

Economic impacts of the Klong Luang Ratchalothorn reservoir project: Insights from beneficiary households in Thailand

Pech Taveevong¹ Junya Singkham^{2*} Ponsaran Saranrom³ Janenarong Tiensawang⁴ Siriluck Namwong⁵
Narat Rattanacharoen⁶ Sutthipong Noonai⁷

^{1,2,3,4,5,6} School of Agriculture and Cooperative, Sukhothai Thammathirat Open University, Nonthaburi

⁷Socio Economics and Project Evaluation Division, Bureau of Project Management, Royal Irrigation Department,
Bangkok

Corresponding author's e-mail: junya_28@hotmail.com^{2}

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Abstract

This study analyzes the economic conditions of households benefiting from the Klong Luang Ratchalothorn Reservoir Project in Chonburi Province. It evaluates the current financial state, identifies challenges, and compares agricultural data from the 2018–2019 and 2022–2023 planting seasons. The results indicate that the reservoir positively influenced agriculture and yielded substantial advantages, including enhanced net income from livestock farming. Nonetheless, elevated production expenses, declining agricultural prices, financial challenges, and a significant rise in pest and disease occurrences since 2019 persist. Household expenses and debt also showed significant growth, while household savings increased, it indicated the improved financial resilience. Despite these positive trends, economic stability was still impacted by rising costs and market volatility. The research highlighted the importance of targeted support, including enhancing water resource management, training for farmers, and economic assistance, to improve household financial health and to ensure sustainable development in the region. These measures aim to mitigate existing challenges and strengthen the livelihoods of affected communities, promoting resilience and long-term economic sustainability.

Keywords: economic impact, Klong Luang Ratchalothorn reservoir, production costs

Background and significance

Water resources are critically important for human life, and play a vital role in all social and economic

activities. In particular, water is essential for agricultural production, which serves as Thailand's primary source of income. Therefore, efficient water resource management is crucial to support agricultural development and to meet the growing demand for water in agriculture and other related sectors. Agriculture in Thailand accounted for 75% of the country's total water demand that, made it critical factor in promoting the growth of the national economy. However, the ongoing problem of water scarcity, especially in agricultural areas that relies on natural water sources, it remains a significant challenge that impacts farming households' economic and social conditions.

One method to tackle these limitations is through the construction of dams and reservoirs, along with the implementation of suitable irrigation systems in the region. However, discussions continue regarding the effects of these irrigation systems; for instance, the building of dams along the Mekong River has led to the decreasing several fish species (Yuichiro et al., 2020). Conversely, the findings indicated that farmers, especially those living near reservoirs and dams, had benefited from drought mitigation and reduced water scarcity for agricultural development, resulting in economic advantages (Nguyen et al., 2024). The Klong Luang Ratchalothorn Reservoir Project, initiated under the royal initiative in Chonburi province, was pivotal in addressing the water scarcity problem in the province's northeastern region. This area depended on water for agriculture, industry, and household consumption. To clarify the actual effect of the reservoir project, it was essential to examine the effects of the irrigation system on farming households and the constraints faced by nearby farmers and provide recommendations for the economic and social development of households benefiting from this project. Additionally, it aimed to compare the economic, social, and agricultural data from the 2022–2023 planting season with data from the 2018–2019 season to highlight changes and emerging trends in the region. Furthermore, this study examined agricultural development within the project area and evaluated the associated economic and social impacts. The findings were intended to offer practical recommendations for maximizing the efficiency of water resource management, particularly in optimizing water usage for agriculture, household consumption, and industrial development in the region.

Objectives

1. To study the economic conditions of households benefiting from the project.
2. To study the economic problems of households in the areas benefiting from the project.
3. To compare the economic conditions of the 2022–2023 planting season with the 2018–2019 economic survey data.

Literature reviews

This literature review draws from various studies and sources, focusing on the economic and social evaluation of the Klong Luang Ratchalothorn Reservoir Project, initiated under royal directive in Chonburi province in 2023. The review covered several vital areas relevant to the economic and social conditions of households benefiting from the project, the comparison of agricultural, financial, and social data across planting seasons, and recommendations for economic and social improvements. The following sections provide an overview of these topics presented in prior research.

Economic and social conditions of households benefiting from the project: one of the primary objectives of this study was to understand the current financial and social challenges that households in the project's area faced

and gathered recommendations for improvement. Previous research, for example Royal Irrigation Department, had highlighted that large-scale water projects like the Klong Luang Ratchalothorn Reservoir were critical for improving agricultural productivity and supported the livelihoods of local communities. Despite the reservoir's positive effect on water availability, many households in the area continually faced economic difficulties due to inconsistent water supply and limited access to irrigation.

Studies on water resource management, including non-structural and structural approaches, demonstrated that these strategies could improve household economic outcomes. However, as noted by the Department of Water Resources (2020), effective management also required community involvement and tailored solutions to meet the specific needs of different agricultural zones. This aligned with the first research objective, which sought to identify and address the region's economic and social problems.

Comparing agricultural, economic, and social data across different planting seasons were the second objective. The second objective focused on comparing the conditions of the 2022–2023 planting season with those of the 2018–2019 season. The data from both periods offered insights into the evolving challenges agricultural households face in the project area, particularly regarding their economic and social well-being. Previous evaluations, such as those by the Office of Project Evaluation and Management, had shown that projects like the Klong Luang Ratchalothorn Reservoir could significantly impact crop yields, household incomes, and social stability. However, these impacts were inconsistent, water availability fluctuations could cause productivity variations between seasons.

Technological advances in water management, such as ICT and Big Data, had recently been used to monitor water distribution more efficiently and guide farming practices according to real-time water conditions. The Royal Irrigation Department (2023) reported that these technologies could potentially improve agricultural outcomes, particularly in drought-prone areas like those surrounding the reservoir. Comparing data from 2022–2023 with that from 2018–2019 would help evaluate whether these technological advancements and other interventions have contributed to improved agricultural and economic outcomes.

According to and social improvements: Taveevong (2023) highlighted that satisfaction with the project's benefits was an important indicator of its success. Household satisfaction had revealed that community members' perceptions in terms of project's benefits were various depending on their economic and social conditions. The data gathered would address the first objective of understanding current problems and contribute to formulating recommendations for improving household welfare. These recommendations may include further investment in water management infrastructure, capacity building for farmers, and additional economic support mechanisms to mitigate the financial challenges faced by households.

In conclusion, this literature review demonstrated that while the Klong Luang Ratchalothorn Reservoir Project had provided substantial benefits in terms of water availability and agricultural productivity, significant challenges remain faced by households. By comparing the conditions across different planting seasons and addressing the economic and social issues specific to the project area, this study aims to provide actionable insights to improve the livelihoods of those who depend on the reservoir's resources, ensuring a more sustainable and equitable development for the community.

Conceptual Framework

This study's conceptual framework examines the socio-economic effects of the Klong Luang Ratchalothorn Reservoir Project on rural households, linking water resource access, household economic outcomes, and targeted support mechanisms. Key components include:

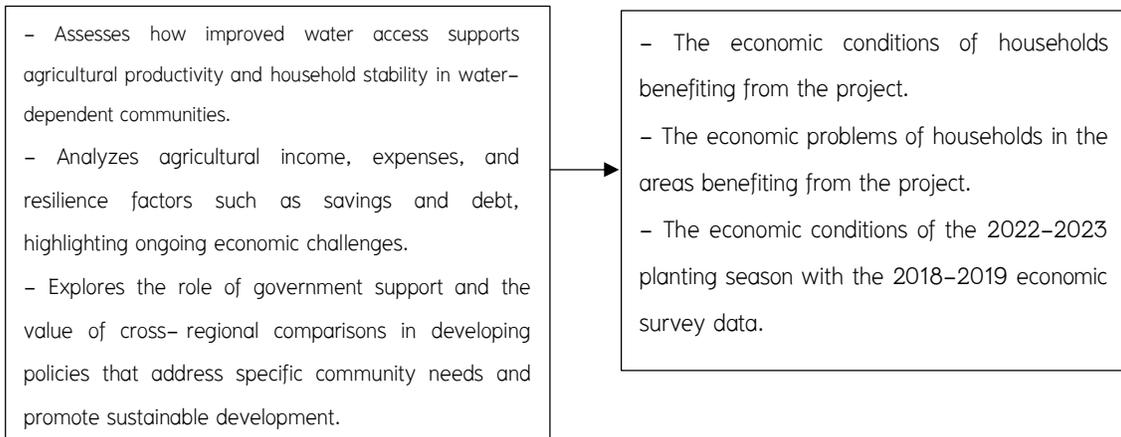


Figure. 1 Conceptual framework of the research

Methods

This study used a survey research design to assess households' economic and social conditions benefiting from the Klong Luang Ratchalothorn Reservoir Project in Chonburi Province. The research analyzed current conditions, identifies challenges, and compares findings with previous surveys. The study focuses on two districts in Chonburi, Koh Chan and Phanat Nikhom, which are directly affected by the reservoir project.

1. Populations and samples

The population and sample using in the research consisted of households in the areas benefiting from The Klong Luang Ratchalothorn Reservoir Project w a s initiated under the royal directive in Chonburi Province. This included 44,828 households from Phanat Nikhom District and 14,300 from Koh Chan District, totaling 59,128 households. The Socio Economics and Project Evaluation Division used a purposive sampling method, selecting a sample of 211 households, including 174 households from Phanat Nikhom and 37 households from Koh Chan. The respondents must be directly involved and able to answer questions and providing information in alignment with the research objectives.

2. Research tools

A questionnaire was developed to collect data on household economic conditions and economic and social issues. The instrument was validated by experts using the IOC index, with all questions scoring above .5.

3. Data collection

Data were gathered using surveys administered to households in the targeted area. Respondents granted informed consent, and the data was securely stored and evaluated. Upon completion, all personal data of the responders was obliterated.

4. Data analysis

Descriptive statistics (frequency, percentage) were used to analyze economic conditions and economic and social problems. Data from 2022–2023 was compared with 2018–2019 to identify trends and changes.

Results

This study presented findings in three main areas: the economic conditions of beneficiary households, the financial challenges, and a comparison of agricultural and economic conditions between the 2018–2019 and 2022–2023 planting seasons.

1. The economic conditions of households in the areas benefiting from the project

1.1 Household analysis in the project area showed an average household head age of 57.86 years, with 4.13 members per household, including 2.84 economically active individuals (ages 15–60). The average landholding size was 46.85 rai per household.

Table 1 The primary household data

	Indicator	Value
1	Average Age of Household Heads (years)	57.86
2	Average Household Size (persons per household)	4.13
3	Average Labor Force (aged 15–60) (persons per household)	2.84
4	Average Landholding Size (rai per household)	46.85

1.2 Economic conditions of households'. benefit from the Project reported that 32.2% had annual expenses on chemical fertilizers and pesticides of less than 10,000 baht. this Moreover, 21.8% spent more than 40,000 baht per year, while 19.4% had expenses between 10,001 and 20,000 baht per year. The average expenditure on fertilizers and chemicals was 31,741.83 THB per year, indicating a considerable household financial burden (Figure. 2).

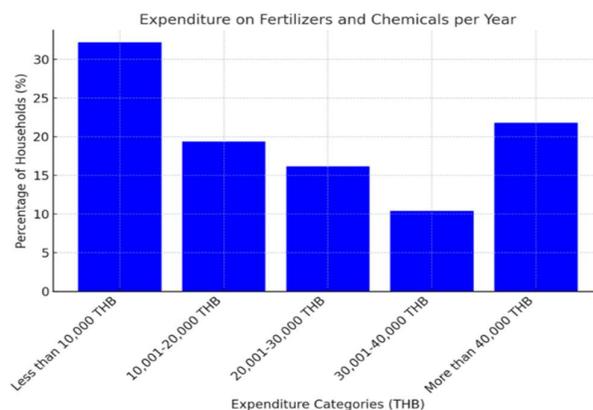


Figure. 2 Expenditure on Fertilizers and Chemicals per Year

The trends in chemical fertilizer usage among households benefiting from the Project showed that 44.1% had no change in their use of chemical fertilizers. This was followed by 22.3%, indicating a decrease, and 21.8% reporting an increase in fertilizer usage. Regarding pesticide usage, 42.7% of households reported no change, 27.0% showed a rise, and 18.5% reported a decrease (Figure. 3). This suggested that although many households maintained their input levels, they were moving toward reducing chemical usage.

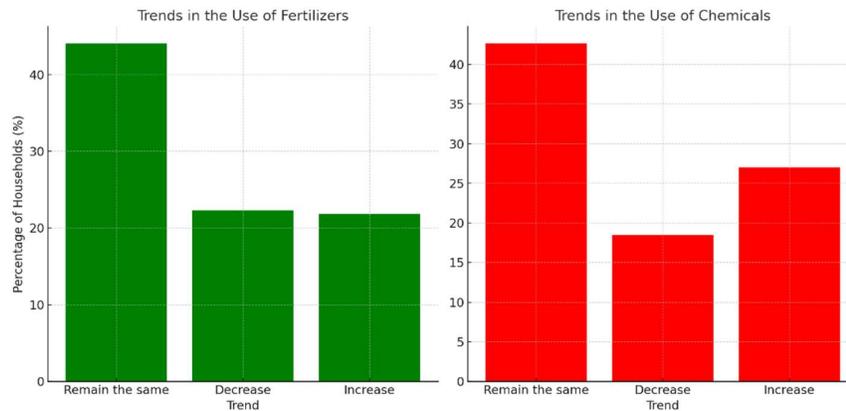


Figure. 3 Trends in the use of fertilizers and chemicals

The study found that the average monthly expenses of all household members in the project area were primarily allocated to vehicle loan payments, with an average of 8,552.00 baht per month. This was followed by expenses on food and beverages, averaging 8,085.07 baht per month. Households also spent an average of 2,770.89 baht per month on fuel for cars or motorcycles and transportation costs. On average, contributions to religious and cultural ceremonies, such as weddings and ordinations, accounted for 2,011.29 baht per month. In addition, average monthly expenses for utilities amounted to 1,745.54 baht, while expenditures on tobacco products averaged 1,226.42 baht. Clothing expenses averaged 1,037.01 baht monthly, and mobile phone service costs amounted to 992.55 baht monthly. Personal expenses, such as haircuts, soap, toothpaste, shampoo, and laundry detergent, averaged 980.55 baht monthly. Other notable expenditures included 752.22 baht per month on lottery or gambling, 510.58 baht per month on fuel, and 424.24 baht per month on new furniture purchases throughout the year. Waste collection in the village accounted for the most minor portion of monthly expenses, with an average of 23.41 baht per month (Figure. 4).

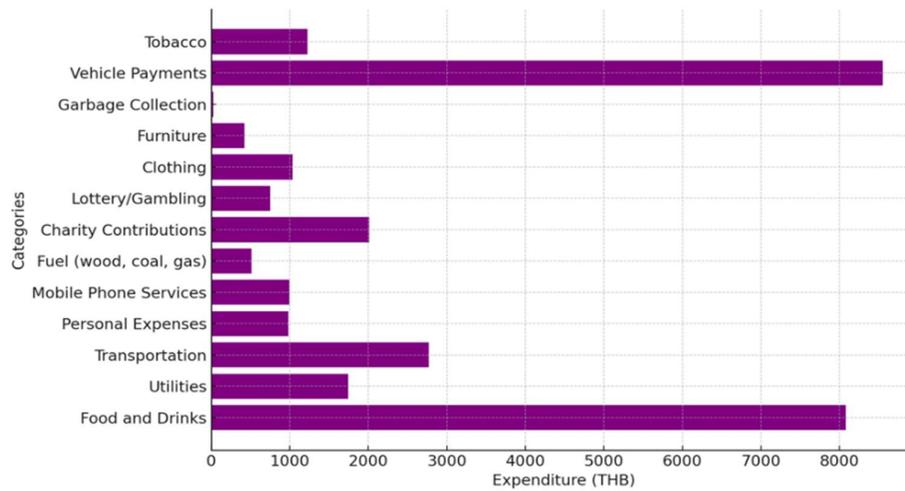


Figure. 4 Average Monthly Expenditures of Household Members

The study revealed that the average annual expenses for all household members in the project area were primarily allocated to educational costs for children, with an average of 48,048.84 baht per year. This was followed by annual life insurance premiums, with an average of 19,614.54 baht per year. Households also spent an average of 7,913.61 baht per year on healthcare expenses. Other significant annual expenses included 6,026.00 baht for repairs and maintenance of tools, machinery, and vehicles, as well as oil changes and tire replacements. Land and vehicle taxes averaged 4,935.57 baht annually. Entertainment expenses, such as movie tickets, traditional performances like Likay, village fairs, or concerts, averaged 3,333.33 baht per year. Lastly, funeral expenses (for village or organizational ceremonies) averaged 2,621.51 baht per year (Figure. 5)

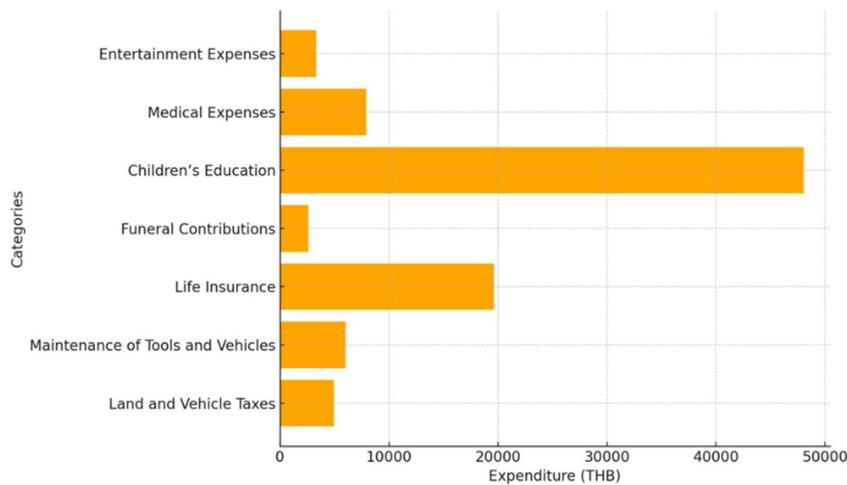


Figure. 5 Average Annual Expenditures of Household Member

1.3 Debt and Savings. The analysis of household debt in the project area yielded the following results (Figure 6):

1) Household borrowing behaviour: The data indicated that 55.5% of households in the project area had no borrowing by any household members. In comparison, 44.5% of households reported that one or more members had taken out loans.

2) Sources of loans: Among households with debt, the most common source of borrowing was the Bank for Agriculture and Agricultural Cooperatives, with an average loan amount of 313,953.13 baht. This was followed by loans from the Village Fund, averaging 59,148.94 baht. Loans from relatives averaged 283,300.00 baht while borrowing from commercial banks amounted to an average of 580,000.00 baht. Households also borrowed an average of 112,500.00 baht from the Government Savings Bank, 250,000 baht from cooperatives, 210,000 baht from the Government Housing Bank, 100,000 baht from private lenders, and 40,000 baht from farmer groups. Overall, the average annual debt among households in the project area was 216,544.67 baht per household.

3) Loan purposes: Regarding the purposes for which loans were taken, 25.5% of households reported borrowing primarily to purchase agricultural materials. A further 9.9% borrowed for non-agricultural purposes, such as buying vehicles and homes or renovating homes. Additionally, 5.2% borrowed funds to acquire agricultural machinery, 1.9% for land purchases, and 1.9% for livestock acquisition.

The analysis of household savings among members in the project area revealed the following results (Figure. 6):

1) Household savings behaviour: The findings showed that 52.1% of households in the project area reported that all household members were engaged in saving. In comparison, 47.9% of households indicated no savings activity by household members.

2) Sources of savings: Among households, the most significant average amount was deposited with the Bank for Agriculture and Agricultural Cooperatives, amounting to 106,174.63 baht. This was followed by savings in commercial banks, with an average of 134,083.33 baht. Households also reported saving cash at home, averaging 43,812.50 baht. Additional savings sources included the Village Fund (17,580.00 baht), cooperatives (200,000 baht), and mutual aid funds (27,500 baht). Households also saved with life insurance companies and the Government Savings Bank, with average amounts of 120,000 baht and 20,000 baht, respectively. Households in the project area reported an average annual savings of 88,191.74 baht per household.

3) Savings purposes: Regarding the reasons for saving, 30.3% of households reported saving primarily for old age. This was followed by 10.9% who saved for household consumption, 7.6% who saved for agricultural purposes, and 3.3% who saved to pass on to their descendants.

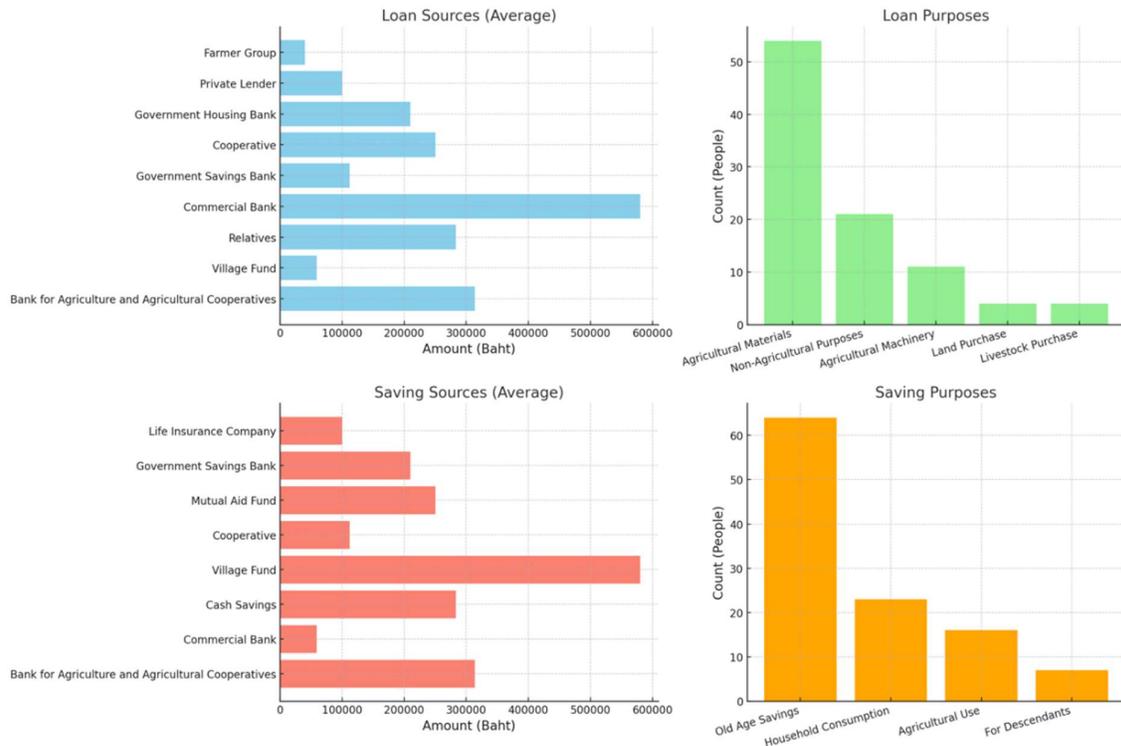


Figure. 6 Household Debt & Purposes and Savings & Purposes

1.4 Analysis of household Income and expenditure in the Project Area

1) Household Income: The data revealed that households in the project area generated a substantial portion of their income from non-agricultural sources, with an average non-agricultural cash income of 1,907,751.49 baht per household. Agricultural income contributed an additional 1,738,458.24 baht per household on average. The breakdown of agricultural income showed that cash income from crop production accounted for 212,981.45 baht per household, while livestock production was the predominant source, averaging 1,525,476.79 baht per household.

2) Cash Expenditure: In terms of expenses, households spent an average of 1,341,610.43 baht per household on agricultural activities, with most of these expenses related to livestock production, which averaged 1,281,767.27 baht per household. Crop-related expenditures, by contrast, were significantly lower, averaging 59,843.16 baht per household. Additionally, non-agricultural expenses were reported at an average of 441,834.64 baht per household.

3) Net Cash Income: Households in the project area realized an average net agricultural cash income of 396,847.81 baht per household. When combining agricultural and non-agricultural sources, the total net cash income averaged 2,304,599.30 baht per household. After accounting for expenditures, households reported an average remaining cash balance before debt repayment of 1,862,764.66 baht per household.

Table 2 Household Income and Expenditure in the Project Area

(Unit: Baht per household per year)

Item	Amount (Baht)
1. Total Income (1.1 + 1.2)	3,646,209.73
1.1 Agricultural Income (Baht/household)	1,738,458.24
– Crop Sector	212,981.45
– Livestock Sector	1,525,476.79
1.2 Non-Agricultural Income (Baht/household)	1,907,751.49
2. Total Expenditure (2.1 + 2.2)	1,783,445.07
2.1 Agricultural Expenditure (Baht/household)	1,341,610.43
– Crop Sector	59,843.16
– Livestock Sector	1,281,767.27
2.2 Non-Agricultural Expenditure (Baht/household)	441,834.64
3. Net Cash Income (Baht/household)	
3.1 Net Agricultural Cash Income (1.1 – 2.1)	396,847.81
3.2 Total Household Net Cash Income (3.1 + 1.2)	2,304,599.30
3.3 Remaining Cash Before Debt Repayment (3.2 – 2.2)	1,862,764.66

Note. The data is based on an analysis of sample groups and is used for estimation purposes only.

2. The economic problems of households in the areas benefiting from the project

Households faced several challenges like low agricultural product prices (67.8%) high production costs (64.0%). pest infestations 45.5% of households, experienced a lack of capital (26.5%) , and insufficient income (25.1%). Additionally, 11.8% of households struggled with debt, and 9.5% reported lacking land or having limited farmland. Other issues included poor-quality seeds (8.5%), a lack of knowledge of new production techniques (6.6%), difficulties in finding buyers for their products (5.7%), and unsuitable or infertile land for farming (2.4%).

Table 3 The economic problems of households in the areas benefiting from the project

	Issues	Number of Households	Percentage
1	Low Agricultural Product prices	143	67.8
2	High Production costs	135	64.0
3	Pest/disease outbreaks	96	45.5
4	Lack of capital	56	26.5
5	Income insufficient for expenses	53	25.1
6	Debt problems	25	11.8
7	Lack of land or insufficient land	20	9.5
8	Poor seed quality	18	8.5

Table 3 (continued)

	Issues	Number of Households	Percentage
9	Lack of Knowledge on new techniques	14	6.6
10	No buyers for agricultural products	12	5.7
11	Land unsuitable for farming	5	2.4

3. Comparing the economic conditions of the 2022–2023 planting season with the data from the 2018–2019 economic survey

3.1 Economic changes between 2019 and 2023. The study highlighted several notable economic transformations in households within the project area over the period from 2019 to 2023:

1) Average Household Size: In 2023, the average household size in the project area increased marginally to 4.13 persons per household, up from 4.12 persons per household in 2019.

2) Dependency Ratio: The dependency ratio—the number of dependents relative to the working-age population—rose to 0.45 in 2023 from 0.29 in 2019. This shift suggested the increasing economic burden on household workers.

3) Net Agricultural Income: The net agricultural income per household grew substantially and rose to 396,847.81 baht per year in 2023, up from 172,585.00 baht annually in 2019. This indicated a notable improvement in the profitability of agricultural activities over the period.

4) Non-Agricultural Expenditure: Household spending on non-agricultural activities also grew significantly, with the annual non-agricultural cash expenditure reaching 441,834.64 baht per household in 2023, compared to 220,087.00 baht in 2019. This suggested a diversification of household expenditures beyond agriculture.

5) Household Savings: The analysis revealed an increase in household savings, with the average household saving 88,191.74 baht in 2023, comparing to 49,361.00 baht in 2019. This increase pointed the improving financial capacity and a greater household saving propensity.

6) Household debt: The analysis indicated a significant rise in household debt within the project area over the study period. In 2023, the average household debt reached 216,544.67 baht per household, this marked increase from 42,256.00 baht per household in 2019.

7) Household debt: The analysis indicated a significant rise in household debt within the project area throughout the study. In 2023, the average household debt reached 216,544.67 baht per household, this marked increased from 42,256.00 baht per household in 2019. This substantial growth in debt suggested a heightened reliance on borrowing among households during the period under review.

Table 4 Changes in Economic Conditions

	Item	Operational Period (2019)	Operational Period (2023)	Nature of Change
1	Average Household Size (persons/household)	4.12	4.13	Increase
2	Dependency Ratio	.29	.45	Increase
3	Net Agricultural Income (baht/household/year)	172,585.00	396,847.81	Increase
4	Non-Agricultural Expenditure (baht/household/year)	220,087.00	441,834.64	Increase
5	Household Savings (baht/household)	49,361.00	88,191.74	Increase
6	Household Debt (baht/household)	42,256.00	216,544.67	Increase

3.2 Key Economic Challenges Faced by Households in the Project Area.

- 1) High Production Costs: In 2023, 64.0% of households reported high production costs, a significant increase from 17.0% in 2019.
- 2) Falling Agricultural Product Prices: In 2023, 67.8% of households experienced falling agricultural product prices, compared to 39.9% in 2019.
- 3) Lack of Capital: In 2023, 26.5% of households reported a lack of capital, up from 5.1% in 2019.
- 4) Labor Shortage: In 2023, 3.8% of households faced labor shortages, increasing from 0.5% in 2019.
- 5) Pest and Disease Outbreaks: In 2023, 45.5% of households were affected by pest and disease outbreaks, a sharp rise from 3.7% in 2019.
- 6) Epidemic Diseases: In 2023, 37.4% of households reported epidemic diseases, up from 0.0% in 2019.
- 7) Lack of Land or Insufficient Land for Cultivation: In 2023, 9.5% of households lacked their land or had insufficient land, an increase from 5.6% in 2019.
- 8) Debt Problems: In 2023, 11.8% of households reported debt issues, a decrease from 18.5% in 2019.
- 9) Unsuitable or Infertile Land: In 2023, 2.4% of households reported that their land was unsuitable or infertile, consistent with 2.4% in 2019.
- 10) Income-Expenditure Imbalance: In 2023, 25.1% of households indicated that their income was insufficient to cover expenses, down from 28.7% in 2019.
- 11) Lack of Knowledge of New Production Techniques: In 2023, 6.6% of households reported a lack of knowledge of new production techniques, slightly down from 7.4% in 2019.
- 12) Poor-Quality Seeds: In 2023, 8.5% of households experienced poor-quality seeds, up from 1.6% in 2019.

Table 5 Key Economic Challenges Faced by Households in the Project Area

	Item	Operational Period (2019)	Operational Period (2023)	Nature of Change
1	High Production Costs	17.0	64.0	Increase
2	Falling Agricultural Product Prices	39.9	67.8	Increase
3	Lack of Capital	5.1	26.5	Increase
4	Labor Shortage	.5	3.8	Increase
5	Pest and Disease Outbreaks	3.7	45.5	Increase
6	Epidemic Diseases	.0	37.4	Increase
7	Lack of Land or Insufficient Land for Cultivation	5.6	9.5	Increase
8	Debt Problems	18.5	11.8	Decrease
9	Unsuitable or Infertile Lan	2.4	2.4	No Change
10	Income–Expenditure Imbalance	28.7	25.1	Decrease
11	Lack of Knowledge of New Production Techniques	7.4	6.6	Decrease
12	Poor Quality Seeds	1.6	8.5	Increase

Discussion

This study's findings revealed positive and challenging economic trends among households in the project area. One of the notable improvements was the increase in net household income, which rose significantly from 172,585.00 baht per household in 2019 to 328,523.66 baht in 2023. This aligned with broader national income growth trends in rural areas due to improved access to agricultural resources and market integration. Furthermore, the household savings rate increased from 49,361.00 to 88,191.74 baht during the same period, indicating a growing financial resilience among rural communities (Atanda & Ibrahim, 2023). This was consistent with studies that emphasized the role of microfinance and savings programs in rural economic stability (Moll, 2005).

However, several critical challenges were identified. The rising cost of agricultural inputs was reported by 64.0% of households in 2023, up from 17.0% in 2019. This surge in production costs reflected global trends, where inflation and supply chain disruptions had led to increased prices for fertilizers and other agricultural inputs. The decline in agricultural product prices, affecting 67.8% of households, exacerbated the financial strain on rural farmers. The decrease and volatility of agricultural prices resulted from various factors, including the impact of the wholesale selling system, export pricing, a restricted number of processors, trade dependency, and the quality of agricultural products (Duangbootsee, 2024). The selling prices of several agricultural commodities, particularly palm, rice, and rubber, were influenced by stock market fluctuations, significantly impacting export earnings in the ASEAN-5 region, including Thailand (Lim et al., 2021).

The study also highlighted a significant rise in capital and labor shortages, with capital constraints growing from 5.1% to 26.5% and labor shortages increasing from .5% to 3.8%. This trend mirrors the findings of several studies that emphasized the impact of rural outmigration and the COVID-19 pandemic on labor availability and financial access in agricultural communities (Gray, 2009). Additionally, the pandemic had compounded pest and disease outbreaks, with 45.5% of households reporting such issues, an increase from 3.7% in 2019. This correlated with research highlighting the vulnerability of small-scale farmers to environmental and health-related shocks in developing countries (Onyenekwe et al., 2022).

Despite these challenges, the decrease in debt-related issues from 18.5% to 11.8% and the reduction in households facing income insufficiency, from 28.7% to 25.1%, suggested that financial management strategies may be improving, possibly because of targeted interventions like government subsidies and debt relief programs (Si et al., 2021).

Even though farmers had benefited from sophisticated irrigation systems, rising production costs, labor issues and unpredictable selling prices of agricultural products had made the farming sector highly vulnerable. Creating an insurance fund for farmers in this irrigation area to stabilize their cash flow and providing them with the requisite knowledge and skills to execute cost management and mitigate the risks associated with price volatility of their products would enhance and secure their farming career. These findings emphasized the necessity of ongoing assistance for rural households in managing economic possibilities and persistent challenges.

Body of Knowledge

This study advanced the understanding of the socio-economic impact of localized water resource projects on rural communities, focusing on households around the Klong Luang Ratchalothorn Reservoir. Examining economic shifts over multiple planting seasons and highlighting challenges these communities face offers insights into sustainable development and rural resilience. Key contributions include:

1. **Economic Effects of Water Projects:** The study demonstrates how water projects could enhance household income while presenting challenges impacting economic stability, such as rising production costs.
2. **Comparative Agricultural Analysis:** The research highlighted the importance of monitoring economic changes over time to better address agricultural community needs by comparing two planting seasons.
3. **Policy Implications for Community Support:** Findings underscore the need for tailored government initiatives focused on skill development, production efficiency, and market access to strengthen rural economic resilience.
4. **Guidance for Cross-Regional Research:** Future studies should include regional comparisons to identify unique needs in reservoir communities, facilitating adaptable rural development strategies.

This framework provides valuable guidance for policymakers and researchers in enhancing sustainable livelihoods within rural, water-dependent communities.

Suggestions

Recommendations for Application: The government should enhance occupational efficiency by providing training and skills development in agricultural production. This support would empower households to improve their production and effectively manage their agricultural marketing, leading to a better quality of life and economic resilience.

Future Research Recommendation: Future studies should compare other regions to identify economic and social differences in reservoir communities, helping to guide targeted community development strategies. Longitudinal studies examining the changing financial circumstances and livelihood improvements of irrigation farmers are crucial for determining the sustainability of reservoir projects.

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