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Towards Data-Driven Dairy Farming in Thailand: A Preliminary Survey of Farmer's Needs Based on In-Depth Interviews

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ABSTRACT

Currently, Thailand's dairy industry faces five critical problems: aging farmers, shortage of laborers, lack of successors, low productivity, and oversupply of milk. The consensus among researchers and dairy farming experts is that the root cause of the problems is the lack of in-depth data (individual cow yield per milking). Without data, the growth of the dairy industry is stagnating, resulting in dairy farming as a career being perceived as economically unstable. Ultimately, this results in aging farmers, shortage of laborers, and lack of successors as more young farmers decide to pursue other career paths. Additionally, the lack of data prevents effective management of dairy farms and the dairy supply chain leading to two problems. Following the design-thinking approach, in-depth interview is chosen as the method of choice to empathize directly with the users and obtain insights regarding their problems and needs, especially those related to data management. The interviews were conducted with farmers from nine different farms selected based on their size, milking system, and location. The result showed that most selected farms do not record the individual cow yield per milking. Furthermore, milk collection centers require farmers to deliver milk within a specific time after it is milked. This further discourages data collection as it is time-consuming. Additionally, the lack of growth increased cow feed prices and diseases among many other factors further dissuade farmers from investing in technology to assist them in collecting the data. Therefore, the insights obtained from the interview will be the cornerstone in coming up with a practical solution to the current data problems.

Keywords: Dairy farming, Farmer's needs, Preliminary survey, Thailand

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INTRODUCTION

Thailand has always been known as the land of agriculture. The agriculture sector is one of the most extensive of Thailand's economy covering 9.3% of its total GDP. In 2019, the market value of the dairy industry reached 108 billion THB (Statista, 2021). In addition, the sector has presented many job opportunities for the Thai population (Manakitsomboon, 2021). As one of the main contributors to Thailand's agriculture sector, the dairy industry's importance cannot be overstated.

As for the technology situation in Thailand, the trend of farming 4.0 can be seen in the agriculture sector as well as the dairy industry. However, smart farm adoption is not as widespread among smallholders. This is because investment costs remain high compared to their revenue and lack of knowledge. Moreover, the dairy industry's big data infrastructures are not standardized across organizations, leading to low potential and many issues in actual practices (Thailand Development Research Institute, 2020). Currently, there are five critical problems in the Thai dairy industry.

Aging farmers, lack of successors, and shortage of laborers are three main problems. As of 2020, approximately 35% of dairy farmers are between 46-55 years old, 30% are between the age of 56-65, and only 15% are in the younger generations (Kwangsawad and Jattamart, 2021). This data shows the tendency that dairy farmers are primarily elders. Since farm ownership in Thailand is mostly passed down from generation to generation, once the older generation resigns, the younger generation has to take over the business. However, with the rise of urbanization, more young farmers are opting to pursue other careers in urban areas perceived to be more economically stable (Salvago, 2018).

Another problem is the low productivity of Thai dairy farms. One of the main factors which affect the amount of milk produced is genetic. In Thailand, most dairy farms are smallholders with an insufficient workforce to record data for effective breeding programs. This leads to the average productivity of Thai farms (14 kg/cow/day; Dairy Farming Promotion Organization of Thailand, 2022) being lower compared to other countries (e.g., Japan, Australia, and New Zealand).

The last problem is the oversupply of milk at a particular year period. Thailand's milk market is separated mainly into two submarkets including commercial and school milk. Every day, 3,756.5 tons of milk were produced by farmers in Thailand, and approximately 1,170 tons (31%) were used to produce school milk (Office of Agricultural Economics, 2020). Therefore, a large excess of milk can be seen every year during school breaks.

In order to improve productivity and fix the oversupply problems, applications for data recording and utilization, such as CowLog application developed by Kasetsart University; Zyanwoa developed by Zyntelligent Co., Ltd; were proposed (Songsupakit et al. 2019). However, these applications are not practical as data must be entered manually. Additionally, improvement in terms of user experience can still be made. Thus, this study aims to collect farmers' insights, especially those related to data management, using in-depth interviews as the method. The collected insights will allow for the solutions to the five main problems to be formulated.

Table 1. In-depth interview questions.

Topics	Questions
1. Demographic profile	a. Farmer age b. Location c. Number of manpower
2. Farm information	a. What type of suction unit do you use? / How does it work? / How to maintain and clean it? b. Number of cows c. Amount of milk per day
3. Operation	a. What does the working schedule look like? b. Do you collect the milk yield of each cow? If yes, how?. If not, why? c. How large is a bucket?
4. Insight issues	a. Please explain and describe any problems occurred in the farm b. Is not knowing individual milk yields a problem?
5. Data collection	a. Currently, what data is collected? What is their purpose? b. How do you store the collected data? c. What additional data do you want to keep? d. Do you know that knowing individual milk yield helps improve genetics by facilitating effective selective breeding as well as assisting in forecasting the supply?
6. Technology Adoption	a. Do you use a desktop computer? What do you use it for? b. Do you use a smartphone? What do you use it for? c. Does the internet cover both your house and farm area?
7. Technology investment perception	a. What is your perspective toward investing in smart technology to uplift efficiency of the farm?

IN-DEPTH INTERVIEW OVERVIEW

Following the purposive sampling framework, we selected study farms based on farm's size (i.e., classified by the number of milking cows), farm's locations, and tools used to conduct a deep interview to acquire detailed information, including thoughts of farmers, behaviors, and perspective as well as validating the pain points directly with the farmers. Their demographics, daily schedule and activities, data handling and usage, and perspective towards technologies were to be inquired. Interview questions are shown in Table 1.

In the end, nine small-sized farms were selected and contacted (see Table 2), with two farms from Sakaeo Province, three farms from Khon Kaen Province, and four farms from Saraburi Province. These farms could represent the typical farm characteristics in Thailand's East, Central and Northeast areas. The restriction of the COVID-19 situation in Thailand determined the interview sessions were conducted online. The following parts present the outcome of

Table 2. Interview result summary I.

Farm No.	Province	Age (Years)	Number of man-power	Number of suction unit	Number of cow	Amount of milk per day (kg)
1	Sakaeo	36	Not Availa-ble	Not Available	38	150
2	Sakaeo	32	4	4	67	380
3	Saraburi	52	4	Not Available	50	350
4	Khon Kaen	39	3	4	70	360
5	Khon Kaen	34	3	6	65	300
6	Khon Kaen	29	5	4	165	1100
7	Saraburi	38	3	3	80	400
8	Saraburi	36	2	2	56	230
9	Saraburi	41	1	2	35	400

the interview and any additional information, concerns, and opinion that were obtained during the conversation.

IN-DEPTH INTERVIEW RESULT

As shown in Table 3, the results from the in-depth interview are very positive with most farmers acknowledging the benefits of knowing the individual milk yield of each cow. Although this is the case, only two out of nine farms record the individual yield. As mentioned previously, this is due to the lack of work-force and time, as weighing a 30-kilogram bucket manual is impractical and would prevent most farms from delivering their milk to the cooperatives on time. Additionally, in spite of the fact that most farmers are informed regarding the benefits of the data, most farmers are not knowledgeable enough to perform data analytics and convert them into meaningful conclusions and would require the help of external researchers and specialists. On the positive side, all nine farms recorded other data such as reproduction data and the cows' names, ages, etc. These data are recorded using both physical notes as well as note-taking applications.

As for technology adoption among farmers, the result shows that they are familiar with smartphones and prefer them to computers. This adoption could be seen by using existing application-supported data collection, such as the previously mentioned CowLog, Zyanwoa, and CowManager. Most farmers have their home and farm area covered with an Internet connection, including WiFi and cellular coverage. However, some periods of Internet downtime are not uncommon. In addition, seven out of nine farms have positive perception toward investment in technology. The other two farms do not have a positive perception of technology. The first farm considered that investments in technology were costly and barely reached the breakeven point. The second farm was afraid that with the upcoming Free Trade Area (FTA) agreement with Australia (Department of Livestock Development,

Table 3. Interview result summary II.

Farm No.	Currently collects individual cow yield	Data collection method	Wants to know individual yield	Availability of internet connection	Perception toward technology investment
1	No	Notebook	Yes	Available	Negative
2	No	Notebook	Yes	Available	Positive
3	Yes	Notebook	No	Not Available	Negative
4	Yes	Application	Yes	Available	Positive
5	No	Application	No	Available	Positive
6	No	Application	No	Available	Positive
7	No	Application	Yes	Available	Positive
8	No	Notebook	No	Available	Positive
9	No	Application	No	Available	Positive

2021), Thailand's dairy industry would stagnate with fewer opportunities for growth, leading to an unwillingness to invest in technology.

CONCLUSION

Through the in-depth interview, it can be seen that there are multiple reasons why farmers do not record in-depth data (individual cow yield per milking), although most of them understand the benefits of collecting such data and have a positive perception toward investment in technology. These reasons include the lack of a workforce, tools, and know-how. Even though solutions such as the aforementioned applications are available, these applications are not efficient. Without a sufficient workforce, data cannot be collected due to time limitations imposed by milk collection centers. Most farms would also require help and support from external specialists to analyze the data even if they actively collect it. Additionally, other factors such as diseases, trade agreements, and increasing feed prices further discourage farmers from investing in the workforce and technologies for data management.

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