



# Budget Deviation Factors and Project Performance at Holland GreenTech, Rwanda

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*Abstract: Agricultural projects implemented by private firms require disciplined budgeting because deviations from planned costs can affect time, quality, scope, stakeholder satisfaction, and achievement of objectives. This study assessed budget deviation factors and project performance at Holland GreenTech Rwanda, focusing on financial planning, price fluctuations, and scope creep. A cross-sectional explanatory case-study design with a mixed-methods approach was used. The target population was 224 project staff, technical personnel, administrative and finance staff, monitoring personnel, and beneficiaries. Yamane's formula generated a planned sample of 144 respondents, of whom 114 returned complete questionnaires, giving a 79.2% response rate; key informants provided qualitative evidence. Quantitative data were analyzed using descriptive statistics, Pearson correlation, multiple linear regression, and binary logistic regression, while interviews were analyzed thematically. Financial planning was positively associated with project success ( $r = 0.581$ ,  $p < 0.001$ ;  $B = 0.356$ ,  $p < 0.001$ ). Price fluctuations ( $r = -0.477$ ,  $p < 0.001$ ;  $B = -0.214$ ,  $p = 0.001$ ) and scope creep ( $r = -0.536$ ,  $p < 0.001$ ;  $B = -0.285$ ,  $p < 0.001$ ) were negatively associated with success. The multiple regression model explained 48.4% of variation in project success. The study recommends realistic budgeting, regular price reviews, contingency provisions, early procurement, supplier arrangements, and formal approval of scope changes.*

**Keywords:** Budgeting, Performance, Planning, Prices, Scope, Agriculture, Rwanda

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## 1. Introduction

Agricultural projects are increasingly expected to deliver productivity, technology, market, and sustainability benefits while remaining within agreed financial and implementation constraints. The pressure is particularly strong for private agricultural firms because they must combine technical delivery with commercial viability, cash-flow management, supplier relationships, client expectations, field logistics, and reputational considerations. In this setting, the project budget is not simply an accounting statement. It is a management

baseline that translates approved activities into expected quantities of labour, equipment, materials, services, transport, technical support, and time. A credible baseline therefore supports both resource allocation and managerial accountability throughout the project life cycle.

Budget deviation is the difference between a project's planned or approved expenditure and the cost actually incurred during implementation. Deviations can take the form of overruns or underruns, but neither should be interpreted in isolation from physical progress and project outputs. A project may appear to spend below budget because activities were delayed or outputs were reduced,

while a justified increase in expenditure may protect quality or an essential change. Contemporary project management consequently treats performance as multidimensional, combining cost, time, scope, quality, stakeholder satisfaction, and achievement of intended objectives (Project Management Institute [PMI], 2021; Ibrahim et al., 2024).

Globally, cost and schedule deviation remain persistent across project sectors. A systematic review by Afana et al. (2024) grouped cost-overrun causes into project-management and execution factors, financial-management weaknesses, estimation problems, contractual issues, resource constraints, and external risks. Gómez-Cabrera et al. (2024) similarly showed that many deviations become visible during the execution phase, when weaknesses in initial planning interact with actual implementation conditions. These findings are important for agricultural projects because implementation often requires many suppliers, geographically dispersed activities, transport, technical specifications, and field-level adjustments.

Agricultural projects face an additional layer of uncertainty because a substantial part of their cost structure can be influenced by markets and conditions outside the direct control of the implementing organization. Input and equipment prices, fuel and transport costs, exchange rates, weather-related disruption, supplier availability, and seasonal timing may all affect the cost of completing planned activities. The Organisation for Economic Co-operation and Development and Food and Agriculture Organization (OECD/FAO, 2024) emphasize that agricultural markets remain exposed to energy prices, macroeconomic conditions, climatic variability, geopolitical disruption, and exchange-rate movements. A budget that is realistic at approval can therefore lose accuracy during implementation unless managers review assumptions and update forecasts.

Sub-Saharan African projects can be particularly sensitive to these pressures because financing constraints, import dependence, transport costs, infrastructure limitations, and market instability reduce the ability of organizations to absorb sudden changes. Under such conditions, the existence of a formal budget is not enough. The quality of cost estimation, adequacy of contingencies, timing of procurement, regularity of financial review, and discipline of scope management influence whether a deviation is detected early and whether corrective action can be taken before project performance deteriorates.

In Rwanda, agriculture remains central to livelihoods and economic transformation, while public and private actors continue to invest in irrigation, technology, farmer services, market linkages, and value-chain development. Private agricultural firms contribute to this transformation by providing greenhouse technologies, irrigation solutions,

technical advice, input systems, and commercial services. Their projects must meet client and beneficiary expectations while controlling cost and time. This makes project financial discipline a strategic concern rather than a narrow accounting function.

Holland GreenTech Rwanda operates in this environment. Its agricultural projects may involve specialized equipment and materials, multi-location field implementation, transport to different districts, supplier-dependent procurement, client-specific technical requirements, and changing site conditions. Each of these features can create a pathway for budget deviation. Weak financial planning can create unrealistic baselines and inadequate contingencies; price fluctuations can increase the cost of inputs and logistics; and scope creep can add activities, specifications, or deliverables that were not fully priced in the original plan.

The present study conceptualized budget-related pressure through three measurable dimensions: financial planning, price fluctuations, and scope creep. Financial planning represents the preventive and monitoring capacity of the organization; price fluctuation represents external market uncertainty; and scope creep represents change-governance risk. Project performance was measured through cost efficiency, timeliness, quality of outputs, stakeholder satisfaction, and achievement of planned objectives. This structure made it possible to test whether each budget-related factor was associated with project success and whether the three factors jointly explained variation in performance.

## 1.1 Problem Statement

The practical management problem is the difficulty of maintaining agreed project performance when approved budgets are exposed simultaneously to weaknesses in planning, market-price changes, and additions to project scope. Ideally, a project should begin with realistic estimates, adequate contingency provisions, clear deliverables, and monitoring systems that compare actual expenditure with implementation progress. In practice, inaccurate estimates, outdated quotations, delayed procurement, price shocks, exchange-rate changes, and unapproved additions may cause resource requirements to diverge from the original baseline.

Evidence from the wider project-management literature shows why the problem deserves separate analysis. Cost deviation rarely has a single cause; instead, planning weaknesses, external uncertainty, project changes, resource problems, and managerial response interact during execution (Afana et al., 2024; Gómez-Cabrera et al., 2024). Scope creep creates a particularly important internal pressure because requirements can expand without corresponding adjustment of time, cost, or resources.

Ahmed and Jawad (2022) found that technological, organizational, and human dimensions of scope creep were negatively associated with construction-project success, demonstrating that uncontrolled change can undermine performance even where the original plan was technically sound.

Rwandan evidence has established the importance of cost control and project-management practice, but it remains fragmented across sectors. Baributsa and Njenga (2023), for example, reported a strong positive relationship between project cost control and project performance in a Rwandan construction setting. However, evidence from private agricultural firms is much thinner, and studies do not normally examine financial planning, price fluctuations, and scope creep simultaneously. Managers at Holland GreenTech Rwanda therefore need context-specific evidence on which of these budget-related conditions are most closely associated with performance. This study addressed that empirical and managerial gap by combining questionnaire-based statistical analysis with qualitative explanations from project personnel.

## 1.2 Study Objective

The study sought to assess the relationship between budget deviation factors and project performance at Holland GreenTech Rwanda.

## 1.3 Research Questions

1. What is the relationship between financial planning practices and project success at Holland GreenTech Rwanda?
2. What is the relationship between price fluctuations and project success at Holland GreenTech Rwanda?
3. What is the relationship between scope creep and project performance at Holland GreenTech Rwanda?

# 2. Related Literature

## 2.1 Conceptual Review

Budget deviation refers to the variance between an approved financial baseline and actual project expenditure. Its interpretation requires more than observing the final amount spent. Variance can result from inaccurate estimates, procurement timing, market prices, changes in quantities, delayed activities, incomplete work, or authorized changes. A useful budget-control system therefore compares financial information with implementation progress, asks why the variance occurred, forecasts likely cost at completion, and links the result to management action (PMI, 2021).

Project performance is the extent to which a project delivers intended outputs and objectives while meeting agreed constraints and stakeholder expectations. Traditional assessment emphasized the cost-time-quality triangle, but contemporary approaches recognize that a project can perform well on one dimension and poorly on another. For this study, project performance was measured through cost efficiency, timely completion, quality of outputs, stakeholder satisfaction, and achievement of planned objectives, providing a broader outcome than a single accounting variance (Ibrahim et al., 2024).

Financial planning is the process of translating project activities and objectives into realistic financial requirements before and during implementation. It includes budget preparation, cost estimation, resource allocation, contingency planning, review of assumptions, and regular monitoring. Strong financial planning creates a credible baseline and improves the ability of managers to identify emerging variances. Weak planning can produce unrealistic estimates, insufficient contingency provisions, and resource gaps that only become visible after activities have started.

Price fluctuations are changes in the market cost of inputs, equipment, transport, fuel, labour, supplier quotations, and imported components. They are important to agricultural project management because many implementation costs are exposed to market forces. Price increases can reduce the quantity of resources that a fixed budget can purchase, while exchange-rate movement can affect imported equipment and specialized technologies. The managerial response may include market monitoring, earlier procurement, framework agreements, alternative suppliers, price-adjustment provisions, and contingency reserves (OECD/FAO, 2024).

Scope creep is the uncontrolled or insufficiently authorized expansion of project activities, requirements, specifications, or deliverables beyond the approved baseline. Unlike price volatility, which is largely external, scope creep is mainly a governance and change-control problem. Agricultural projects may experience scope creep when clients request extra installations, technical modifications, additional field visits or training, or new deliverables after implementation begins. If the change is not documented, costed, assessed for schedule and quality implications, and formally approved, hidden resource pressure can accumulate (Ahmed & Jawad, 2022).

The three concepts are related but not interchangeable. Financial planning represents anticipatory control, price fluctuation represents external uncertainty, and scope creep represents change-governance pressure. All three can lead to budget deviation, but they require different managerial responses. This distinction provides the conceptual basis

for examining their separate and combined relationships with project performance.

## 2.2 Theoretical Review

The Project Management Triangle provides the main theoretical logic for the study. The model emphasizes interdependence among cost, time, and scope, with quality affected by the balance among these constraints. When prices increase without a budget adjustment, a manager may reduce quantity, change specifications, seek more funding, or delay procurement. When scope expands, additional time and cost are usually required. The theory therefore explains why budget-related pressures can influence several dimensions of performance simultaneously rather than only the final cost figure (PMI, 2021).

Earned Value Management (EVM) adds a control perspective by emphasizing the integration of cost and schedule information. Its central managerial principle is that deviations should be detected during implementation rather than at closure. Managers compare planned performance with actual cost and work accomplished so that unfavorable trends can trigger corrective action. Even where a full EVM system is not used, periodic budget review, updated forecasts, and comparison of expenditure with physical progress apply the same logic. This is directly relevant to financial planning and budget monitoring in agricultural projects.

Agency Theory also helps explain why transparency and formal authorization matter when project conditions change. Project owners, managers, staff, clients, and suppliers may possess different information and may have different incentives. Clear budgets, documented approvals, reporting responsibilities, and change-control procedures reduce information asymmetry and make deviations visible. The theory therefore reinforces the need for accountability when scope or expenditure departs from the original baseline.

Together, the theories support a management interpretation of the study model. Strong financial planning should improve performance because it strengthens preventive control and monitoring. Greater price fluctuation should reduce performance because it creates external cost uncertainty. Greater scope creep should also reduce performance because changing requirements place pressure on cost, time, resources, and quality. These theoretical expectations informed the direction of the research questions and interpretation of the statistical results.

## 2.3 Empirical Studies: Global to Local Perspective

Global research consistently shows that project overruns arise from combinations of planning, execution, financial, contractual, resource, and external-risk factors. Afana et al. (2024), in a systematic review, identified categories ranging from project-management weakness and estimating problems to financial constraints and external shocks. Gómez-Cabrera et al. (2024) reviewed evidence on time and cost overruns and emphasized the execution stage as a point at which previously hidden planning weaknesses interact with actual project conditions. These studies support active monitoring after project approval rather than assuming that the initial budget will remain valid throughout implementation. Durdyev (2021) likewise identified inaccurate estimation, poor planning, financial-management problems, and price fluctuations among frequently reported causes of construction-project cost overruns.

Evidence on project planning also supports the importance of front-end preparation. Irfan et al. (2021) found that project planning and project-manager competencies contributed to public-sector project success. The finding is relevant to financial planning because realistic cost estimates, resource scheduling, risk identification, and management capability are established before and during implementation. In a Rwandan setting, Baributsa and Njenga (2023) reported a strong positive relationship between project cost-control practices and project performance. Although the study was in construction, it demonstrates that systematic control can improve time, quality, and financial outcomes in the local context.

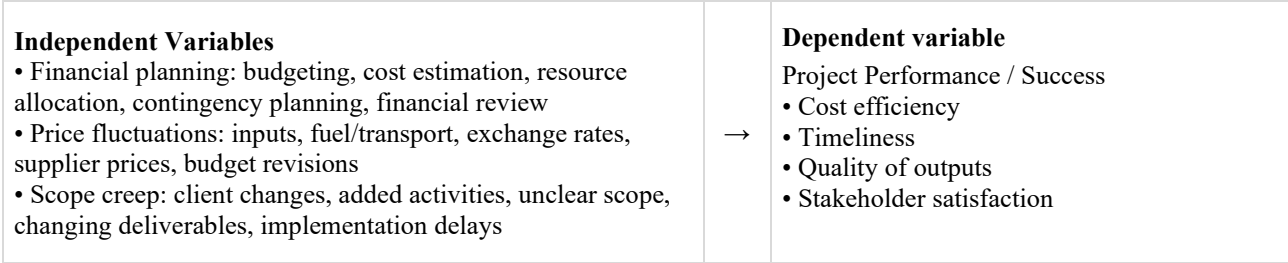
Price risk is more prominent in sectors where projects depend on traded inputs, fuel, transport, imported components, and supplier quotations. OECD/FAO (2024) confirms that agricultural markets remain exposed to macroeconomic, energy, environmental, and geopolitical uncertainty. For an agricultural technology firm, such volatility can affect greenhouse materials, irrigation equipment, transport, fuel, technical components, and other project inputs. The practical implication is that financial plans need contingency provisions and procurement strategies that can respond to market changes.

Scope-management studies distinguish between legitimate controlled change and uncontrolled scope creep. Ahmed and Jawad (2022) found that scope-creep dimensions negatively affected construction-project success, with project complexity worsening the relationship. The mechanism is transferable to agricultural projects: additional installations, technical modifications, client requests, field adjustments, and unplanned services can consume budget and time. The key issue is not whether

change occurs, but whether it is documented, assessed, costed, and authorized before implementation.

Rwandan agricultural projects differ from large infrastructure projects because their outputs often involve farmer services, training, irrigation, technology adoption, field demonstrations, market linkages, and geographically dispersed implementation. These characteristics make direct transfer of construction evidence inappropriate without contextual testing. Holland GreenTech Rwanda provides a bounded private-sector setting in which financial planning, market-price pressure, and scope change can be examined together.

The literature reveals three gaps. Contextually, private agricultural firms in Rwanda are less represented than public, donor-funded, or construction projects. Empirically, budget deviation is often examined as a final cost overrun rather than through the distinct pathways of planning quality, price fluctuation, and scope creep.



**Figure 1: Conceptual Framework**  
*Expected direction: financial planning (+); price fluctuations (-); scope creep (-).*

### 2.5 Critical Synthesis and Research Gap

A critical comparison of the reviewed studies shows that the same observable outcome, budget deviation, can emerge through different causal pathways. A weak estimate or inadequate contingency is primarily a planning problem; a sudden increase in imported equipment or fuel prices is primarily a market-risk problem; and a client request for additional work is primarily a scope-governance problem. Treating all three as a single cost-overrun construct can obscure the management response required. This study therefore separates the three mechanisms analytically while recognizing that they can interact during implementation.

The literature also differs in how project performance is defined. Some studies focus on cost variance or schedule adherence, while others include quality, stakeholder satisfaction, benefit realization, and achievement of objectives. A narrow financial measure could misclassify a project as successful simply because expenditure stayed low even when activities were delayed or outputs were reduced. The multidimensional project-success index used in this study was therefore appropriate for agricultural

Methodologically, many studies rely on one quantitative source and offer limited explanation of the managerial processes behind the statistical relationships. The present mixed-method case study addressed these gaps by estimating separate and combined associations and triangulating them with interview evidence.

### 2.4 Conceptual Framework

The analytical framework treated financial planning, price fluctuations, and scope creep as the independent variables and project performance/success as the dependent variable. Financial planning was expected to have a positive relationship with success, whereas price fluctuations and scope creep were expected to have negative relationships. Only variables measured and analyzed in the completed study were retained in the framework.

projects, where beneficiary value and functional delivery matter alongside budget compliance (Ibrahim et al., 2024).

Finally, the strongest published evidence on cost overrun and scope creep still comes from construction and infrastructure. Those studies offer useful mechanisms, but agricultural projects differ in seasonality, biological and weather risk, dispersed beneficiary participation, specialized inputs, and dependence on farmer decisions. The present study contributes by testing planning, price, and scope mechanisms in a private agricultural organization in Rwanda and by using qualitative evidence to interpret the statistical results rather than assuming that sectoral findings transfer unchanged.

## 3. Methodology

### 3.1 Research design and setting

The study used a cross-sectional explanatory case-study design within a mixed-methods approach. Holland GreenTech Rwanda constituted the bounded organizational case, while individual questionnaire respondents formed the unit of quantitative observation.

The cross-sectional design captured information during the 2026 study period, and the explanatory component assessed how variation in financial planning, price fluctuations, and scope creep was associated with variation in project performance. No study variable was experimentally manipulated; consequently, the estimated relationships are interpreted as associations within the observed case rather than evidence of causality.

The mixed-method approach was selected because the research questions required both numerical estimation and contextual explanation. Questionnaire data made it possible to compare respondent perceptions and estimate correlations and regression coefficients, while key-informant interviews provided explanations of how budgeting, procurement pressure, price changes, client requests, and management decisions were experienced in practice. Integration through triangulation allowed the qualitative evidence to confirm, explain, or qualify the quantitative patterns.

### 3.2 Population and Sampling

The study population comprised approximately 224 individuals involved in agricultural project planning, budgeting, implementation, monitoring, administration, or beneficiary participation at Holland GreenTech Rwanda. The population included project and technical staff, finance and administrative staff, field officers and agronomists, monitoring and evaluation personnel, and selected beneficiary farmers across Kigali, Rwamagana, Musanze, and Karongi. These groups were appropriate because they had direct experience of the planning, cost, scope, and performance variables examined.

The quantitative sample size was determined using Yamane's (1967) finite-population formula at a 5% margin of error. With  $N = 224$ , the planned sample was 114 respondents. The verified respondent groups were 33 employees/staff and 81 farmers/beneficiaries. For the qualitative component, key informants in management, finance, accounting, monitoring, and project implementation were selected purposively because they held detailed information on budgeting and performance decisions. Quantitative respondents were selected using procedures that ensured representation of staff and beneficiaries, while purposive sampling was used for key informants.

### 3.3 Data collection tools and measurement

The questionnaire collected demographic information and measured financial planning, price fluctuation, scope creep, and project success using a five-point Likert scale. Financial-planning items covered budget preparation, realistic cost estimation, contingency budgeting, financial review, and support to timely execution. Price-fluctuation

items covered input prices, fuel and transport, exchange rates, supplier quotations, and budget revisions. Scope-creep items addressed client requests, additional activities, unclear or changing scope, delays, and quality implications. Project success was assessed through time, budget, quality, stakeholder satisfaction, and achievement of objectives.

The interpretation of descriptive means followed the direction of the questionnaire items. For financial planning, a higher score represented stronger planning practices. For price fluctuations and scope creep, a higher score represented greater exposure to an adverse condition. Project-success scores represented stronger perceived performance. This directionality was important when interpreting regression coefficients: a positive financial-planning coefficient indicated an association with improved success, whereas negative coefficients for price fluctuation and scope creep indicated that greater exposure to those pressures was associated with reduced success.

### 3.4 Data collection and quality control

Data were collected using questionnaires and key-informant interviews. Completed questionnaires were reviewed for completeness before data entry. Variable labels and coding categories were checked against the questionnaire, and incomplete or inconsistent records that could not support the analysis were excluded. Of the 114 planned quantitative respondents, 114 provided complete and usable questionnaires. Likert-scale items were coded from 1 to 5, and composite indices were constructed from items aligned with the study objectives.

### 3.5 Data analysis and integration

Questionnaire data were checked, coded, and analyzed using SPSS version 25.0. Frequencies and percentages summarized respondent characteristics. Means and standard deviations summarized the study indices. Pearson correlation estimated bivariate relationships between each independent variable and project success. Multiple linear regression estimated the combined model  $PS = \beta_0 + \beta_1FP + \beta_2PF + \beta_3SC + \varepsilon$ , where PS was project success, FP financial planning, PF price fluctuations, and SC scope creep. Binary logistic regression provided a secondary analysis of the likelihood of high project success after the project-success index was categorized. Statistical significance was assessed at the 5% level.

Before interpreting the multiple regression model, the analysis considered whether the three predictors represented distinct constructs rather than duplicate measurements of the same condition. The conceptual review and questionnaire structure separated preventive financial planning, externally driven market-price pressure, and internally governed scope change. The

regression model was therefore used to estimate the net statistical contribution of each factor while holding the other two constant.

Qualitative interviews were analyzed thematically. Responses were read, coded, grouped into categories, and organized under the three research questions. The themes were compared with quantitative results during triangulation.

The qualitative component was integrated at the interpretation stage rather than treated as a separate parallel study. Interview statements were coded according to the three objectives and compared with the direction of the quantitative results. Convergence was recorded where respondents described mechanisms consistent with the statistical pattern, such as realistic budgeting improving preparedness, price changes disrupting procurement, or scope additions increasing costs. Where qualitative evidence suggested operational weaknesses, those observations were used to explain the managerial meaning of the quantitative findings and to shape the recommendations.

3.6 Ethical considerations

Ethical safeguards included informed consent, voluntary participation, confidentiality, anonymity, respectful data collection, and honest reporting.

4. Results and Discussion

4.1 Findings

Of the 144 planned quantitative respondents, 114 provided complete and usable questionnaires, yielding a 79.2% response rate. Men represented 67.5% of respondents and women 32.5%. The largest age group was 35-44 years (55.3%). Farmers and beneficiaries constituted 71.1% of the sample, while project managers, finance/accounting staff, field officers/agronomists, and administrative staff made up the employee group. Most respondents held a bachelor's degree (55.3%), and 66.7% had participated in budgeting or financial-planning activities. These characteristics indicate that the sample combined operational staff and beneficiaries with relevant exposure to agricultural project implementation.

Table 1: Selected Background Characteristics of Respondents (n = 114)

| Characteristic                | Category                 | n  | %    |
|-------------------------------|--------------------------|----|------|
| Gender                        | Male                     | 77 | 67.5 |
|                               | Female                   | 37 | 32.5 |
| Age                           | Below 25                 | 6  | 5.3  |
|                               | 25-34                    | 32 | 28.1 |
|                               | 35-44                    | 63 | 55.3 |
|                               | 45+                      | 13 | 11.4 |
|                               |                          |    |      |
| Position                      | Project manager          | 6  | 5.3  |
|                               | Finance/accounting       | 12 | 10.5 |
|                               | Field officer/agronomist | 8  | 7.0  |
|                               | Administrative staff     | 7  | 6.1  |
|                               | Farmer/beneficiary       | 81 | 71.1 |
| Budget/planning participation | Yes                      | 76 | 66.7 |

No

significant positive predictor (B = 0.353,  $\beta$  = 0.370,  $p < 0.001$ ). The logistic model gave the same direction: respondents reporting good/high financial planning had higher adjusted odds of high project success than those reporting poor/low planning (AOR = 3.18, 95% CI: 1.32-7.65,  $p = 0.010$ ).

4.1.1 Research Question One: Financial Planning and Project Success

Financial planning was rated highly, with an overall mean of 4.22 (SD = 0.56). Budget preparation before implementation and the perceived contribution of planning to timely execution each received a mean of 4.48. Realistic cost estimation received the lowest mean (3.95), showing that planning procedures were generally strong but that the accuracy of cost assumptions remained the main area for improvement.

Financial planning had a positive and statistically significant correlation with project success ( $r = 0.581$ ,  $p < 0.001$ ). In the multiple regression model, it remained a

#### 4.1.2 Research Question Two: Price Fluctuations and Project Performance

Price fluctuations recorded an overall mean of 4.44 (SD = 0.52), the highest of the three predictor indices. Respondents strongly agreed that changing input prices, fuel and transport costs, exchange-rate movements, supplier quotations, and price-related budget revisions created pressure on project implementation. The item on input-price effects on budgets received a mean of 4.67, indicating that market volatility was widely experienced as a budget-management challenge.

Price fluctuations were negatively correlated with project success ( $r = -0.477$ ,  $p < 0.001$ ) and remained a significant negative predictor in the multiple regression model ( $B = -0.214$ ,  $\beta = -0.245$ ,  $p = 0.001$ ). In the logistic model, high price fluctuation was associated with lower adjusted odds of high project success (AOR = 0.41, 95% CI: 0.16-0.98,  $p = 0.046$ ).

Interview evidence explained that supplier price changes, transport costs, fuel prices, and exchange-rate movements often required budget revision or delayed procurement. The qualitative and quantitative findings converged: market-price instability reduced the reliability of the original financial baseline and placed pressure on time, cost, and delivery decisions.

#### 4.1.3 Research Question Three: Scope Creep and Project Success

Scope creep was rated highly, with an overall mean of 4.24 (SD = 0.60). Respondents reported client-requested changes, additional activities after approval, unclear or changing scope, implementation delays, and effects on output quality. The results indicate that project requirements were sometimes expanded or modified after approval in ways that increased resource demands.

Scope creep had a negative and statistically significant relationship with project success ( $r = -0.536$ ,  $p < 0.001$ ). In the multiple regression model, it had the largest negative standardized coefficient among the negative predictors ( $B = -0.285$ ,  $\beta = -0.326$ ,  $p < 0.001$ ). High scope creep was also associated with lower adjusted odds of high project success (AOR = 0.32, 95% CI: 0.13-0.79,  $p = 0.014$ ).

Key informants linked the negative pattern to additional activities, client-requested changes, technical modifications, and unclear approval procedures. When changes were not formally costed and approved before implementation, they created additional expenditure and schedule pressure. The qualitative findings therefore provide a clear governance explanation for the statistical association.

**Table 2: Descriptive Summary of Main Study Variables**

| Variable           | Mean | SD   | Interpretation |
|--------------------|------|------|----------------|
| Financial planning | 4.22 | 0.56 | High           |
| Price fluctuations | 4.44 | 0.52 | Very high      |
| Scope creep        | 4.24 | 0.60 | High           |
| Project success    | 3.98 | 0.62 | High           |

**Table 3: Correlations with Project Success**

| Predictor          | r      | p-value | Direction |
|--------------------|--------|---------|-----------|
| Financial planning | 0.581  | <0.001  | Positive  |
| Price fluctuations | -0.477 | <0.001  | Negative  |
| Scope creep        | -0.536 | <0.001  | Negative  |

**Table 4: Multiple Linear Regression Predicting Project Success**

| Predictor          | B      | SE    | Beta   | t     | p      |
|--------------------|--------|-------|--------|-------|--------|
| Constant           | 2.112  | 0.343 | -      | 6.16  | <0.001 |
| Financial planning | 0.356  | 0.067 | 0.370  | 5.31  | <0.001 |
| Price fluctuations | -0.214 | 0.062 | -0.245 | -3.45 | 0.001  |
| Scope creep        | -0.285 | 0.061 | -0.326 | -4.67 | <0.001 |

Model summary:  $R = 0.696$ ;  $R^2 = 0.484$ ; Adjusted  $R^2 = 0.470$ ;  $F(3,110) = 34.37$ ;  $p < 0.001$ .

**Table 5: Adjusted Odds of High Project Success**

| Variable           | Comparison            | AOR  | 95% CI    | p     |
|--------------------|-----------------------|------|-----------|-------|
| Financial planning | Good/high vs poor/low | 3.18 | 1.32-7.65 | 0.010 |
| Price fluctuations | High vs low           | 0.41 | 0.16-0.98 | 0.046 |
| Scope creep        | High vs low           | 0.32 | 0.13-0.79 | 0.014 |

Project success itself had an overall mean of 3.98 (SD = 0.62), indicating generally favorable performance. The strongest item was that project outputs met required standards (M = 4.22), followed by stakeholder satisfaction with project outcomes (M = 4.17) and achievement of planned objectives (M = 4.01). Remaining within approved budgets recorded the lowest mean (M = 3.69), while timely completion had a mean of 3.83. The pattern is consistent with the study problem: respondents viewed quality and objective achievement relatively positively, but cost control was the most visible performance pressure.

The bivariate correlations among predictors described the relationships among the three indices. Financial planning was negatively associated with price fluctuations ( $r = -0.218$ ) and scope creep ( $r = -0.264$ ), while price fluctuations and scope creep were positively associated ( $r = 0.391$ ). These relationships suggest that stronger planning may coexist with lower exposure to unmanaged pressure, whereas market volatility and uncontrolled change can occur together.

The regression equation was Project Success =  $2.112 + 0.356(\text{Financial Planning}) - 0.214(\text{Price Fluctuations}) - 0.285(\text{Scope Creep})$ . The signs of all three coefficients were in the theoretically expected direction. The model therefore provides a coherent answer to the study's three questions: stronger planning was associated with better performance, while greater price pressure and scope creep were associated with lower performance. The 48.4% explained variance describes model fit in this sample; it does not establish causality or predictive accuracy in other projects.

The descriptive and inferential findings were also consistent in managerial direction. The high planning mean coexisted with high reported price and scope pressure, suggesting that reported planning strength can coexist with external market uncertainty and uncontrolled change. This pattern supports attention to both preparing a credible baseline and protecting that baseline during implementation through monitoring, procurement discipline, and formal change authorization.

## 4.2 Discussion

The first research question concerned financial planning. The positive correlation and regression coefficient indicate that stronger financial planning was associated with better project performance even after price fluctuations and scope creep were considered simultaneously. This pattern is consistent with Irfan et al. (2021), who linked project planning and management competence to project success, and with Baributsa and Njenga (2023), who reported a strong positive relationship between cost control and project performance in Rwanda. The present study adds an agricultural private-sector perspective by showing that realistic estimates, contingencies, and periodic financial review are relevant to both resource control and timely implementation.

The descriptive findings also qualify the positive result. Budget preparation was rated very highly, but realistic cost estimation was the weakest planning item. This suggests that having a formal planning process does not automatically produce an accurate baseline. Site conditions, supplier quotations, transport requirements, technical specifications, and beneficiary needs must be reflected in estimates. If assumptions are not updated, a project can appear well planned procedurally while remaining financially vulnerable. The practical implication is to treat budgeting as an iterative management process rather than a one-time approval activity.

The second research question addressed price fluctuations. The negative correlation, regression coefficient, and adjusted odds show that greater market-price pressure was consistently associated with poorer project success. This is consistent with OECD/FAO (2024), which describes agricultural markets as exposed to energy, macroeconomic, climatic, and geopolitical uncertainty. For Holland GreenTech Rwanda, such risk can directly influence the cost of specialized agricultural technologies, irrigation components, greenhouse materials, fuel, transport, and supplier contracts. Because these pressures are partly external, management cannot eliminate them, but it can reduce exposure through early procurement, updated quotations, framework agreements, alternative suppliers, and contingency provisions.

The third research question examined scope creep. Scope creep had a larger negative standardized regression coefficient than price fluctuation in the reported model, suggesting that uncontrolled changes were an important internal management risk. The finding agrees with Ahmed and Jawad (2022), who found that scope-creep dimensions reduced project success. In the current case, informants linked client-requested additions, technical modifications, extra activities, and unclear approval procedures to additional costs and implementation delays. The result reinforces the Project Management Triangle: expanding scope without adjusting cost, time, and resources can place pressure on other performance dimensions.

The combined model explained 48.4% of variation in project success. This indicates the reported in-sample fit of the three-predictor model and shows that more than half of variation remained outside the model. Leadership, procurement efficiency, technical capacity, climate conditions, stakeholder behavior, financing arrangements, and other organizational factors may also influence outcomes. The mixed-method design improves interpretation because interviews showed how the statistical associations were experienced in practice: planning improved preparedness, price changes disrupted procurement, and scope additions created hidden resource requirements.

The findings should therefore be interpreted as an integrated control problem. Improving financial planning without monitoring prices leaves projects exposed to external cost escalation; monitoring prices without controlling scope leaves projects vulnerable to internal changes; and strict scope control without realistic budgeting may preserve an unrealistic baseline. Effective project performance requires coordinated financial planning, market-risk monitoring, procurement management, and formal change control throughout implementation.

From a managerial perspective, the findings indicate that budget control should begin before the first expenditure and continue through project closure. Financial planning establishes the baseline, but that baseline must remain a living management tool. Monthly or milestone-based reviews can compare planned expenditure with actual commitments, procurement status, work completed, emerging price risks, and approved changes. Such reviews would help managers distinguish an unavoidable external variance from a planning error or an unapproved scope addition and select the appropriate corrective action.

The results also have implications for procurement governance. Price fluctuations cannot be controlled by project managers, but exposure can be managed through timing and contracting decisions. Updated quotations, framework contracts, multiple qualified suppliers, early

ordering of price-sensitive items, and explicit escalation or contingency provisions can reduce the probability that a market shock becomes a schedule or quality problem. Finance and procurement functions therefore need shared market intelligence rather than sequential approval processes that delay purchasing until quotations are obsolete.

Scope creep requires a different control response. Stakeholders and clients may request legitimate changes as field conditions evolve, particularly in agricultural technology projects. The risk arises when the change is implemented before its cost, time, quality, and resource implications are assessed. A formal change request should identify the requested modification, justification, cost estimate, schedule implication, responsible approver, and revised baseline. This does not prevent useful adaptation; it makes adaptation transparent and financially accountable.

The findings also contribute theoretically by illustrating how the Project Management Triangle may operate through empirically distinct pressures. Financial planning protects the cost baseline, price fluctuation changes the cost of planned resources, and scope creep changes the quantity or nature of work. Each mechanism can subsequently affect time and quality. The study therefore supports a systems view of budget deviation: the reported associations support coordinating planning, market-risk monitoring, procurement, scope control, and communication.

## 5. Conclusions and Recommendations

### 5.1 Conclusions

The study found that financial planning, price fluctuations, and scope creep were associated with perceived project performance at Holland GreenTech Rwanda. The conclusions below answer the three research questions. They concern respondent perceptions in one organization and do not establish causal effects.

Financial planning had a positive and statistically significant relationship with project success. Respondents reporting stronger planning also reported better performance. Although budget preparation was rated highly, realistic cost estimation was the weakest planning item. The conclusion is that the usefulness of financial planning depends on the credibility of its assumptions and the quality of ongoing review, as well as the existence of a formal budget.

Price fluctuations had a negative and statistically significant relationship with project performance. They also had the highest mean among the three predictor indices, indicating substantial perceived market-price

pressure. Input prices, fuel and transport costs, supplier quotations, and exchange-rate movements were reported to weaken the reliability of fixed budgets. Price volatility therefore represents an external financial risk that planning and procurement decisions need to accommodate.

Scope creep had a negative and statistically significant relationship with project success. Informants linked uncontrolled additions, client-requested modifications, unclear requirements, and delayed approval of changes to additional resource pressure. Scope management is therefore a financial-control issue as well as a technical project-management issue, requiring explicit consideration of the budget and schedule implications of requested changes.

Taken together, the findings support coordinated attention to the realism of budgets, exposure to market-price changes, and authorization of additional work. These are complementary management priorities. Their effectiveness as interventions was not tested by this cross-sectional study.

## 5.2 Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Holland GreenTech Rwanda should translate these findings into the following operational measures. The proposed responsibilities and review intervals provide an implementation framework; they are recommendations rather than activities evaluated by the study.
2. Financial planning: Project managers and finance staff should strengthen participatory budget preparation through detailed site assessment, realistic and updated cost estimation, clear budget lines, and contingency provisions. Before approving each new project budget, technical staff should validate quantities, specifications, locations, and implementation timing against field needs and current supplier quotations. During implementation, project and finance teams should review expenditure, commitments, physical progress, and forecasts monthly and before major procurement commitments. Review records should document significant variances, their causes, and agreed corrective actions.
3. Price fluctuations: Procurement staff, supported by finance and technical teams, should monitor prices of major inputs, fuel, transport, and imported components monthly and refresh quotations before major purchases. The organization should plan procurement early and assess supplier or framework agreements where feasible. Finance staff should assess exposure to

price and exchange-rate changes when setting contingency provisions. Procurement reviews should record quotation validity, material price changes, and available supplier alternatives so that forecasts can be updated before commitments are made.

4. Scope creep: Project managers and technical teams should agree on deliverables, specifications, exclusions, and acceptance criteria with clients before implementation. Every requested change should be documented, costed, assessed for time and quality implications, and formally approved by the designated authority before additional work begins. A change-control register should connect each approved modification to the corresponding budget and implementation-plan update. At monthly reviews, project managers should check that work outside the baseline has documented approval and identify any outstanding change requests.

5. Coordinated oversight: Senior management should assign responsibility for a monthly joint review involving finance, procurement, technical delivery, and monitoring and evaluation staff. The review should consider budget status, physical progress, price risks, scope changes, and stakeholder implications together. Management should track unresolved cost variances, procurement delays associated with price changes, and the proportion of implemented changes supported by approval records. The immediate priorities are to validate budgets before approval, refresh market information before purchasing, and authorize scope changes before implementation. The organization should assess whether these measures improve performance over successive project cycles.

## 5.3 Limitations and Future Research

The study focused on one organization, used a cross-sectional design, and relied largely on respondent perceptions rather than audited project-cost records. The findings therefore cannot establish causal effects or be generalized automatically to other organizations. Non-response may have introduced selection bias, and measurement of predictors and outcomes through the same questionnaire may have introduced common-method bias. Combining staff and beneficiary responses may also conceal differences in access to financial information. The absence of a retained numerical reliability coefficient limits assessment of scale consistency. Future research should use longitudinal designs, verified financial data, and multiple agricultural organizations to test whether the observed relationships remain stable across project phases and organizational contexts. Further work could compare staff and beneficiary responses and evaluate digital budgeting tools, price monitoring, and formal change-

control systems as interventions for reducing budget deviation.

## 5.4 Contribution to Practice and Knowledge

The study contributes context-specific evidence from a private agricultural project setting in Rwanda, where published budget-deviation research is limited. Its main contribution is the simultaneous examination of three distinct pathways - preventive financial planning, external price pressure, and internal scope change - within one performance model. The mixed-method design adds practical explanation by linking the coefficients to procurement, budgeting, and change-control experiences reported by key informants.

For practice, the evidence provides Holland GreenTech Rwanda with a focused control agenda: improve the realism and frequency of financial planning, institutionalize market-price monitoring and procurement risk management, and require documented approval of scope changes. For research, the findings provide a basis for future studies using audited cost variance, longitudinal project records, and cross-company samples to test whether the same relationships hold beyond the current organizational case.

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