ASEAN International Sandbox Conference 2023
http://aseansandbox.org

Ministry of Agriculture and Cooperatives' Strategy for Enhancing Thai farmers' Escape from the Middle-income trap

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Abstract

"Behavioral Economics" is an interdisciplinary field that integrates knowledge from economics and psychology to explain irrational behavior, which is challenging to predict and influences individuals' decision-making processes. A fundamental characteristic of most individuals is their preference for freedom and aversion to control, which can be leveraged as a tool to guide and persuade individuals towards beneficial actions and decision-making. Although widely employed in healthcare and finance, there is a scarcity of academic literature applying behavioral theories to government policy and administration. This article aims to explore the realm of economic behaviorism through the lens of the "Nudge Theory" and propose strategies to apply these theories in establishing, implementing, and enhancing government policies and administration, specifically within the various contexts of the Ministry of Agriculture and Cooperatives' strategy. The findings indicate that the "Nudge Theory" can be utilized to design government activities that comprehensively align with the objectives and indicators of the Ministry of Agriculture and Cooperatives' strategy. The study suggests that the E A S T principle, encompassing (a) ease of implementation, (b) attractiveness, (c) promotion of social norms, and (d) timeliness, can serve as a guiding framework for fostering desirable behavior and should be implemented in accordance with the strategic plan within each context. This approach will enhance the performance of the Ministry of Agriculture and Cooperatives, address long-term challenges faced by Thai farmers, enable their escape from the middle-income trap, and sustainably achieve the targets and indicators outlined in the Ministry of Agriculture and Cooperatives' strategy.

Keywords: *Behavioral Economy; Nudge Theory; Ministry of Agriculture and Cooperatives' strategy*

1. Introduction

Agriculture has been an integral part of Thai livelihoods since the Sukhothai period, playing a critical role in the country's economy. The Thai government's proactive approach to agricultural management and development has elevated the profile of Thai agricultural products on the international market, earning Thailand the nickname "Kitchen of the World" (Thongmeethip, 2021) Approximately one-third of the Thai workforce is employed in the agricultural sector, which utilizes around 32% of the country's total land area (Ministry of Agriculture and Cooperatives, 2022). Despite the global economic contraction of 7.4% during the 2019-2020 fiscal year caused by the COVID-19 pandemic (PMTW, 2021), Thai agricultural exports experienced only a marginal decrease of 0.9% (Bank of Thailand, 2022), highlighting the resilience of the sector in generating income for farmers and improving their quality of life. However, the agricultural sector's contribution to the country's Gross Domestic Product (GDP) stands at only 8.55%, growing at a slower rate compared to neighboring agricultural producers (NESDC, 2022). This disparity results in low returns for farmers due to factors such as low consumption value, high production costs, and land-use problems (Songsittikul, 2021). As a result, many farmers are compelled to borrow money to cover cultivation expenses and household needs. The returns obtained often fall short of debt repayment, pushing farmers into a persistent cycle of poverty (Jaisuya, 2022). Although there are government income guarantee programs, they prove inadequate to cover both household expenses and debt repayment. The average outstanding debt per household is 433,000 Baht, with the majority originating from agricultural activities (Ministry of Agriculture and Cooperatives, 2022). The seasonal nature of agricultural income exacerbates financial constraints, leading to difficulties in effective financial management for farmers, compounded by natural disasters and unstable market prices (Chantarat, 2019). Despite the government's income insurance program for farmers, its implementation has resulted in significant debt accumulation amounting to 2.57 trillion baht

(Mahathanaseth, 2022), impacting other programs under the same Act. The accumulated loan balance of the Bank for Agriculture and Agricultural Cooperatives (BAAC) has risen sharply, reaching over 1.6 trillion baht, including substantial bad debt. It is evident that the existing project falls short of resolving the long-term debt problem faced by farmers. This raises important questions regarding the factors contributing to farmers' poverty and the need to analyze their economic behaviors and habits (Behavioral Insight). To address these issues and support Thai farmers in escaping the middle-income trap, agricultural promotion and policy strategies aligned with the 20-year agricultural and cooperative strategy (2017-2036) should be proposed in accordance with the Ministry of Agriculture and Cooperatives' strategic plan.

2. Literature Review

2.1 The Middle-Income Trap of Thai Farmers

The concept of the "Middle-income Trap" refers to the phenomenon in which countries that have transitioned from low-income levels to middle-income levels struggle to make the leap to high-income levels. This struggle is primarily due to an economic slowdown that leaves these countries stuck in the middle-income range (Wongsinthuwiset, 2017). In Thailand, farmers constitute a significant workforce, contributing 15-20% of total exports. However, they have faced a decline in net income over the past decade, which can be attributed to global changes (World Bank, 2022). Thai farmers encounter various challenges, including high levels of debt, issues with production factors and technological knowledge, an aging population, a deteriorating education system, and low agricultural productivity.

Research suggests that enhancing the potential of the agricultural sector and education improvement (Yarrow, 2022) also upgrading coalition (Schneider, 2016) is one solution to escape the "middle-income trap", social inequality, black economy, foreign investment, etc. Over the past period, it has been observed that various government and private sector organizations have provided assistance and support to the Thai agricultural sector, from upstream to downstream of business activities. These efforts include adjusting the agricultural sector's structure, conducting surveys and research related to agriculture, and developing high-level agricultural innovations and technologies. However, there is a need for genuine consolidation and stronger institutional factors to increase efficiency. This requires a clear and strong political consensus and a long-term reform tendency at the regional level. Such efforts are crucial for effectively leading Thai farmers out of the middle-income trap and towards sustainable economic growth.

2.1 Nudge Theory

The Nudge Theory is a concept that evolved from the notion of Libertarian Paternalism. It is a type of governance that shares similarities with parenting in a family. In such a scenario, parents allow their children to feel that they have freedom and autonomy in decision-making within a particular framework of rules. This concept aligns with the principles of libertarianism. (Richard &Thaler, 2009) conducted research and defined the Nudge Theory as a process of influencing human behavior without coercion. Its objective is to reinforce and guide individuals towards beneficial actions or to encourage them to make desirable decisions or exhibit desirable behaviors. The human thought process that affects behavior can be classified into two systems, namely, the Automatic Thinking System and the Reflective Thinking System (Banerjee & John, 2021). The Automatic Thinking System is a rapid decision-making system that depends on intuition and does not require reasoning. In contrast, the Reflective Thinking System is a decision-making system that considers cause and effect, involving reflection, which leads to slower processing. These two systems of thinking interact with each other and result in behavior that responds to the situation at hand. In a recent case study, it was discovered that Theresa M. May, the former second female Prime Minister of the United Kingdom, implemented the Nudge theory to boost tax revenue in the country. This was achieved by sending courteous letters to taxpayers, encouraging them to pay their taxes in line with their neighbors. As a result of the opt-out policy, the number of organ donors increased by up to 100,000 per year. Under this policy, it was presumed that individuals had consented to donation unless they explicitly declined (Samakoses, 2017). These successes illustrate the efficacy of automatic decision-making systems that operate under the Nudge theory. dditionally, the tripartite system employed by the charity organization STICKK has generated donations exceeding 2 billion baht. Users are empowered to enter into self-contracts, specifying a betting amount and a time frame to accomplish their desired goals within a year. Successful individuals receive their

funds back, while unsuccessful ones are required to donate the money to the default charity organization. This exemplifies the effective utilization of a default option and a commitment device to incentivize improved decision-making within a predefined time frame before the year's end.

Furthermore, a study conducted by Czap, Czap, Lynne, and Burbach (2015) demonstrated that the combination of empathy nudging with financial incentives significantly enhances farmers' engagement in conservation practices compared to employing a single nudge alone. This finding emphasizes the importance of integrating empathy into environmental policies and promoting farmers' involvement in conservation efforts. It aligns with research conducted by Zhang, Lu, Zou, and Lv (2022), which explores the application of nudging strategies to encourage arable land protection behaviors in China. The study discusses the cost-effectiveness of nudging and proposes six strategies that target cognitive and motivational aspects. These strategies include default options, framing effects, descriptive norms, as well as motives associated with home, country, heritage, and personal benefit. When implementing nudging, it is crucial to consider factors such as farmers' diversification, appropriate options, and the external environment. These factors contribute to the overall effectiveness of nudging in promoting positive behavioral changes among farmers in relation to land protection.

The Global Economics Laboratory, led by Owain Service (2014), based in England, has successfully applied the EAST principle in designing programs for both government and private sectors. The EAST principle comprises four key elements:

Easy: This element focuses on making it effortless for individuals to adopt desirable behaviors by utilizing "choice architecture." Taking advantage of the phenomenon of conformity (Ash, 1956), individuals can be influenced to engage in a behavior by making it the default option, thus reducing complexity. Access should be made convenient, and information should be communicated in a concise and clear manner. In cases where the information is extensive, breaking it down into smaller pieces enhances comprehension.

Attractive: Making behaviors interesting or appealing to individuals can be achieved through the use of visual, auditory, and other sensory cues or by reinforcing positive outcomes (Panditsewee, Jarupanya, Chantanee, Changcharoen, & Jeansut, 2021). This can involve providing rewards or increasing the perceived probability of a positive outcome.

Social: Highlighting social norms by informing individuals about prevailing behaviors and demonstrating the impact of those behaviors on society facilitates decision-making and increases personal commitment to the desired behavior. Humans are highly susceptible to social influence (Chawanonwanit, 2021).

Timely: This element emphasizes the ability to perform tasks within a specified timeframe and capitalizing on periods of heightened receptivity. The timing of proposals can significantly impact outcomes, as individuals are more inclined to change their behavior when they are outside their comfort zone. Humans are motivated by the fear of loss (costs) and the desire for gain (benefits) that arise in the immediate moment. Behavior change often occurs in the gap between intention and the initiation of new behavior (Batra, 2022). Therefore, it is important to consider the fear of loss, desire for gain, and address potential problems and obstacles when attempting to modify individual behavior. Effective planning to support timely behavior change is crucial for success.

This article focuses on government policies that use the Nudges Theory to induce behavioral changes among farmers. It begins by discussing (a) the objective of nudging, which is to shift behavior away from (b) related activities (old behaviors/desired behaviors) and towards (c) data collection and analysis from various sources and contexts of the situation. The data is gathered from (d) the old behaviors of farmers (nudged individuals) that are influenced by factors such as personal information, interests, abilities, etc. This information is then forwarded to (e) the government/policy-makers (nudgers) to design nudges that (f) align with the desired objective. Once the (f) nudge format is developed, the nudged individual will assess whether it meets the objective of the nudge or not. If the criteria are met, the nudge activity will be applied to the

nudged individual. However, if the criteria are not met, the nudged individual will evaluate the information and begin the process of adjusting the nudge objective (a) again. The E A S T principles are used to design nudges as Figure 1.

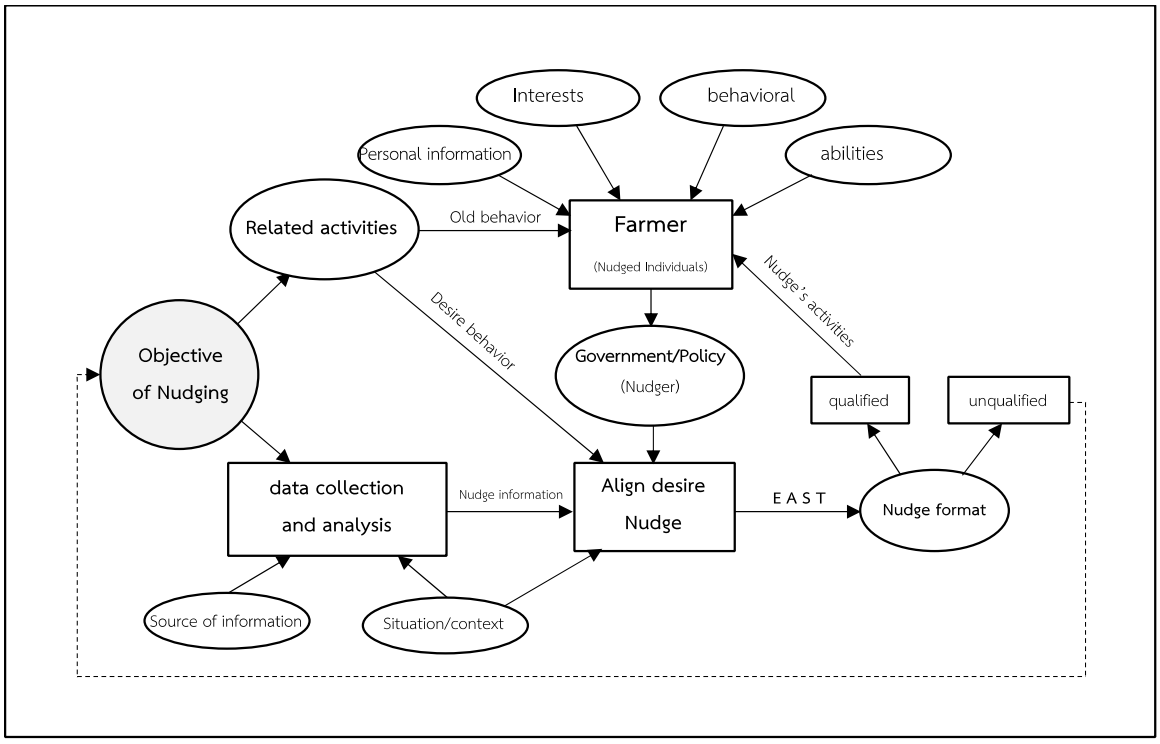

Figure1 The Process of Nudging Design and Decision-Making to Induce Desired Behaviors

2.3 Farmers have Escaped from being Classified as Middle-Income Earners under the 20-Year Agriculture and Cooperative Strategic Plan (2017-2036)

The utilization of Nudge Theory in agricultural and cooperative policies and strategies serves as a means to collect data and engage with farmers, facilitating the development of relevant policies that encourage desirable behavior towards specific goals. The objectives and indicators of each strategy are outlined in the 20-year (2017-2036) agriculture and cooperative development plan, overseen by the Ministry of Agriculture and Cooperatives in collaboration with projects conducted by the Ministry of Finance, the Department of Agricultural Extension, and the BAAC. These initiatives aim to support Thai farmers during periods of low crop prices and alleviate the burden of debt resulting from high-cost production factors. The Ministry of Finance, the Ministry of Agriculture and Cooperatives, and the BAAC are the primary agencies responsible for implementing and overseeing these policies. They work together to promote, supervise, monitor, and evaluate each policy and strategy to ensure alignment with the national 20-year strategy. The Office of Agricultural and Cooperatives has identified key issues in the Thai agricultural sector that require ongoing development, including strengthening farmers and agricultural institutions, enhancing production systems and production factors, addressing debt and land issues, promoting value-added creation, and facilitating the restoration and conservation of natural resources. Additionally, effective public sector management is crucial. The overall objective is to strengthen the weaknesses and leverage the strengths of the agricultural sector, working towards the vision of "stable farmers, prosperous agricultural sector, sustainable agricultural resources." This strategic direction aligns with the targets outlined in the 20-year agriculture and cooperative development plan, which encompasses four key strategies:

1st strategy: Empowering farmers and agricultural institutions to become Smart Farmers, Smart Groups, and Smart Enterprises, while instilling pride in agricultural occupations. The aim is to effectively manage agricultural labor and technology to support an aging agricultural society.

2nd strategy: Improving production efficiency and elevating agricultural product standards to meet international levels through the integration of science, technology, and knowledge. The goal is to promote value-added products and embrace smart farming practices.

3rd strategy: Enhancing the competitiveness of the agricultural sector through the development of technology and innovation, aligning with the Agriculture 4.0 concept under the Thailand 4.0 initiative. This involves managing information technology for agriculture, ensuring universal access and utilization for farmers, promoting research and commercialization of information, and fostering global networks.

4th strategy: Achieving a balance between sustainable agricultural resource management and environmental conservation, in line with the Sustainable Development Goals (SDGs). This includes restoring and conserving agricultural resources to achieve long-term balance and sustainability.

However, the objectives and indicators for each strategy are interconnected and linked to different levels of the annual Government Operation Plan 2022 of the Department of Agricultural Extension (Department of Agricultural Extension, 2021) can be concluded as shown in Table 1.

Table 1 Agricultural Development Objectives and Indicators According to Agricultural and Cooperative Strategies

Strategy	Objective	Indicator
1st strategy	- To enhance the potential of farmers. - Improve the strength of agricultural organizations, community enterprises, and networks. - Expand the project outcomes under the Royal Projects initiatives. - Decrease household expenses and increase income. - promote food security for farmers.	- Index measuring the maturity of farmers. - Income per farmer. - Percentage of Smart Farmers among all farmers aged 18-64. - Percentage of agricultural institutions that meet standard requirements. - Number of farmers who are members of agricultural institutions.
2nd strategy	- Local specialty agricultural products have increased in value. - Safe agricultural products have increased in value. - Farmers have been developed towards producing according to good agricultural practices. - Processed agricultural products and goods have increased in value.	- The agricultural sector's GDP has increased. - The growth rate of agricultural exports and products' value has expanded. - The percentage of farms/factories/businesses under the supervision of the Ministry of Agriculture and Cooperatives that have applied for standard certification has increased. - The number of large plots of land and areas that have been converted from Agri-map S3, N to S1 (in millions of rai) has increased.

Strategy	Objective	Indicator
	- Efficiency of agricultural production per unit has improved through adjustment. - Farmers' income has increased. - Income from agricultural tourism has increased.	
3rd strategy	- Agricultural economic zones for key agricultural products (Zoning) have developed production of agricultural products according to the suitability of the area. - Farmers have adjusted the production process by using technology to replace labor. - Farmers sell their products through online channels.	- Proportion of research budget to the total budget of the Ministry of Agriculture and Cooperatives. - Percentage of research, technology, and innovation that are developed for further application and benefit. - Percentage of farmers and service recipients who have received technology transfer and are able to apply it.
4th strategy	- Farmers reduce burning practices in agricultural areas. - There are value-added products made from agricultural waste materials	- Area of agricultural land conserved, improved, and restored - Area of irrigated land - Area benefited from external sources of water for agriculture outside of irrigation areas - Area of sustainable agriculture

Source: implemented from The Ministry of Agriculture and Cooperatives (2017) and The Department of Agriculture Extension (2021).

The agricultural promotion agencies operating under the Ministry of Agriculture and Cooperatives in each region are obligated to adhere to the principles outlined in the Agricultural and Cooperatives Strategy. These agencies play a crucial role in promoting the advancement of agriculture, farmers, agricultural organizations, and community enterprises. Their promotional efforts should primarily focus on enhancing production capacity, processing techniques, value-added initiatives, and the overall quality improvement of agricultural products and services. This can be achieved through thorough study, research, the development of effective measures, and the provision of comprehensive guidelines for promoting agriculture. Furthermore, the agricultural promotion agencies should actively facilitate the transfer of agricultural technology and services to ensure that farmers can engage in sustainable occupations, generate consistent incomes, and enjoy an improved quality of life. Therefore, the application of the Nudge Theory in the promotion of agricultural development, as discussed earlier, can effectively encourage desirable behavior that aligns with the goals and objectives of the Agricultural and Cooperatives Strategy. Overall, the integration of the Nudge Theory in agricultural promotion efforts can serve as a valuable tool to drive the implementation of the Agricultural and Cooperatives Strategy. By utilizing nudges, the agencies can effectively influence farmers' decision-making processes and steer them towards adopting behaviors that support the strategy's objectives. This approach can ultimately contribute to the overall development and progress of the agricultural sector while improving the well-being of farmers and their communities.

2.4 Facilitating farmers with Nudge Theory to break free from the middle-income trap, as stipulated in the 20-year (2017-2036) Agricultural and Cooperatives Strategy

The Nudge theory is a concept in behavioral economics that aims to encourage people to make decisions that align with desirable behavior without coercing them. Nudging involves stimulating individuals to make decisions that have been defined by the government (referred to as the "nudger") through policy or predetermined options. It addresses biases commonly held by farmers, such as risk aversion, loss aversion, and present bias, which directly influence their receptiveness to new technologies (Chantarat, 2022). Therefore, when implementing policies based on the Agricultural and Cooperatives Strategy, it is important to stimulate desirable behavior among farmers or employ the Nudge Theory in conjunction with the annual government action plan to achieve predetermined objectives. This approach will enhance production capacity, mitigate risk, increase farmers' incomes, and ultimately improve their quality of life, thereby breaking the cycle of poverty. For example, farmers can participate in research on mixed crop cultivation (to reduce risk aversion) and be encouraged to adopt new technologies and innovations to enhance production motivation (Rapeepong Ingsathit, 2019).

Furthermore, the significance and benefits of the Nudge Theory lie in its effectiveness in changing behavior without coercion and as a guide to promote beneficial behavior for farmers within the framework of rights and freedom in decision-making. Specifically, the Ministry of Agriculture and Cooperatives can design steps, activities, or methods to stimulate desirable behavior among farmers, enabling them to adopt sustainable agricultural practices and adapt to environmental changes such as climate change, drought, fluctuating agricultural prices, and social inequality. The Nudge Theory can also promote the development of smart farmers, smart groups, and smart enterprises, which can effectively manage the agricultural workforce and technology systems to support an aging agricultural society. By fostering efficient agricultural production and standardization, the agricultural sector can compete in the era of Agriculture 4.0 and establish connections with a global information network. Through summarizing and categorizing studies and research that have applied the Nudge Theory to encourage desirable behavior and achieve predetermined objectives, guidelines for nudging farmers to escape the middle-income trap according to the Agricultural and Cooperatives Strategy over a 20-year period (2017-2036) can be derived, as illustrated in Table 2.

Table 2 Application of Nudge Theory in accordance with Agricultural and Cooperatives Strategy for 20-year period (2017-2036)

Farmer's Outcome	Desirable Behavior	Guidelines for Nudging (EAST principle)	Research studies related to the topic
1st strategy	Farmers have the potential to produce efficiently, along with a strong agricultural network, reducing household expenses and increasing income, and ensuring food security.	**(Easy)** The registration plan's structure is linked to various sectors' networks, which are connected from the Ministry of Agriculture and Cooperatives to both public and private sector networks and state enterprise organizations according to the principles of self-development guidelines.	(Yooprasert, Keowarn, Sanserm, & Jun-iad, 2018); (Bunyarat, 2016); (Koutsouris & Zarokosta, 2022) ; (Oerlemans & Assouline, 2004)
		(Attractive) Providing support to farmers who adhere to agricultural standards through intervention, such as health inspection rights, certification of agricultural standards per hectare/field or farm, providing	(Rose, Keating, & Morris, 2018) ; (Yap, 2015)

Farmer's Outcome	Desirable Behavior	Guidelines for Nudging (EAST principle)	Research studies related to the topic
		knowledge/training to farmers, and rewarding farmers who have the potential to produce according to specified criteria.	
		(Social) Developing a collaborative learning network involving main organizations, related networks, farmers, and researchers, to encourage participatory practices.	(Meekotkong, Sawatta, & Rattanakanasap, 2021) ; (Sripraprai Udomlamul et al., 2019); (Richardson, Coe, Descheemaeker, & Haussman, 2021) ; (Isaac, Nyantakyi-Frimpong, Matous, & Lawrence, 2021)
		(Timely) Information and news related to economic trends, government policies related to agriculture, weather forecasts, and other relevant information are transmitted to farmers or interested parties.	(Sanserm, Tangwiwat, Yooprasert, Keowan, & Rattanacharoen, 2021) ; (Panbucha, Sanserm, & Saranrom, 2021); (Havinal, 2020) ; (Arora, 2017)
2nd strategy	Agricultural products have added value through local identity, safe agriculture practices, various processing methods, and development towards standardized production. In addition, income is generated through agricultural tourism, and farmers have increased income.	**(Attractive)** The Ministry of Agriculture and Cooperatives has strengthened farmers by providing the Good Agricultural Practices (GAP) certification, promoting safe and sustainable agriculture practices. Additionally, the government agencies act as intermediaries between farmers and tourism businesses, such as hotels, and provide opportunities to participate in local product exhibitions and events, supported by the Ministry of Commerce.	(Hennessey M, 2020) ; (Abulai, 2013) ; (Chaiseang, 2021) ; (Noknoi, 2018)
		(Social+Timely) Organize partnership activities that provide opportunities for local farmers with unique local identity and GAP farmers to meet and work together according to the suitability of each area. This includes promoting statistical information and the number of participants through various channels of the Department of Agriculture	(Zaga-Mendez, 2020)

Farmer's Outcome	Desirable Behavior	Guidelines for Nudging (EAST principle)	Research studies related to the topic
		Promotion, the Ministry of Tourism and Sports, etc.	
3rd strategy	Farmers are utilizing technology to improve their production, including producing agricultural products suitable for their specific geographical areas. They are also selling their products through online channels.	**(Easy)** Identify and select leading farmer groups who have the potential to implement the 1st Strategy and/or 2nd Strategy within the same area to participate in a project in the form of a "Social Lab."	(Chantarat. 2019) ; (Juntaramast, 2016); (Saruno, 2015); (Mohammad & Amir, 2020)
		(Attractive+Time) Government agencies and related organizations provide funding for start-ups that develop platforms linking farmers and users, serving as intermediaries in creating online markets and promoting sales.	(Didero, 2021); (Brooks, 2021); (Kuhfuss, Preget, Thoyer, & Hanley, 2016)
4th strategy	Farmers practice sustainable agriculture and have products that are processed from agricultural waste.	**(Easy)** Provide information on sustainable agriculture practices and upcycling from agricultural waste, as well as knowledge resources from relevant organizations.	(Brown, Anwar, Hossain, & Islam, 2022) ; (Zhang, Lu, Zou, & Lv, 2022) ; (Prachachoti, 2017) ; (Songkhla, 2013)
		(Attractive) Supporting individuals or groups practicing sustainable agriculture to become community leaders.	(Wasinon, 2011); (Viphatphumiprathes, 2013)
		(Social+Timely) The Ministry of Agriculture and related agencies promote and disseminate knowledge about the importance and impact of sustainable agriculture.	(Nyathi, Stevens, Moyo, & Posthumus, 2012) ; (Llanillo, Telles, Junior, & Kaweesa, 2020)

The guidelines presented in the aforementioned table for nudging behaviors that promote desired outcomes can serve as a valuable resource for implementing, adapting, and developing nudging policies aimed at stimulating desired behaviors among farmers without the need for enforcement. These guidelines

can act as tools to strengthen and guide beneficial behaviors. It is important to consider the goals and potential impacts of such interventions and gather relevant in-depth information during the design process of nudging procedures to achieve desirable outcomes, despite potential obstacles or limitations that may arise during experimentation. The Ministry of Agriculture and Cooperatives and other relevant agencies can draw lessons from these findings and utilize them to enhance and refine future policies. For example, a study conducted in India demonstrated the effectiveness of nudging techniques in encouraging farmers to adopt water-saving irrigation practices through simple interventions such as personalized messages and visual cues. The results revealed a significant reduction in water usage and increased crop yields, leading to improved sustainability and economic benefits for farmers. Another successful application of nudging can be observed in the adoption of organic farming practices. By employing nudging strategies such as providing information on the harmful effects of chemical pesticides and offering incentives for organic certification, farmers have been motivated to transition to more sustainable and environmentally-friendly farming methods. This not only enhances their health and well-being but also contributes to ecosystem preservation and the production of healthier food for consumers. Furthermore, nudging has proven effective in promoting financial literacy and enhancing farmers' financial management. Through measures such as simplifying information on financial products, introducing default savings options, and facilitating access to financial services, farmers have been empowered to make informed financial decisions, reduce debt, and establish sustainable livelihoods.

3. Limitations and Counterarguments

While this study provides valuable insights into the application of behavioral economics and nudging strategies in government policies and administration, it is important to acknowledge certain limitations. Firstly, it is crucial to note that the findings and recommendations presented in this study are context-specific, based on the Ministry of Agriculture and Cooperatives in Thailand. Therefore, caution should be exercised when generalizing these findings to other countries or agricultural systems. Secondly, the study's reliance on specific data sources introduces inherent limitations that may impact the depth and accuracy of the analysis. It is essential to consider the availability, reliability, and representativeness of the data when interpreting the results. Additionally, it is important to recognize the complexity of human behavior, which is influenced by socio-cultural and psychological factors. Nudging strategies alone may not fully capture or account for these complexities. While nudging can be effective in shaping behavior, it is crucial to acknowledge that it may interact differently in diverse cultural and contextual settings. Thus, tailoring approaches to suit specific populations and considering local norms and values becomes imperative to achieve desired outcomes effectively.

Moreover, ethical concerns arise when implementing nudging interventions. It is essential to strike a balance between achieving positive outcomes and preserving individual autonomy and freedom of choice. Ethical considerations should guide the design and implementation of nudges to ensure that they respect individuals' rights and do not manipulate or unduly influence their decision-making processes. Furthermore, to evaluate the long-term sustainability and enduring impact of nudging strategies, more research is needed. Longitudinal studies can provide insights into the consistent effectiveness of nudging over time and the potential challenges in maintaining behavior change. Evaluating the long-term impact will contribute to a more comprehensive understanding of the efficacy and durability of nudging interventions.

4. Conclusion

The Agricultural and Cooperative Strategy in the Government Action Plan for the year 2022 of the Department of Agriculture aims to achieve several goals in agricultural development. The 1st strategy is to enable farmers to have the potential to produce, along with a strong agricultural network, reduced expenses, increased household income, and food security. The 2nd strategy is to add value to agricultural products through local innovation, safe agriculture, various processing methods, and development to meet standards, generating income through agricultural tourism, and increasing farmers' income. The 3rd strategy is for farmers to use technology to aid in production, including producing agricultural products suitable for the area and selling them online. Finally, the 4th strategy is for farmers to practice conservation agriculture and to have processed products from agricultural waste materials, which is a long-term development of the agricultural sector in order to achieve the vision of the Ministry of Agriculture and Cooperatives. The principles of behavioral economics, specifically the EAST framework, can be effectively utilized in policy

design to guide the implementation of behavioral change strategies among farmers. Firstly, it is crucial to prioritize the facilitation of desired behaviors by simplifying processes, reducing barriers, and providing accessible information and resources that promote the adoption of sustainable agricultural practices. Streamlining administrative procedures, offering user-friendly technology tools, and promoting easily comprehensible educational materials are among the initiatives that can enhance farmers' engagement. Secondly, the significance of attractiveness in nudging behavior change is underscored, whereby visually appealing campaigns, positive reinforcement techniques, and the highlighting of benefits and rewards associated with sustainable practices can boost farmers' motivation. Showcasing success stories of farmers who have successfully adopted sustainable practices and providing incentives such as financial rewards or recognition for environmentally friendly methods are effective strategies. Thirdly, the power of social influence in shaping behavior is emphasized, and it can be harnessed through community-based programs, peer learning networks, and farmer-to-farmer knowledge sharing platforms. Highlighting social norms and demonstrating that desired behaviors are widely adopted and respected within the farming community can encourage alignment with these norms. Lastly, the importance of timely interventions is highlighted, with an emphasis on recognizing critical decision-making periods for farmers and implementing nudges at strategic moments to maximize their effectiveness. Providing timely weather forecasts, market information, and reminders about seasonal agricultural practices can support informed decision-making and appropriate actions. While this study offers valuable insights and practical recommendations, it is essential to acknowledge its limitations. The generalizability of the findings may be constrained by the specific context of the study. Future research should explore the effectiveness of nudging strategies in diverse agricultural settings and cultural contexts to enhance their applicability and impact. In conclusion, the integration of nudging strategies into agricultural policies and programs holds substantial potential for promoting sustainable practices, improving farmers' livelihoods, and fostering overall agricultural development. Policymakers can design effective nudging interventions tailored to the specific needs and challenges of farmers by leveraging the principles of ease, attractiveness, social influence, and timeliness. Further research and policy implementation should continue to explore and refine nudging approaches to maximize their impact and ensure long-term sustainability in the agricultural sector.

5. Suggestion

Based on the study's findings, it is recommended that further research focuses on addressing the limitations identified in this study and exploring additional aspects related to the application of nudging procedures in agricultural and cooperative strategies. Future research should investigate the long-term effectiveness and sustainability of nudging interventions, considering factors such as behavior persistence and the potential for habit formation. Additionally, studies could delve deeper into the cultural and contextual factors that influence the success of nudging strategies in different agricultural settings and regions.

To facilitate the practical application of the research findings, policymakers should consider incorporating nudging procedures into their agricultural and cooperative policies. This can be achieved by establishing guidelines and frameworks for designing and implementing nudges that align with the specific needs and challenges faced by farmers. Policymakers should also ensure that the design of nudging procedures is economically viable by conducting a cost-benefit analysis, taking into account the resources required for implementation and the potential benefits for farmers and the agricultural sector as a whole. Furthermore, it is important for policymakers to consider the ethical implications of nudging interventions and to strike a balance between promoting desirable behaviors and respecting the rights and freedoms of individuals. By addressing this research gaps and providing policymakers with practical guidance, the study's findings can contribute to the development of effective and sustainable agricultural and cooperative strategies that support farmers, enhance agricultural productivity, and promote sustainable development in the agricultural sector.

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