IMPACT OF ECONOMIC FACTORS, CAPACITY OF PROJECT PARTICIPANTS AND STATE MANAGEMENT AGENCIES ON THE EFFICIENCY OF IRRIGATION DEVELOPMENT INVESTMENT IN THE MEKONG DELTA

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Abstract: ***The Mekong Delta is a key agricultural region of Vietnam. To contribute to promoting the development of this economic region, irrigation infrastructure plays an important role, because synchronous and modern investment in irrigation infrastructure will ensure irrigation for crops, increasing income for farmers. This paper studies the impact of economic factors, capacity of project participants and state management agencies on the effectiveness of investment in irrigation development using state budget capital in the Mekong Delta. Through a survey of 348 officials working in project management boards and state management agencies on irrigation in the Mekong Delta, the results show that the capacity of project participants has the greatest impact on the efficiency of irrigation development investment using state budget capital in the region.***

• Keywords: *efficiency, development investment, irrigation.*

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1. Introduction

The Mekong Delta is the region at the end of the Mekong River, stretching across 6 countries and flowing into the East Sea. After more than 30 years of renovation, this is an economic region that contributes more than 33% of the country's agricultural GDP, 56% of rice output, 60% of fruit output, 95% of rice export output and about 60% of Vietnam's seafood export output (Ministry of Agriculture and Rural Development, 2023).

In recent years, the region's irrigation infrastructure has received attention from the state. In the period of 2021 - 2024, the investment capital from the state budget for irrigation development investment in the Mekong Delta reached more than 8,609 billion VND, accounting for about 29% of the total state budget capital for irrigation development investment in Vietnam. Thanks to the investment in irrigation infrastructure, it has contributed to flood control in the region, acidification and alum washing, preventing salinity and preserving fresh water, expanding the area of cultivated land, increasing productivity and crop yield, and ensuring the people's domestic water source (Le Manh Hung, 2015). However, irrigation development investment from the state budget in the region has not been highly effective, the irrigation infrastructure is incomplete, lacking in synchronization, degraded, and there is overlap in management and coordination of resources and stakeholders.

Regarding the effectiveness of irrigation development investment, there have been many studies by domestic and foreign scientists. Regarding foreign studies, Leslie E. Small and Mark Svendsen (1990), Eliakim C. Matekere and Ninatubu M. Lema (2011) proposed a research framework and identified factors affecting the efficiency of irrigation projects, however, the authors only mentioned small irrigation projects in Tanzania. In domestic studies, the efficiency of investment in infrastructure development is mentioned in different fields, specifically Nguyen Van Phuc (2023) researched in the field of airport infrastructure, Cu Thanh Thuy (2018) researched in the field of road traffic infrastructure, Hoang Thu Ha (2013) researched in the field of seaports... With studies on the efficiency of investment in irrigation infrastructure development, Le Manh Hung (2015), Bui Thi Bong Trang (2017), Nguyen Hong Nhung (2020)... mainly focused on analyzing the current investment status and proposing solutions to improve investment efficiency without quantifying the factors affecting the efficiency of investment in irrigation infrastructure development.

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2. Literature review

Economic factors

Policies related to investment in developing irrigation infrastructure: According to Cu Thanh Thuy (2018), if policies related to investment and development are built synchronously and scientifically, investment efficiency will be improved. These policies also demonstrate investment incentives and investment encouragement from the state, thereby affecting the efficiency of investment and development activities (Pham Van Hung and Nguyen Thi Ai Lien, 2024)

Compensation, site clearance, and resettlement support policies: Compensation, site clearance, and resettlement support are a step in the process of implementing investment and development activities. This is a factor that affects the investment costs of building irrigation systems during the construction phase (Tran Thi Hong Phuc, 2020), thereby affecting the efficiency of investment and development activities. If this policy is built synchronously, satisfying the interests of the parties involved in the project, it will make the project quickly deployed and put into operation, achieving high efficiency. On the contrary, it will slow down the progress, prolong the construction time, causing waste of investment capital.

Socio-economic development planning: Development investment projects that are consistent with the socio-economic development planning of the region, economic sector or country will have the opportunity to be accepted and implemented. Socio-economic development planning is the scientific basis and a factor affecting the effectiveness of development investment (Cu Thanh Thuy, 2018; Nguyen Van Phuc, 2023). Public investment structure: If the public investment structure is not reasonable, investing too much in areas where the private sector is ready to invest, not finishing investing in important projects, lacking investment in sectors that have spillover effects on the development of other sectors... it will negatively affect the efficiency of public investment (Pham Minh Hoa, 2017).

Capacity of project participants

In order to invest in developing irrigation infrastructure, there is the participation of many parties such as investors, design consultants, construction contractors, supervision consultants... Research by Esfahani, H. and Ramirez, M. (2003); Haque, M., and Kneller, R. (2008) has the same view that the capacity to manage and implement investment projects affects investment efficiency. If the investment project is poorly managed, it will be a factor leading to low efficiency of investment activities. In addition, the capacity of the units participating in the project includes management capacity, financial capacity, technological capacity, etc.

Capacity of the investor: the capacity of the investor affects the use of capital economically and effectively in the process of implementing and operating the investment project (Hoang Thu Ha, 2013; Phan Thi Thu Hien, 2015). If the investor has good management skills, allocates the work of the investment project effectively and reasonably; has the ability to apply advanced science and technology to implement and operate the investment project, it will improve investment efficiency.

Experience of the investor: If the investor has little experience in the field of development investment, it will lead to risks for the investment project during the implementation process, negatively affecting the results and efficiency of the investment (Cu Thanh Thuy, 2018).

Contractor capacity: If the contractor has poor professional and technical capacity, the quality of the project will not meet the requirements. If the contractors implementing the investment project are experienced and have good financial resources, the project will ensure the right schedule as well as limit the risks that occur during the project construction process (Pham Minh Hoa, 2017; Le Tuan Loc et al., 2021). Yami Mastewal (2016) believes that the recruitment and capacity improvement of project staff or ineffective project financial management capacity negatively affects irrigation investment projects. Moreover, the capacity of design engineers and contractors participating in the construction is also a challenge that affects irrigation investment projects. If the project participants have financial capacity, management capacity, technological capacity, etc., it will speed up the project progress, reduce project costs, and contribute to improving investment efficiency (Cu Thanh Thuy, 2018).

Contractor experience: if the contractor has experience in implementing the work in the investment project, it will ensure the progress of the project according to the plan, limiting risks during

the project construction process. If the contractor does not have much experience, it will lead to shortcomings, mistakes, increasing investment costs, thereby reducing investment efficiency (Larsen et al., 2015; Abdul Rahman, 2006).

Coordination between the investor, contractor and project participants: if there is a lack of coordination between the investor, contractor and project participants, it will lead to incorrect information during the implementation of the investment project, which can lead to the destruction and re-construction, slowing down the progress and increasing the project investment costs, greatly affecting the efficiency of the development investment project (Abdul Rahman, 2006).

State management agencies

Management capacity of state management officials related to investment in developing irrigation infrastructure: weak management capacity of management officials will prolong the settlement and payment process when investing in construction works, delaying investment progress and reducing investment efficiency (Yami Mastewal, 2016). The capacity of the leader also affects making the right decisions, avoiding wasting investment capital (Phan Thi Thu Hien, 2015; Cu Thanh Thuy, 2018).

Professional qualifications of managers related to investment in developing irrigation infrastructure: if the staff lack professional qualifications in the field of investment implementation such as lack of knowledge related to the location of the investment project, the use of a top-down approach in planning... will affect the efficiency of irrigation investment (Yami Mastewal, 2016).

Quality and ethics of managers related to investment in developing irrigation infrastructure: if managers of management agencies related to investment and development have good qualities and ethics, it will positively affect the promulgation and organization of the implementation of investment and development plans, affecting the efficiency of investment and development (Phan Thi Thu Hien, 2015; Cu Thanh Thuy, 2018). In addition, some activities in investment and development such as bidding are not transparent, investment project appraisal does not comply with legal regulations... will lead to a decrease in the efficiency of investment in using state budget capital (Pham Minh Hoa, 2017).

3. Research method

Research method

The author uses a combination of qualitative and quantitative research to measure the level of influence of the following factors: Economy, State management agencies, Capacity of units participating in the project on the effectiveness of investment in developing irrigation infrastructure using state budget capital.

5-level Likert scale is used to assess the level of influence of factors on the effectiveness of investment in developing irrigation infrastructure. The assessment level from 1 to 5 is arranged in increasing order of the level of influence of factors on the effectiveness of investment in developing irrigation infrastructure using state budget capital.

The study uses the method of processing collected data using SPSS software. The data is preliminarily cleaned, then coded before analysis. The author uses a multivariate linear regression model to study the level of influence of factors on the efficiency of investment in irrigation development

The quantitative analysis method is used for the main analysis part of the study with the following steps: Testing the reliability of the scale; Exploratory factor analysis EFA; Correlation analysis and multiple linear regression. These steps are carried out to assess the level of influence of factors on the efficiency of investment in infrastructure development using state budget capital in the Mekong Delta.

Data collection

The author uses a survey form to interview officials directly working at units and state management agencies related to investment in irrigation infrastructure development using state budget capital, including the Ministry of Planning and Investment, the Ministry of Agriculture and Rural Development and affiliated units; staff working at Project Management Boards, construction contractors, consulting contractors, and contractors supervising irrigation works using State budget capital in the Mekong Delta.

The sampling method used is convenience sampling, which is a suitable sampling method that the author can approach and interview the survey subjects (Nguyen Van Thang, 2015).

Sample

With a sample size of 348, it is enough to ensure

the sampling principle according to Yamane (1967) and Rao (1985). The questionnaire was coded, entered using Excel software and processed using SPSS 20 software for analysis.

The economic factor group includes 4 scales: policies related to investment in irrigation infrastructure development; compensation policies, site clearance, resettlement support; socio-economic development planning; public investment structure. The group of factors of state management agencies includes 3 scales: management capacity of state management officials, professional qualifications of officials related to investment in developing irrigation infrastructure, qualities and ethics of officials related to investment in developing irrigation infrastructure

The group of factors of capacity of units participating in the project includes 5 scales: capacity of investors, experience of investors, capacity of contractors, experience of contractors; coordination between investors, contractors and parties participating in the project in the stages of the investment project.

4. Research results

Reliability results of scales

Conducting a reliability test of the scales, the results show that only the scale of public investment structure of the economic factor has a total correlation coefficient of less than 0.3, so this variable is eliminated; All factors have Cronbach's Alpha coefficients > 0.7 and the total correlation coefficients are all greater than 0.3. Therefore, the scales of the factors meet the reliability requirements.

Table 1: Cronbach's test results of the research factors

No	Factor	Cronbach's Alpha
1	Economic factors (KT)	0,692
2	State management agencies (QLNN)	0,874
3	Capacity project participants (DVTG)	0,890
4	Effectiveness of irrigation development investment (HQ)	0,915

Table 2: KMO and Bartlett's test with independent variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.683
Bartlett's Test of Sphericity	Approx. Chi-Square	2516.124
	Df	55
	Sig.	.000

The results of the EFA exploratory factor analysis with the independent variables in the research model gave quite good results. This is shown in the KMO coefficient = 0.683 corresponding to the significance level Sig = 0.000 < 5%. This result indicates that the results of the EFA exploratory factor analysis have high reliability. In addition, the total value of the extracted variance of the third factor and the convergence coefficient of eigenvalues of this factor are 72.181% > 50% and 1.449 > 1, respectively. In addition, the rotated matrix table of factors shows that the loading factors of the observed variables are all greater than 0.5. Thus, the factors after performing the EFA exploratory factor ensure the ability to represent the original survey data and are eligible to perform multivariate regression. Three factors were extracted after conducting EFA analysis including: Economy, State management agencies and Capacity of project participants.

Correlation analysis results

Based on the results of the correlation analysis, we can see that the dependent factor (HQ) has a positive correlation with the independent factors: KT, QLNN, DVTG, which is shown through the Pearson correlation coefficient of these relationships being greater than 0. This close relationship is highly desirable because the close, linear relationships between the variables explain the influence of the model results. Therefore, these independent variables can be included in the regression analysis to explain the influence on the results of the research model.

Regression result analysis

Multiple linear regression results

The results of the model show that the adjusted R^2 is 0.775, which means that 77.5% of the variation in the dependent variable HQ is explained by the independent variables in the model. In addition, the results also show that the F test also gives a very small Sig. value, which proves that the research model is suitable for the data set being surveyed.

On the other hand, the independent variables KT, DVTG are all statistically significant with a significant level of Sig. < 0.05, the variable QLNN is statistically significant with a significance level of Sig. < 0.1.

The regression model results also show that the tolerance coefficient is quite high from 0.814 to 0.963, while the VIF variance inflation factor is low (from 1.039 to 1.229) less than 2.

On that basis, we can conclude that the relationship between these independent variables is insignificant and there is no multicollinearity.

Table 3: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
Constant	-.067	.147		-.457	.648					
KT	.144	.028	.143	5.135	.000	.460	.267	.131	.841	1.189
QLNN	.051	.026	.050	1.911	.057	.195	.102	.049	.963	1.039
DVTG	.820	.029	.806	28.550	.000	.871	.839	.727	.814	1.229

From the results of the regression model, we can draw a multiple regression equation representing the relationship between the independent variables and the dependent variables as follows:

*HQ = 0.143*KT + 0.050*QLNN + 0.806*DVTG*

Results of the multivariate regression model: Based on the results of the multivariate regression analysis, it is shown that there are 3 factors affecting the efficiency of investment in developing irrigation infrastructure using state budget capital, including: (1) Economic factors, (2) State management agencies, (3) Capacity of project participants. In which, the factor "Capacity of project participants" has the greatest impact on the efficiency of investment in developing irrigation infrastructure using state budget capital with a regression coefficient of 0.806.

The results of the regression analysis show that the factors affecting the efficiency of investment in developing irrigation infrastructure using state budget capital are as follows:

+ Economic factor: The results of the regression analysis show a positive correlation between the factor "economic" and "the efficiency of investment in developing irrigation infrastructure using state budget capital". The regression coefficient is 0.143, which means that under the condition that other factors remain unchanged, when the factor "economic" increases by 1 unit, the efficiency of investment in developing irrigation infrastructure using state budget capital will increase by 0.143 units.

+ State management agency factor: The regression analysis results show a positive correlation between the factor "state management agency" and "investment efficiency in developing irrigation infrastructure using state budget capital". The regression coefficient is 0.050, which means that under the condition that other factors remain unchanged, when the factor "state management agency" increases by 1 unit, the investment efficiency in developing irrigation infrastructure using state budget capital will increase by 0.050 units.

+ Capacity factor of project participating units: The regression analysis results show a positive correlation between the factor "capacity of project participating units" and "investment efficiency in developing irrigation infrastructure using state budget capital". The regression coefficient is 0.806, which means that under the condition that other factors remain unchanged, when the factor "capacity of project participants" increases by 1 unit, the efficiency of investment in developing irrigation infrastructure using state budget capital will increase by 0.806 units.

5. Conclusion

The article has studied the level of influence of 3 groups of factors: Economy, State management agencies, Capacity of project participants. The results show that these factors all have a positive impact on the efficiency of investment in developing irrigation using state budget capital. This result is consistent with some previous studies in the field of investment in developing infrastructure (Cu Thanh Thuy, 2018; Nguyen Van Phuc, 2023). In particular, this study has shown that the capacity of the units participating in the project has the strongest impact on the efficiency of investment in developing irrigation infrastructure using state budget capital. Therefore, improving the capacity of investors and contractors such as financial capacity, professional capacity... will contribute to improving the efficiency of investment in developing irrigation using state budget capital.

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