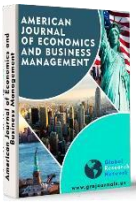

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Article

Increasing The Economic Efficiency of Cotton-Textile Clusters: Ways to Optimize Costs

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Abstract: This research investigates the economic efficiency of cotton-textile clusters and explores effective strategies for cost optimization and productivity enhancement. Cotton production is traditionally labor-intensive and resource -demanding, particularly during the harvesting season, which incurs significant costs. The study employs econometric modeling using Stata 18.0 and SPSS 25.0, analyzing data from 133 clusters to assess key economic factors influencing total expenses. Results indicate that land area, farm management efficiency, financial resources, and irrigation investments significantly impact cost structures. The findings highlight that mechanization, improved financial management, and optimized irrigation systems contribute to expense reduction and overall profitability. The study provides practical recommendations for enhancing the economic sustainability of cotton-textile clusters.

Keywords: Cotton Clusters, Economic Efficiency, Cost Optimization, Econometric Analysis, Productivity

1. Introduction

Historically, cotton cultivation has been labor-intensive and required significant resources, particularly during the harvest season, which incurs high costs. These costs reduce efficiency, but optimizing them is crucial for stable economic growth. Cotton harvest expenses are strategic in terms of reducing village farm sector competitiveness and general productivity increase possible.

2. Materials and Methods

Integrating digital technologies in cotton harvesting can minimize expenses and improve efficiency. Mechanized harvesting, improved irrigation techniques, and optimized logistics significantly reduce labor costs. To the region's typical strategies and modern village farm practices, acceptance is done through cotton to harvest expendable expenses reduction for long-term benefit to make possible. Costs reduce not only profitability increases, maybe cotton growers contribute to the broader economic and ecological goals of their countries.

This comment on scientific research states that Stata 18.0 and SPSS 25.0 were used in the analysis [1]. Modeling in the process our republic in the regions totals 134 cotton and 15 variables of clusters in space information based on econometric modeling. Panel data techniques enhance the robustness of econometric models [2].

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3. Results

The relationship between independent variables (Total land area, Own funds) on the x-axis and Total expenditure spent on the y-axis, using a scatter plot. Blue points separate information points; red lines and regression from the model show installed values, as shown in Figure 1.

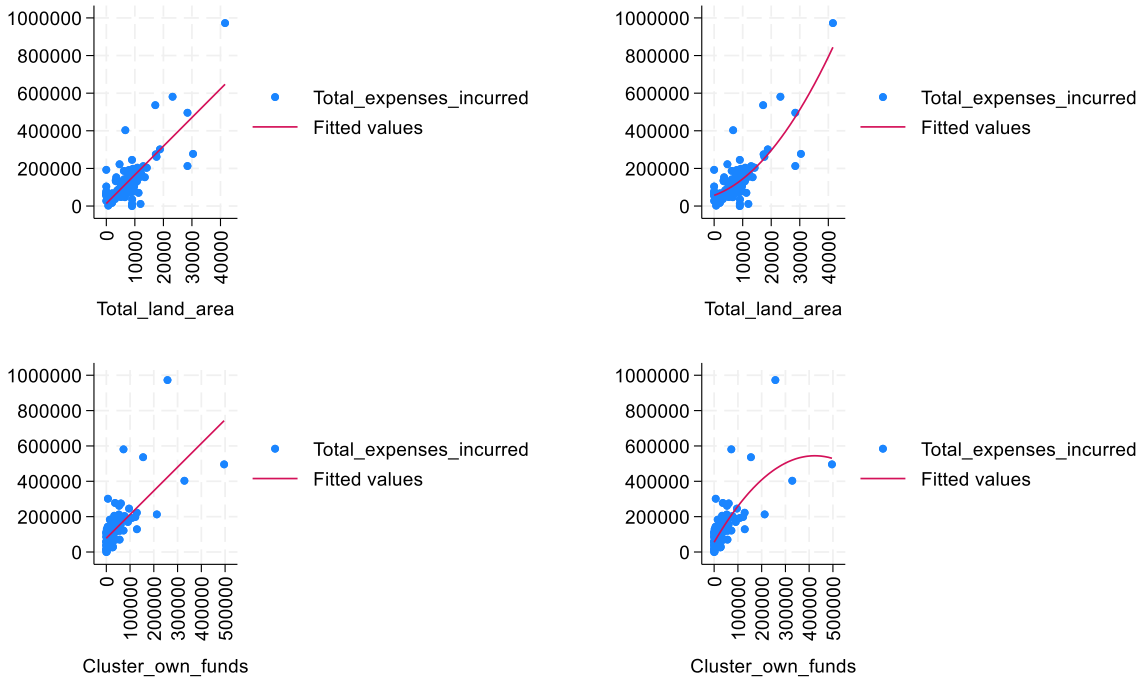

Figure 1. Clusters own funds and total land the area with total scatter plot of costs.

To determine mutual relationships, we used Pearson pair correlation tests [3]. To it according to this table, expenses and other factors with related variables between pair correlations presented will have their statistical significance p-values determined.

Table 1 shows the Pearson pair correlation coefficients between key variables and their statistic importance with one in the row (brackets p-values) are presented. Total_expense_spent (total costs) depends on variable one, how many factors with strong positive correlation demonstration will reach. The results indicate strong positive correlations between Total land area, Farm land area, and Number of farms, suggesting that an increase in land area is associated with a proportional increase in farm activities. Additionally, Total expenses show a high correlation with Money spent on irrigation (r = 0.756) and Farmer loans for irrigation (r = 0.691), implying that financial investments in irrigation significantly impact overall costs. The matrix also reveals that Productivity has a weak correlation with land-related factors but a stronger link to investment variables, emphasizing the role of financial resources in improving efficiency. This finding cost forms in determining land size, financial mechanisms, and labor importance, emphasizing that together they credit related factors such as some variables with less contribution as addictive.

Table 1. Pearson pair correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Total_expenses~d	1.000							
(2) Total_land_area	0.784*	1.000						
	(0.000)							
(3) Number_farms	0.642*	0.805*	1.000					

	(0.000)	(0.000)						
(4) Farm_land_area	0.670*	0.862*	0.862*	1.000				
	(0.000)	(0.000)	(0.000)					
(5) Percentage_lan~t	0.070	0.021	0.026	-0.066	1.000			
	(0.423)	(0.813)	(0.768)	(0.446)				
(6) Productivity	0.230*	0.146	0.020	0.081	0.234*	1.000		
	(0.007)	(0.093)	(0.821)	(0.354)	(0.007)			
(7) Money_spent_ir~e	0.756*	0.510*	0.466*	0.372*	0.469*	0.260*	1.000	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)		
(8) Farmer_loan_ir~e	0.691*	0.391*	0.356*	0.328*	0.261*	0.239*	0.794*	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.005)	(0.000)	
(9) Irregation_lan~n	0.588*	0.430*	0.322*	0.256*	0.136	0.055	0.560*	0.643*
	(0.000)	(0.000)	(0.000)	(0.003)	(0.118)	(0.526)	(0.000)	(0.000)
(10) Cluster_own_f~s	0.703*	0.539*	0.526*	0.393*	0.157	0.105	0.623*	0.320*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.069)	(0.229)	(0.000)	(0.000)
(11) Investment_ag~e	0.476*	0.396*	0.238*	0.249*	0.201*	0.136	0.426*	0.443*
	(0.000)	(0.000)	(0.006)	(0.004)	(0.020)	(0.118)	(0.000)	(0.000)
(12) Value_project~s	0.405*	0.289*	0.063	0.132	-0.022	0.141	0.307*	0.298*
	(0.000)	(0.001)	(0.472)	(0.129)	(0.800)	(0.103)	(0.000)	(0.000)
(13) Value_bank_cr~s	0.183*	0.125	-0.040	0.036	-0.060	0.110	0.131	0.112
	(0.034)	(0.150)	(0.650)	(0.676)	(0.489)	(0.207)	(0.132)	(0.198)
(14) Seasonal_empl~t	0.666*	0.539*	0.547*	0.581*	0.108	0.122	0.503*	0.551*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.215)	(0.161)	(0.000)	(0.000)
(15) kwt	0.187*	0.025	0.042	0.037	0.228*	0.189*	0.221*	0.229*
	(0.031)	(0.778)	(0.629)	(0.671)	(0.008)	(0.028)	(0.010)	(0.008)

Simple correct linear regression model is a statistical technique used to understand the relationship between a single dependent variable and multiple independent variables. The importance of multivariate relationships in economic models [4]. This model extends the principles of simple linear regression to account for the complexity of real-world data and allows researchers to examine the combined effects of multiple predictors [5]. The model's compatibility determination coefficient, R-squared, is evaluated.

In the Table 2 discussed, the results of the simple linear regression model estimating the determinants of total expenses in cotton-textile clusters are shown. The model's high R-squared value of 0.916 indicates strong explanatory power. The model explains approximately 91.6% of the variations in expenses through independent variables. The model's overall statistical significance is confirmed by an F-test value of 93.189 ($p < 0.001$). Impact of land area and financial resources on expenses in agricultural economics [6]. The coefficients indicate that total land area (Coef. = 4.361, $p < 0.01$) and farm land area (Coef. = 5.793, $p < 0.01$) are significant cost drivers, meaning that expanding agricultural land increases expenses. Conversely, the number of farms (Coef. = -104.792, $p < 0.01$) has a negative effect on total expenses, suggesting that clusters with more farms may achieve cost efficiency through economies of scale. Farmer loans for irrigation (Coef. = 1.138, $p < 0.01$) and cluster-own funds (Coef. = 0.688, $p < 0.01$) are also strong predictors of expenses, highlighting the role of financial investments in determining cost structures.

Table 2. Simple correct linear regression model.

Total_expenses _inc~d	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Total_land_area	4.361	1.434	3.04	.003	1.522	7.201	***
Number_farms	-104.792	34.094	-3.07	.003	-172.301	-37.283	***
Farm_land_area	5.793	1.731	3.35	.001	2.365	9.221	***
Percentage_land	-929.221	265.301	-3.50	.001	-1454.544	-403.899	***

_dr~n							
Productivity	1041.429	630.782	1.65	.101	-207.583	2290.44	
Money_spent_irriga~m	.474	.282	1.68	.096	-.085	1.033	*
Farmer_loan_irriga~m	1.138	.252	4.52	0	.639	1.636	***
Irregation_land_re~n	1.283	1.079	1.19	.237	-.853	3.419	
Cluster_own_funds	.688	.085	8.15	0	.521	.856	***
Investment_agricul~e	.088	.381	0.23	.818	-.666	.842	
Value_projects_clu~s	.292	.086	3.41	.001	.122	.462	***
Value_bank_credit_~s	-.112	.046	-2.42	.017	-.204	-.021	**
Seasonal_employment	4.361	2.167	2.01	.046	.071	8.651	**
Kwt	-2.124	17.202	-0.12	.902	-36.185	31.937	
Constant	-7497.079	22638.234	-0.33	.741	-52323.043	37328.884	

Mean dependent var	128556.392	SD dependent var	116917.167
R-squared	0.916	Number of obs	134
F-test	93.189	Prob > F	0.000
Akaike crit. (AIC)	3204.055	Bayesian crit. (BIC)	3247.523

*** p<.01, ** p<.05, * p<.1

In general, taking regression from the ground use [7], financial expenses, and labor total expenses are strong determinant factors that The polynomial is expressed as the addition of a constant term to the dependent variable in a linear equation and the multiplication of each independent variable by its corresponding coefficients.

Total_expenses_incurred=−7497.079+4.361(Total_land_area)−104.792(Number_farms)+5.793(Farm_land_area)−922.221(Percentage_land_drip_irrigation)+
+1041.429(Productivity)+0.474(Money_spent_irrigation_system)+1.138(Farmer_loan_irrigation_system)+1.283(Irregation_land_reclamation)+0.688(Cluster_own_funds)+0.088(Investment_agriculture)+0.292(Value_projects_clusters)−

-0.112(Value_bank_credit_projects)+ ϵ

General conclusion to do if we use the OLS model [8] to take regression to the results based on how many variables are noticeable in the result at the level of impact that it determined, how many variables are noticeable in the result?

4. Discussion

The analysis results show that effective land and resource use in cotton-textile clusters plays a crucial role in reducing costs. In particular, the cluster total land of the area increased from one to unity, increasing total spent costs by 4.361 units. The cluster in the content farmer farms land area increased from one to unity, increasing total spent costs to 5.793 units. The reason is known to be that it has been.

Clusters for financial resources correct management increase profitability for the main factors; one is considered. Productivity increases expenses even if it increases; the general income multiplication through clusters makes economic stability reinforcement possible. Effective management of credit resources is essential for optimizing expenses.

These results are based on cotton in clusters; expense optimization for the following strategies recommendations is being done:

1. Earth from resources further effective use - mechanization and new technologies current to be [9].
2. Financial management improvement - clusters own investment strategies strengthen necessary [10], [11].
3. Credit systems reform is to do - clusters for percent rates and return conditions again see exit as necessary [12], [13].
4. Productivity increase through expenses optimization - new agrotechnician methods are wide and current to be [14].
5. Risk management strategies and policy evaluation - further studies should focus on assessing financial risks and international best practices to improve economic efficiency [15].

6. Conclusion

Poverty The findings of this research emphasize the critical role of efficient resource management, cost optimization, and technological advancements in enhancing the economic efficiency of cotton-textile clusters. Several key conclusions can be drawn:

2. Land and resource utilization: The study confirms that an increase in total land area and optimized farm management contribute to higher total expenditures but also lead to improved productivity and profitability in the long run.
3. Financial resource allocation: Effective management of financial resources, including own funds and investment strategies, plays a crucial role in reducing unnecessary costs and increasing economic stability.
4. Irrigation and mechanization: The adoption of modern irrigation techniques and mechanized harvesting methods significantly reduces labor costs and improves overall efficiency. Clusters investing in irrigation land reclamation and infrastructure development show better financial performance.
5. Cost optimization through credit systems: Financial support mechanisms, such as farmer loans and investment in agricultural projects, have a substantial impact on expense reduction and yield improvement. Reforming credit systems and optimizing loan conditions for clusters can further enhance efficiency.
6. Regression analysis findings: The econometric model demonstrates that land size, financial investments, irrigation management, and seasonal employment costs are the most influential factors determining total expenses. The high R-squared value of 0.916 indicates that these independent variables explain approximately 91.6% of variations in total costs.

Based on these findings, several practical recommendations are proposed:

1. Enhancing mechanization and modern technologies to improve labor productivity and minimize manual work costs.
2. Strengthening financial planning and investment strategies within clusters to ensure sustainable economic growth.
3. Reforming credit and loan systems to provide clusters with better financial support and lower interest rates.
4. Implementing innovative agricultural techniques to increase productivity while reducing input costs.

In summary, optimizing costs through technological advancement, financial efficiency, and improved resource allocation will contribute to the long-term sustainability and profitability of cotton-textile clusters. Future research should focus on evaluating policy implications, risk management strategies, and global best practices to further enhance economic efficiency in the sector.

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