant research to identify alternatives to further develop the benefits of zinc oxide-doped activated carbon to use in wastewater treatment, catalyst, energy storage, and animal feed additive. These ideas were assessed and compared by the experts participating in the study using eight criteria for the new product development, including profitability (Hart et al., 2003; Bause et al., 2014), barriers to entry (Porter, 2008), market need, growth, and size (Cooper, 1981), innovation and uniqueness (Hart et al., 2003), technological feasibility (Hart et al., 2003; Bause et al., 2014), product performance/efficiency (Hart et al., 2003), competition in the industry (Porter, 2008), and expected return on investment/profit potential (Hart et al., 2003). Table 2 lists the results of the weighted decision matrix to compare ideas for new product development.

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Table 2 Comparisons of ideas by weighted decision matrix for new product development

Criteria	Product Application								
	Weight	**Waste water treatment**		**Catalyst**		**Energy storage**		**Feed additive**	
	%	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Profitability (Hart et al., 2003, Bausea et al., 2014)	10	7.3	7.3	8.0	8.0	7.4	7.4	8.0	8.0
Barriers to entry (Porter, 2008)	10	7.8	7.8	7.8	7.8	7.6	7.6	8.2	8.2
Market need, growth, and size (Cooper, 1981)	15	7.5	11.3	7.2	10.8	8.2	12.3	8.4	12.6
Innovation and Uniqueness (Hart et al., 2003)	15	6.8	10.2	7.8	11.7	7.8	11.7	8.4	12.6
Technology feasibility (Hart et al., 2003, Bausea et al., 2014)	15	7.8	11.7	7.4	11.1	7.2	10.8	8.4	12.6
Product performance/efficiency (Hart et al., 2003)	15	7.3	11.0	7.4	11.1	7.2	10.8	8.4	12.6
Competition in the industry (Porter, 2008)	10	7.3	7.3	7.2	7.2	6.8	6.8	8.0	8.0
Expected Return on investment/Profit potential (Hart et al., 2003)	10	7.0	7.0	7.4	7.4	7.0	7.0	8.2	8.2
Total	**100**		**73.5**		**75.1**		**74.4**		**82.8**

Table 2 illustrates that market need, growth, and size, innovation and uniqueness, technological feasibility, and product performance/efficiency were those with higher weight (15%), as compared to profitability, barriers to entry, competition in the industry, and expected return on investment/profit (10%). The development of popped rice for animal feed additive showed the highest weighted score of 82.8, compared to those of wastewater treatment (73.5), catalyst (75.1), and energy storage (74.4%).

Based on the results of idea generation and screening, this research intends to further develop popped rice into zinc oxide-doped activated carbon for animal feed additive, which function as mycotoxin binder. Since mycotoxins are dangerous disease-causing contaminants in human foods and animal feeds (Yiannikouris and Jonany, 2002), several approaches have been developed to counteract with mycotoxins. Activated carbon is one of the selected materials that can be used as mycotoxin binder. Huwig et al. (2001) suggested that the capability of activated carbon to absorb mycotoxins from fungal species relying largely on the physical structure of the absorbent. This depends on the electric charge and its distribution, size of pores and channels, surface area, solubility, and solvent polarity. Regarding zinc oxide, it is used as an animal supplement to positively affect animal health or outputs (Hill et al., 2000), as a substitute for antibiotics among swine, or as feed additive to reduce the problem of post-weaning diarrhea from enterotoxigenic Escherichia coli among swine (Broom et al., 2006). Jahanbakhsh and Ebrahimi's (2016) study supported that modified activated carbon with zinc oxide nanoparticles displayed better adsorbing capability than conventional activated carbon. Therefore, the researcher focused on the next step of concept testing and evaluation for zinc oxide-doped activated carbon as an animal feed additive.

Concept Testing: The results from the personal in-depth interview with academics and industry insiders revealed the positive growth of the mycotoxin binder usage in the farming sector. The major reason is the scheme to prevent animals from toxins in contaminated animal feed. This entails a good opportunity for the new product development. Majority of the participants suggested that the most important factors affecting the purchase of feed additive were quality, price, and feed manufacturer's creditability. One participant mentioned that certifying the product is essential for its credibility, while others argued that its price is the most important factor. Thus, the product was considered as a commodity with little or no differentiation among brands. One participant suggested that the feed additives should be distributed through professional agents. He also suggested that the sales representatives play an important role in providing the product information and details about its usage which affects consumers' purchase decisions. The country of origin also affects the product's image. A participant mentioned that he trusted imported products from Europe and USA more than Thai products. Moreover, several participants recommended focusing on the swine as the first target group because the mycotoxin binder and zinc oxide are typically used as feed additive for swine. To summarize, most participants agreed that zinc oxide-doped activated carbon made from popped rice can penetrate the feed additive market. However, the producers need to have proof or certification about product features and its efficiency from a trusted institute or authorities, which will influence their purchase decisions about the new product or even persuade them to switch from the existing products in the market.

Business Analysis: The researcher collected data by administering a questionnaire-based survey to 72 respondents who worked in swine farms and engaged in the purchase decisions for animal feeds. The participants included 51 farm owners (74.2%), 11 veterinarians (15.3%), 7 farm managers (9.7%), 2 animal husbandmen (2.8%), and 1 farm worker (1.4%). Majority of them (52.8%) were from medium-sized farms with about 501-5,000 swine, while 40.3% of them were from large-sized farms with over 5,000 swine, and 6.9% of them were from

small-sized farms with about 100-500 swine. Most of them worked on farms using approximately 101-1,000 tons of feed per month (41.7%). They used about 11-100 tons a month (29.2%), more than 1,000 tons per month (16.7%), and less than 10 tons per month (12.5%), respectively.

Most respondents (90.3%) indicated that if they ever experienced a problem with mycotoxins on their swine farms, most of them ever used mycotoxin binders as high as 93.1%. The reasons for the use were mainly for protection of swine against disease caused by mycotoxins (77.8%), loss prevention in animal farm production and boost healthy productivity (73.6%) and ensuring good animal health (52.8%). The results revealed that most respondents used mycotoxin binders mostly for gestation sow feeds (90.3%), followed by lactating sow feeds (84.7%), nursery pig feeds (65.3%), creep feeds (62.5%), grower feeds (56.9%), and finisher feeds (55.6%), respectively. Most of their mycotoxin binders were imported from Europe (54.2%), followed by USA (27.8%) and China (23.6%). Only 22.2% of them used mycotoxin binders manufactured in Thailand. The respondents' product knowledge about zinc oxide was mostly used to reduce the problem of diarrhea or inflammatory bowel disease among animals (75%), slowing bacterial growth (40.3%), and reducing the use of antibiotics in animals (25%). A majority of respondents perceived that zinc oxide is predominantly the most important for nursery pig feeds (43.1%), followed by creep feeds (29.2%), lactating sow feeds (13.9%), gestation sow feeds (13.9%), finisher feeds (6.9%), and grower feeds (5.6%), respectively. Most of the zinc oxide was procured from China (27.8%), followed by local market or Thailand (23.6%), Europe (12.5%), other Asian countries (4.2%), and USA (4.2%).

Regarding the influential factors affecting the purchase decisions of feed additives, the quality of product was the most important factor (mean=4.63), followed by reputation of manufacturer (mean=4.42), product safety (mean=4.33), price (mean=4.29), certification of product standard (mean=4.22), product warrantee (mean=4.15), ingredients/components (mean=4.15), origin of product (mean=4.08), recommendation from sales representative (mean=3.96), promotion (mean=3.51), distribution channel (mean=3.42), brand (mean=3.32), international achievement award (mean=3.29), packaging (mean=3.01), and advertising (mean=2.82), respectively. The important sources of information about feed additives were from the representative sales/suppliers (95.8%), seminars (56.9%), academic/consultants (37.5%), recommendations from friends (20.8%), printed media, magazines, journals (15.3%), trade fair/events (15.3%), internet (9.7%), advertising (1.4%), and others (1.4%).

Regarding the perception towards the product concept of zinc oxide-doped activated carbon for animal feed additive made from popped rice, 29 respondents (40.3%) indicated that it was an interesting product; 38.9% of them agreed that it would add value to Thai rice; and 27.8% of them agreed that the main raw material of the product is natural.

Regarding the respondents' purchase intention towards the new product of zinc oxide-doped activated carbon from popped rice for animal feed additive, the majority of respondents (55.56%) were unsure about their decisions, while 29.17% of them had high purchase intention, 2.78% of them had very high purchase intention, 9.72% had no purchase intention for the product, and the remaining 2.78% had strong intention for not to buy the product. The researcher then further arranged their purchase decisions into two groups: purchase decisions consisting those who had very high intentions for the purchase (31.94%), and purchase decisions to not buy which included those who were not sure about their decisions, those with no purchase intention, and those with strong intentions to not buy the product (68.06%).

Table 3 Comparisons of factors between two purchase decisions

Factor	Mean of Importance Level		T-test	Sig.
	Not-to-buy	Buy		
Product quality	4.61 (0.67)	4.65 (0.57)	-0.246	0.806
Price	4.37 (0.83)	4.13 (0.81)	1.132	0.262
Ingredients/ Components	4.06 (0.90)	4.35 (0.83)	-1.291	0.201
Brand	3.39 (0.97)	3.17 (1.03)	0.853	0.397
Packaging	2.88 (1.03)	3.30 (0.82)	-1.737	0.087
Promotion	3.45 (1.23)	3.65 (0.83)	-0.720	0.474
Distribution channel	3.39 (0.99)	3.48 (0.73)	-0.389	0.699
Reputation of manufacturer	4.45 (0.74)	4.35 (0.64)	0.563	0.575
Recommendation from sales representative	3.94 (1.05)	4.00 (0.67)	-0.256	0.799
Product origin	4.08 (0.81)	4.09 (0.95)	-0.025	0.980
Advertising	2.69 (1.06)	3.09 (1.00)	-1.490	0.141
Product certification	4.08 (0.89)	4.52 (0.59)	-2.162	0.034*
International achievement award	3.16 (1.30)	3.57 (1.08)	-1.290	0.201
Product warrantee	4.08 (0.86)	4.30 (0.76)	-1.058	0.294
Product safety	4.29 (0.89)	4.43 (0.59)	-0.730	0.468

* p-value < 0.05; significant level = 0.05

The results listed in Table 3 suggest that there is a significant difference (p-value < 0.05) in the importance of two different decisions towards product certification of zinc oxide-doped activated carbon for animal feed additive. Those who intended to buy the new product were more concerned about product certification than those with the decision of not to buy the new product.

Conclusions

Rice is an important economic crop in Thailand and a source of income for Thai farmers in over four million households. However, rice demand is typically affected by various factors, which leads to price volatility and market instability. This research intends to develop a new product which is zinc oxide-doped activated carbon. The development based on popped rice for animal feed additives had a higher chance of success in the market, innovation and uniqueness (not easily duplicated), possibility regarding the availability of technology, product efficiency, profitability, accessibility to the market, competition in the industry, and greater expected return on investment than other alternatives, such as those of waste water treatment, catalyst, or even energy storage. The results from quantitative research revealed that mycotoxin binders are widely used, as feed additives, in most swine farms when they face problems caused by mycotoxins. Most of them use mycotoxin binders for several reasons such as prevention of swine diseases, loss reduction in farm production and high-quality farm outputs, and good animal health. Mycotoxin binders are mostly used for gestation sow feeds, followed by for lactating sow feeds, nursery pig feeds, creep feeds, grower feeds, and finisher feeds, respectively. Mycotoxin binders are imported from Europe, USA, and China. Only some swine farms used mycotoxin binders manufactured in Thailand. Zinc oxide is best known for reducing the problem of diarrhea or inflammatory bowel disease, slowing bacterial growth, and reducing the use of antibiotics in animals. It was considered as the most important for nursery pig feeds, followed by creep feeds, lactating sow feeds, gestation sow feeds, finisher feeds, and grower feeds, respectively. Based on questionnaire survey, the top five factors affecting the purchase decisions for feed additives include, the quality of product, reputation of manufacturer, product safety, price, and

certification of product standard. The results also suggested other influential factors affecting the purchasing decisions include product warrantee, ingredients/components, origin of product, recommendation from sales representative, promotion, distribution channel, brand, international achievement award, packaging, and advertising, respectively. Especially, product certification influences the decision to buy. Those who intended to buy the new product have a greater concern for product certification than those with the decision to not buy the new product. The results suggested that greater concern for price, brand, and reputation of manufacturer will lead to lesser chances of consumers considering buying the new product of zinc oxide-doped activated carbon from popped rice for animal feed additive. This means that the developer may need to create a reputation and becoming remarkable by getting certified for the new product at this stage. It is believed that zinc oxide-doped activated carbon which made from popped rice can enter into the feed additive market, a solid proof or certification from a trusted institute or authorities in relation to product features are necessary, and its efficiency with the competitive price (cost per performance), which influences the purchase decisions about the new product or even the switch from the existing products in the market.

The study about the purchase decisions can be supported with evidence before research and development, followed by commercialization. This process confirms that the new product will properly serve the customer requirements. The outcome of this research can be an alternative to create product varieties and enhance the competitiveness based on Thai rice as a value-added feed additive product through science and technology.

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