Perceptions and Choices for Urban Greening: A Socio-Economic Study of Tree Plantation Among Business Community in Faisalabad

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Abstract

This study investigates the perceptions and choices of the business community in Faisalabad regarding tree plantation, recognizing their potential as active contributors to urban sustainability. A descriptive research design was adopted. Five main roads in Faisalabad, i.e., Satyana Road, Jhang Road, Canal Road, Samundri Road, and Sargodha Road, were selected using a map grid method. Primary data were collected from business owners through structured questionnaires and face-to-face interviews. Perception was evaluated using four proxy variables, which were converted into a composite index and analyzed through multiple linear regression. Multinomial logistic regression was applied to assess choice behavior. Variables included enterprise size, owner's gender, experience, income, education, ownership status, perceived benefits of trees, and awareness of tree management practices. Findings show that enterprise size, income, education level, gender, and business experience significantly influence perceptions about tree plantation. Additionally, choices regarding willingness to pay for plantation were affected by ownership status, perceived benefits, tree management concerns, and perceived importance of urban greenery. This study emphasizes that their decisions on tree species, irrigation, and plantation locations are not merely aesthetic but reflect adaptive behavior and resource constraints. Policy efforts must shift from top-down plantation drives to inclusive, enterprise-sensitive, and localized urban greening strategies. Co-ownership and co-management of green infrastructure by commercial stakeholders could transform urban forestry into a scalable, economically integrated tool for climate resilience.

Keywords: Business Community, Tree Plantation, Climate Change, Urban Greening.

Introduction

Human life depends on the environment, which is a vital and reciprocal medium that enables basic needs such as breathing, food, shelter, and social growth (Atolagbe & Fadamiro, 2006; Bush et al., 2011). However, the equilibrium between ecological sustainability and human activity has been upset in modern metropolitan settings. Environmental deterioration has been caused by industrialization, urbanization, and the uncontrolled use of natural resources. This has resulted in noise disruptions, biodiversity loss, and contamination of the air, water, and soil (Corvalán et al., 1999; Kampa & Castanas, 2008). On both local and global levels, environmental quality and public

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health are at risk due to the unsustainable exploitation of natural resources and the lack of restorative ecological practices (Tairu, 1998).

In many South Asian cities, urban pollution, in particular, remains a significant problem. Environmental vulnerability is further exacerbated by land and water contamination from waste discharge, as well as airborne pollutants from industrial emissions and vehicle exhaust, leading to a rise in respiratory disorders (Nishizawa et al., 2018). The loss of green cover is exacerbated by deforestation and forest degradation, which are often caused by the use of wood fuel, logging, and land conversion. These factors also contribute to soil erosion and rising urban temperatures (Langford et al., 1999). These actions have combined to create complex environmental issues that necessitate comprehensive urban greening solutions.

Urban landscaping and tree planting have become crucial strategies to mitigate the effects of urbanization. Urban heat island impacts are lessened, biodiversity is increased, air and water quality are improved, and healthier, more resilient urban habitats are created when trees are planted (Coder, 2011; Bonilla et al., 2008). From a social standpoint, green areas promote community togetherness, lower stress levels, and improve psychological well-being (Velarde et al., 2007). Other social and economic advantages of urban forestry include a decrease in crime, aesthetic enhancements, and higher property values (Killicoat et al., 2002). By providing shade and acting as a wind buffer, well-maintained trees can lower energy costs and raise the market value of both residential and commercial buildings.

Despite these benefits, there are still few urban tree planting initiatives, especially in crowded, busy business areas. Urban plantations are discouraged by factors such as space constraints, poor planting practices, harsh microclimates, and poor upkeep (CUFR, 2001). The willingness and ability of urban actors to engage in environmental stewardship projects can also be influenced by socioeconomic characteristics, like enterprise size, educational attainment, and income levels. Sustainable tree planting initiatives must involve urban stakeholders, especially the business community (Wu, 2008).

The environmental challenges that rapidly urbanizing regions face are exemplified best by Faisalabad, Pakistan's third-largest city and a significant hub for textiles and industry. Faisalabad is one of the most polluted cities in the world, mainly due to its industrial operations, reliance on wood fuel, and high vehicle density, all of which have further exacerbated the city's declining air quality (Li, 2020; Mahmood, 2019). The average air quality index in the city is 130.4, which puts residents at higher risk for respiratory ailments and environmental degradation. These issues are exacerbated by declining tree cover, a lack of organized urban greening initiatives, and insufficient green space. To address these issues, community-based, inclusive strategies that promote cooperation between public and private stakeholders are necessary.

Shopkeepers, market vendors, owners of commercial plazas, and small-scale industrialists make up the business community, which plays a vital role in the urban environment. Their participation in tree planting is particularly pertinent given their proximity to roadsides, marketplaces, and other heavily populated areas. The success of urban forestry initiatives can also be significantly influenced by their choices on tree species, planting techniques, preferred irrigation systems, and funding allocation. In the South Asian context, there remains a dearth of research on their environmental views, motivations, and constraints.

This study examines the views and engagement of the Faisalabad urban business community with tree planting initiatives. It specifically examines the variables that affect their decisions regarding plantation methods, irrigation schedules, and tree types. It also examines how socioeconomic characteristics, including income, education, gender, and firm size, influence their environmental

behavior. By understanding these processes, the study aims to contribute to participatory urban greening models and provide policy recommendations that strike a balance between corporate interests and environmental sustainability. By doing this, it adds to the larger conversation about co-producing resilient urban landscapes and inclusive urban forestry design.

Materials and Methods

Conceptual Framework

The study's conceptual framework (Fig. 1) illustrates how urban greenery, socioeconomic factors within the business community, their perceptions, and subsequent choices regarding tree planting are all interconnected. Based on theoretical presumptions and empirical data, the framework is organized around a cause-and-effect route where each element affects the subsequent one.

Figure 1: Conceptual framework

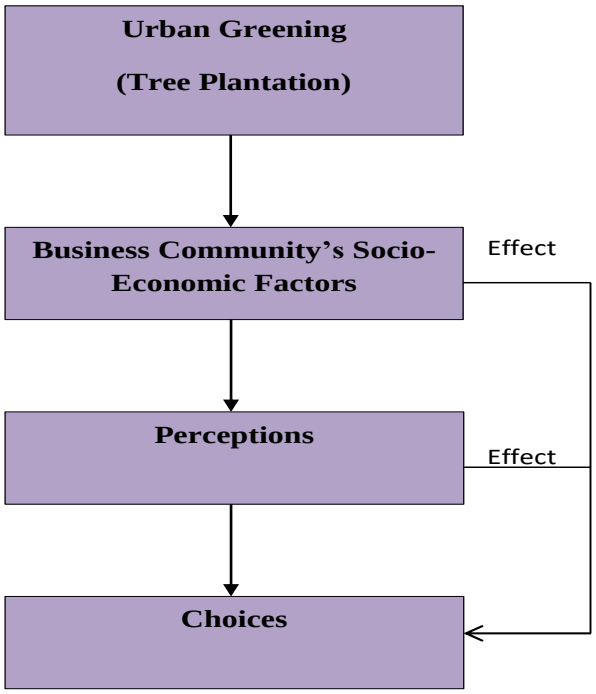


Figure 1: Conceptual Framework

This conceptual framework shows the dynamic relationship between the socioeconomic characteristics of the business community and their perception and choices about tree planting in urban Faisalabad. Perceived advantages, perceived concerns, perceived importance, and management are the four main aspects in which socioeconomic factors such as gender, income, education, experience, firm size, and ownership status are considered to have a substantial impact on how people perceive tree plantations. Businesses' decisions about tree plantation strategies, which range from conventional to highly sophisticated options, are influenced by these perceptions

alongside with the same socioeconomic factors. These factors include nursery selection, sowing, irrigation, fertilization, monitoring, cost management, and preferences for particular tree varieties. The framework highlights a cascading effect, in which socioeconomic factors initially effects perception, which in turn influences actual participation in urban greening initiatives. This approach offers a comprehensive understanding of how perceptions and choices influence sustainable urban forestry practices.

Sampling and Data Collection

The study sites were chosen from among the following five main roads in the urban Faisalabad: (a) Satyana Road, (b) Jhang Road, (c) Canal Road, (d) Samundri Road, and (e) Sargodha Road. The broad geographic dispersion and diversity of these roads served as the basis for the decision. A map grid approach was used to gather data from 30 businesses (shops, stores, and petrol pumps) on each road. Each road's physical map was split into X and Y axis grids, and samples were chosen to guarantee that stores, malls, and petrol pumps were evenly represented in each grid cell. By ensuring a broad spatial distribution of the chosen businesses, this grid-based sample technique enhanced each road's representativeness.

Quantification of Perceptions

The questionnaires were examined following data collection to ascertain the accuracy and validity of the responses. A four-point Likert scale was used to collect perception data on four important components. Management priority (high, medium, low, and not sure), perceived importance (very important, somewhat important, not important, and not sure), perceived benefits (major, minor, not a benefit, and not sure), and concerns (major, minor, not a concern, and not sure) were among these components. In order to quantify and compare perception-based data, the Likert-scale responses were then converted into index values using a composite index approach.

Composite Index

$$TV = \frac{X_i - min}{\max - min} \quad (1)$$

Where,

Index = Sum of TVs

TV = Transformed Variables

A multiple regression model was used to examine the factors, sources, and the respondents' perceptions about planting trees, particularly with regard to perceived benefits concerns, management, and importance. The impact of several socioeconomic characteristics on the business community's perceptions was investigated using this model. To determine how respondents' perceptions of tree plantations were affected by important variables such as education level, gender, income, years of experience, and enterprise size, the following model was empirically estimated.

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + ei \quad (2)$$

Where Y is representing the dependent variable (perception), β0 is the Intercept, (β1,……..,β5) are the parameters or coefficients, (X1,…….., X5) are the independent variables and ei denotes the error term.

Choice Modeling

A stated preference approach was used in the form of a Choice Experiment (CE) to assess the non-market value of trees, specifically their non-use value, which encompasses aesthetic appeal and

environmental relevance. By posing hypothetical choice scenarios to people, the CE approach makes it possible to estimate their preferences (Wang et al., 2007). It provides a structured examination of the trade-offs made by respondents by characterizing the good in this case, trees based on a set of qualities and related levels. Tree varieties, nurseries, sowing, irrigation, fertilizing, monitoring, and total cost were the seven tree-related criteria that were part of the choice design in this study. There were four levels for each attribute: highly advanced, advanced, moderate, and traditional. Different levels of input or management intensity are reflected in these levels.

A multinomial logistic regression model was used to examine the responses, where the dependent variable is categorical and represents alternative possibilities (Long and Freese, 2006). Based on a collection of independent factors, this modeling approach calculates the likelihood of each potential outcome and is suitable for nominal outcome variables. The model was used to evaluate how different socio-economic factors (such as enterprise size, education, gender, income, and experience) affected the business community's choices about planting trees.

For this study the following form of multinomial logistic regression was applied;

$$\text{Ln}\,[P(\text{Choices}=\text{option}i)/P(\text{Choices}=\text{Option}j)] = \beta 0h + \beta 1hX1 + \beta 2hX2 + \beta 3hX3 + \beta 4hX4 + \beta 5hX5 + \beta 6hX6 + \beta 7hX7 \quad (3)$$

Where,

Ln [P (Choices= Option i)/ P (Choices= Option j)] = log-odd, dependent variable (choices) with specific category to base category

i = Options 1-3
j = Base category (option 4, in this study)
X1 = Size of enterprise
X2 = Income
X3 = Qualification
X4 = Benefits
X5 = Concern
X6 = Importance
X7 = Management
β0 = Intercept
(β1,…….. ,β7) = Parameters or Coefficients

Results and Discussion

The respondents' descriptive statistics, including mean values and standard deviations, are shown in Table 1. Perceived benefits and concerns both had average index values of 8.43 and 4.58. Perceived importance and management likewise had average index values of 3.95 and 5.5. Respondents had an average 23.07 years of experience, and the average enterprise size was 9.92 employees per enterprise. The respondents' average level of formal education was 12.20 years, and their average monthly income was 34633.3. In terms of ownership status, 80.7% respondent owned their business, whereas 19.3% operated their business (store, petrol pumps, or mart) on rented space.

Table 1: Descriptive statistics of respondents		
Variables	**Mean**	**St. Deviation**
Dependent Variables		
Perceived Benefits	8.43	1.63
Perceived Concerns	4.58	0.42
Importance	3.95	0.78
Management	5.5	1.5
Independent Variables		
Size of enterprise	9.92	12.23
Experience	23.07	11.03
Income	34633.3	42800.8
Qualification	12.20	3.61

The distribution of respondents' choices among the four options is shown in Table 2. In all, option 1 was selected by 30.7% of respondents, option 2 by 26.7%, option 3 by 22.7%, and option 4 by 20.0%.

Table 2: Distribution of Choices												
Choices	**Satyana Road**		**Jhang Road**		**Samundri Road**		**Canal Road**		**Sargodha Road**		**Overall**	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Option 1	6	20.0	8	26.7	14	46.7	5	16.7	13	43.3	46	30.7
Option 2	11	36.7	10	33.3	4	13.3	8	26.7	7	23.3	40	26.7
Option 3	11	36.7	8	26.7	8	26.7	3	10.0	4	13.3	34	22.7
Option 4	2	6.7	4	13.3	4	13.3	14	46.7	6	20.0	30	20.0

Estimates from Multiple Regression

Four multiple linear regression models were generated in order to evaluate the ways in which socioeconomic variables impact perceptions on tree plantations. (i) Perceived benefits (ii) concerns (iii) perceived importance of tree plantations and (iv) Management were the dependent variables. The same set of independent variables gender, income, education, experience, and enterprise size were included in each model. Perceptions were analyzed in this research regarding perceived benefits from trees, their management, perceived importance of trees, and concerns related to trees. Table 3 displays the regression model findings, emphasizing how the five independent factors affected these perceptions. In all three models (benefits, importance, and management), size of the enterprise had a positive and statistically significant effect. This suggests that respondents who run larger businesses are more likely to think of trees as important, helpful, and to understand how to manage them. The importance of education in influencing how people perceive the environment is further demonstrated by the fact that education (qualification) was a strong and positive predictor in both the benefits and management models.

Table 3: Parameter estimates of regression equations

Variables	**Model 1: Perceived Benefits**	**Model 2: Perceived Concerns**	**Model 3: Perceived Importance**	**Model 4: Perceived Management**
Size of Enterprise	0.008(0.005)**	-0.001(0.003)	0.03(0.00)***	2.91(0.78)***
Experience	0.04(0.007)***	0.001(0.004)	0.009(0.005)*	0.02(0.008)
Gender	0.55(0.45)	0.18(0.25)	0.26(0.36)	-0.33(0.70)
Income	9.61(1.51)	1.20(8.46)*	3.53(1.23)	0.00001(2.36)***
Qualification	0.29(0.02)***	0.0004(0.01)	0.01(0.01)	0.19(0.03)***
Constant	3.15(0.50)***	4.34(0.27)***	2.91(0.40)***	2.91(0.78)***
F value	107.15	0.61	18.65	22.56
Prob > F	0.000	0.69	0.000	0.000
R^2	0.78	0.02	0.39	0.43

Note: Standard Errors are provided in parenthesis. *, ** and *** for significance at 10%, 5% and 1% respectively.

In both models, income reached statistical significance and was positively correlated with management and perceived benefits. This research suggests that people with higher incomes are both more likely to support tree planting and more critical of its management. Benefits and relevance were significantly positively impacted by experience, indicating that respondents with more years of work experience are better aware of the functions that trees play in urban and commercial settings. Only in the benefits model, where male respondents reported higher perceived benefits than female respondents, was gender meaningful. Gender had a detrimental, although not statistically significant, impact on the management approach.

The model's goodness of fit varied. Good model fit and dependability were shown by the benefits model ($R^2 = 0.78$), which was followed by management ($R^2 = 0.43$) and importance ($R^2 = 0.39$). The concern model, on the other hand, did not reach statistical significance ($R^2 = 0.02$), indicating that socioeconomic factors are insufficient to account for the perceived issues around tree planting. In conclusion, perceptions about tree plantation were consistently and significantly predicted by firm size, income, and education. The concern model's poor performance indicates a possible knowledge gap on the factors influencing perceived drawbacks, which calls for additional qualitative research.

Estimates from Multinomial Logistic Regression

The result of multinomial logistic regression explaining the impact of the independents variables on choices which are summarized in the table 4.

Multinomial Logistic Regression analysis of Choices

The multinomial logistic regression models' results (Table 4) show how respondents' decisions about tree plantations are influenced by a number of socioeconomic and perceptual characteristics. The probability of choosing Option 1, Option 2, or Option 3 is compared in each model to the baseline (Option 4). All three models had seven independent variables: ownership status, income, qualification, perceived importance, perceived benefits, perceived concerns, and perceived management.

Table 4: Results from the Multinomial Logistic Regression

Variables	Option 1 vs 4		Option 2 vs 4		Option 3 vs 4	
	Coefficients	Odds Ratio	Coefficients	Odds Ratio	Coefficients	Odds Ratio
Ownership	1.92*** (0.66)	6.82***	1.61*** (0.68)	5.002***	1.76*** (0.71)	5.812***
Income	0.000072** (0.000038)	1.000**	0.000083** (0.000037)	1.000**	.000078** (0.000038)	1.000**
Qualification	0.11* (0.14)	1.116*	0.038 (0.14)	1.038	0.12* (0.15)	1.127*
Benefits	0.15 (0.30)	1.161	0.20* (0.30)	1.221*	0.13* (0.31)	1.138*
Concerns	0.52 (0.56)	1.682	0.75 (0.59)	2.117	0.76 (0.61)	2.138
Importance	-0.13 (0.37)	0.878	-0.23 (0.36)	0.794	-0.03 (0.39)	0.970
Management	-0.44 (0.38)	0.644	-0.67*** (0.37)	0.511***	-0.76** (0.37)	0.467**
Constant	-5.27* (3.31)	0.005*	-4.35 (3.39)	0.012	-5.38 (3.59)	0.004
LR Chi 2	25.51		22.51		25.51	

Note: Standard Errors are provided in parenthesis. *, ** and *** represents significance at 10%, 5% and 1% respectively.

Crucial Actors in Every Model

The best and most reliable indicator of tree plantation decisions was ownership. Compared to Option 4, owner responses were far more likely to select options 1, 2, or 3. According to the odds ratios, owners were almost five to six times more likely than tenants to choose Options 1, 2, or 3, underscoring the crucial influence of land or property tenure on environmental choices. Another significant variable that was strongly correlated with decisions across all models was income. The effect was consistently significant even though the income scale resulted in tiny coefficient values. This implies that people with higher incomes are more likely to support or take part in tree planting, whether as a result of having more money to spend or being more environmentally conscious. All three selections were strongly correlated with perceived tree planting concerns, such as maintenance challenges, falling leaves, or interference from infrastructure. This suggests that those who are more conscious of the possible problems that trees may present are also more actively involved in selecting plantation options, perhaps in an effort to allay or lessen those worries. For every unit rise in the concern index, the likelihood of choosing options 1, 2, or 3 increased by 1.6 to 2.1 times. Option 2 and option 3 were negatively and statistically significantly predicted by perceived management. This suggests that respondents who thought tree management authorities performed well were less likely to select options 2 and 3 over option 4, presumably because they were content with the way things were being managed and didn't think there was a need for additional adjustments or interventions.

Moderate or Inconsequential Factors

Although there was a positive relationship between perceived benefits and all three options, no model showed statistical significance. Although this implies that those who understand the advantages of trees are more likely to support plantations, advantages by themselves might not be

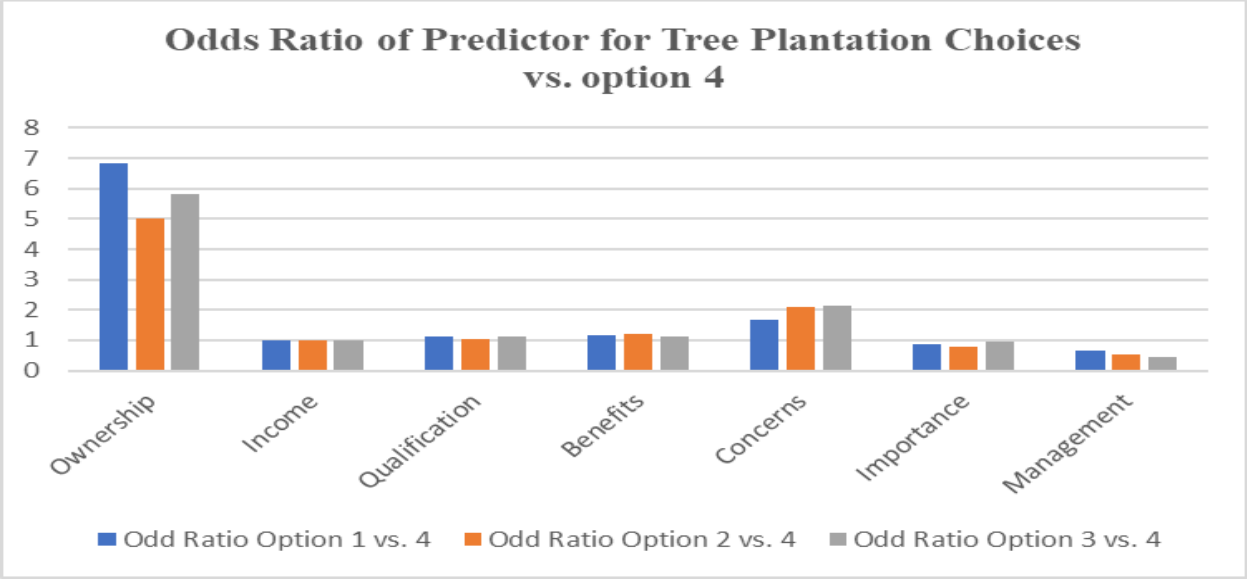
a powerful motivator unless combined with other elements like income or ownership. Additionally, qualification revealed a slight but steady positive correlation between models. Even though respondents with higher levels of education typically chose Options 1–3, the effects were not statistically significant, suggesting that, in the absence of other enabling circumstances, education alone may not translate into stronger behavioral preferences. It's noteworthy to see that all three options were inversely correlated with perceived importance. Despite not being statistically significant, this result might indicate a gap between recognizing the overall value of trees and participating specifically, perhaps as a result of perceived obstacles, satisfaction with the present circumstances, or a lack of empowerment.

Fit of the Model and Basic Trends

With the same Likelihood Ratio Chi-square value ($\chi^2 = 25.51$), all three models were statistically significant overall and showed a better fit than the null models. Variability in predictor significance between models, however, suggests that respondents' preferences for various plantation choices are diverse.

The influence of the predictors on the choice odds in comparison to option 4

Figure 2: Odd Ratio



Each predictor, such as Ownership and Income, affects the likelihood of selecting Options 1, 2, and 3 in comparison to Option 4, the reference category, as shown graphically in a grouped bar chart. The relative likelihood of choosing one of the first three alternatives over Option 4 is represented by each bar, which is clustered together for each predictor. Each bar's height indicates the degree and direction of the predictor's influence on the likelihood of selecting that option.

Conclusion

According to the study's findings, the urban business community in Faisalabad has an overall positive perception of tree plantations, particularly regarding their perceived management, significance, and benefits. The respondents acknowledged trees as important resources that support psychological health, urban beauty, and environmental quality. These perceptions were found to

be highly influenced by key socioeconomic factors, including enterprise size, years of experience, gender, income, and educational attainment. These factors significantly influenced how respondents recognized the benefits of trees, their value in urban environments, and the associated maintenance responsibilities. Perceptions of tree-related issues (such as space limitations, maintenance challenges, and possible property damage) differed from anticipated trends, though, indicating that more education and policy dissemination would be required to alleviate concern.

To determine the business community's willingness to pay (WTP) for the qualities of tree plantation, the study employed a hypothetical choice experiment. The findings showed that urban trees have a high economic value, and most respondents indicated that they would be willing to make a financial contribution, especially if improved management and support services were available. The most expensive option (Option 1), which costs PKR 8130, was chosen by almost 30.7% of respondents. Options 2 and 3 were chosen by 26.7% and 22.7% of respondents, respectively, for 20% and PKR 1240. These results show that demand for tree plantations increases when improved features and services are offered, indicating a market-based opportunity to encourage private sector participation in value-added urban greening projects.

Interestingly, WTP varied across road segments, indicating that contextual and geographical elements can influence the value of urban business trees. Additionally, ownership status, income level, educational background, and respondents' perceived advantages, concerns, and comprehension of tree management all had a substantial impact on the economic value attached to tree plantations. These findings demonstrate how urban business actors can play a significant role in advancing city-level greening initiatives, particularly when laws are created to align with their investment preferences.

To sum up, improving urban forestry in places like Faisalabad requires an incentive-based, collaborative strategy that considers the goals and limitations of many urban stakeholders. This study offers a basis for creating focused urban greening plans that are both economically feasible and socially acceptable by fusing perceptions with economic valuation. Future initiatives should concentrate on strengthening business-community collaborations in sustainable urban forest management by enhancing technical outreach, facilitating support systems, and establishing conducive environments.

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