



Research Article

Public Awareness About Native and Exotic Plants: An Approach to Develop Sustainable Urban Plantation Plan

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Abstract | Public attitudes toward urban trees, as well as an understanding of their ecological services and drawbacks, may significantly affect urban tree management decisions, with significant implications for urban plantation sustainability. The present study was conducted in Faisalabad city, Pakistan. A questionnaire survey of 300 respondents from the city's roadside, urban parks, and residential areas was undertaken to assess their perspectives on the present state of the plantation, and their knowledge level about the sustainable plantation, native, and exotic trees were evaluated. Public involvement and their opinions on the future development of sustainable urban plantations were also studied. The majority of the public showed dissatisfaction with the present status of the plantation (50.3 %). Results also showed that the majority of the public has a low level of knowledge about native (54.7%) and exotic trees (80.6%). Understanding of sustainable plantation was also found low (85.3%). P-values of the chi-square test indicated that education has a strong significant relationship with the knowledge level about urban plantations. To improve public knowledge and understanding of the development of sustainable plantations, municipal departments related to urban plantation development should initiate public awareness campaigns about the knowledge and benefits of native and exotic trees. The local municipality should also improve the plantation and must initiate programs to encourage public participation in the sustainable development of the plantation soon.

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Introduction

Trees are the important component of urban green spaces as they are linked to the supply of a variety of ecosystem services (McBride, 2017). Pollution

abatement, microclimatic management, water regulation, soil quality, and the production of edible fruits are all examples of these services (Escobedo *et al.*, 2011). Trees differ in terms of their physical and biological properties (such as height, foliage, lifetime,

and so on); they contribute differently in the supply of certain ecological services (Roy *et al.*, 2012). Around the world, native and exotic plant species combine in unique combination to develop urban forests (Alvey, 2006; Aronson *et al.*, 2015; Gaertner *et al.*, 2017). According to Jaksic and Castro (2020) exotic plant species have taken over urban green spaces in various parts of the world. In this framework, a debate has erupted about the relative importance of native and exotic tree species (Dearnorn and Kark, 2010; Conway *et al.*, 2019). Some research encourages the usage of native trees for ecological reasons (Oldfield *et al.*, 2015), while some researchers advocate for utilizing the ecological services supplied by tree species regardless of their biogeographically origin (Vaz *et al.*, 2018).

Pakistan is a country where scientific research related to the importance of ecosystem services is still in its initial stages, but it is essential to tackle the increasingly deteriorating status of urban ecological health (Larondelle and Lauf, 2016; Haase *et al.*, 2014). It is critical to raise public awareness in order to protect ecosystems, combat biodiversity loss, and comprehend the impact of humans on nature (Jim and Shan, 2013). Natural ecosystems provide vital benefits to humans like climate regulation, food, medicine, water and soil cycles, pest control and pollination. Public understanding is required for responsible usage of these natural ecosystem services. Human perceptions of the natural environment and the desire to contribute to its long-term viability are influenced by cultural standards and awareness of environmental benefits (Ward Thompson *et al.*, 2005). For ecological integrity and social sustainability, urban environmental deterioration necessitates the restoration, maintenance, and improvement of ecological resources (Kaczorowska *et al.*, 2016; Green *et al.*, 2016; Alavipanah *et al.*, 2017).

Faisalabad is Pakistan's major textile industry centre and the province's third megacity. It is renowned as the Manchester of Pakistan because of its massive textile industry, which is the country's major income source. Faisalabad, being an industrial city, is fast growing in population, resulting in pollution, health, and social problems (Younis *et al.*, 2002). Despite the efforts of Government and private sector to improve the greenery level of the city to cope with the ever-rising challenge of urban heat island, smog and pollution problems the residents of Faisalabad are still facing

serious environmental issues. Thus, there is a dire need to develop a plantation system that helps to reduce the environmental problems. In the landscape of Faisalabad, a higher number of exotic tree species are growing which are disturbing the ecological functioning of the city. Dominance of exotic species and low diversity of tree species results in improper ecological functioning. To improve the ecological functioning of ecosystem there is need to revise the ongoing plantation strategy in Faisalabad. In order to design natural resource planning strategies, it is necessary to understand and account for public views (Younis *et al.*, 2018). The public's response to the cause of reduced biodiversity is influenced by their level of biodiversity understanding. Furthermore, research reveals that people's perceptions of community species richness are generally erroneous (Dunning, 1997). Public knowledge about the role of native and exotic tree species is one of key factor for developing sustainable plantation in urban areas. The theme of this study was to check the knowledge of public about native, exotic trees and sustainable plantation, views about present status of plantation, public involvement and recommendations about the future plantation. The results of this study will help us to analyze the understanding of public about sustainable plantation as well as the knowledge of native and exotic tree species, which is key factor for developing sustainable plantation.

Materials and Methods

Study site

The present study was conducted in Faisalabad city which is located at 31° 25' 7.3740" N and 73° 4' 44.7924" E Faisalabad, Pakistan (Figure 1). According to the theme of our study we divided the city into 3 areas (Roadsides urban parks and street of residential areas).

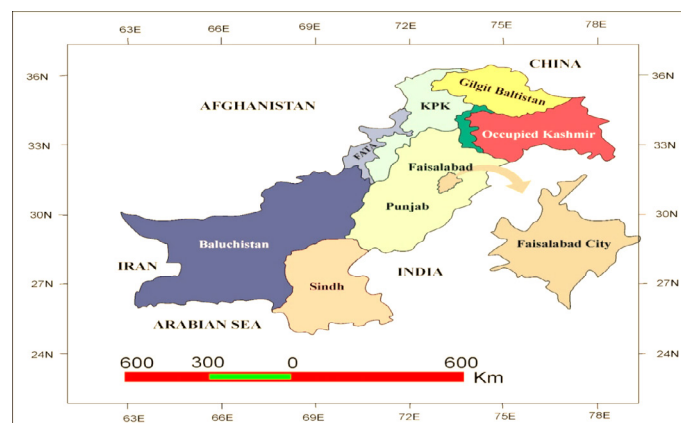


Figure 1: Map of study area.

Collection of data

To record data, in total 300 local respondents were interviewed, 100 each from roadsides, public parks and residential areas. The data was gathered using a questionnaire method. To collect information, an English version of a questionnaire with open-ended and closed-ended questions was prepared. The questions were asked in the respondents' native language (Urdu, Punjabi) for their convenience. The general public in the city was among the respondents. To ensure the maximum availability of persons, the interviews were held from 8:00 am to 11:00 am and 3:00 pm to 6:00 pm.

Data analysis

The gathered data were evaluated by chi square with SPSS (Statistical Package for Social Sciences). To establish the statistical significance of non-parametric population and qualitative observation, the Chi-square test was applied.

Results and Discussion

The distribution of respondents from the three selected areas includes: "roadsides" (male 78% and

female 22%), "urban parks" (male 58% and female 42%), and "streets of residential areas" (males 64% and female 36%). Among all respondents regarding age, 45.3% (21-30 years), 33.3% (31-40 years), 15.7% (41-50 years), and the remaining 5.7% (51-60 years) (Table 1). Results with respect to the education level of the respondents showed: (Below Matric, 30.7%), (Matric, 21.7%), (Graduation, 34.6%), and (post-Graduation, 13%). The distribution regarding profession showed that the proportion of respondents in different businesses was: (government job, 19%), (private job, 35.3%), (business, 18.3%), and others (27.4%) (Table 1).

Respondents perspectives on the status of plantation on the roadside/public park/street

About the current status of plantation on roadsides, the majority of respondents stated the status of plantation as "average" (57%), while (31%) stated the status of plantation as "poor", and only (12%) considered the status of plantation as "good" (Table 2). The *P*-value showed that there is statistically significant relationship between respondent's education and views about the present status of plantation along roadside (Table 14). Regarding urban parks, most of the

Table 1: Demographics characteristics of respondents.

Gender	Roadside		Public park		Street		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Male	78	78	58	58	64	64	200	66.7
Female	22	22	42	42	36	36	100	33.3
Total	100	100	100	100	100	100		
Age								
20-30	60	60	50	50	26	26	136	45.3
31-40	26	26	26	26	48	48	100	33.3
41-50	8	8	18	18	21	21	47	15.7
51-60	6	6	6	6	5	5	17	5.7
Total	100	100	100	100	100	100		
Qualification								
Below Matric	33	33	25	25	34	34	92	30.7
Matric	17	17	29	29	19	19	65	21.7
Graduation	36	36	36	36	32	32	104	34.6
Post-graduation	14	14	10	10	15	15	39	13
Total	100	100	100	100	100	100		
Profession								
Government job	16	16	26	26	15	15	57	19
Private job	43	43	31	31	32	32	106	35.3
Business	17	17	13	13	25	25	55	18.3
Other	24	24	30	30	28	28	82	27.4
Total	100	100	100	100	100	100		

Table 2: Frequency distribution of the respondents according to the status of plantation of roadside/public park/street.

Response	Roadside	Urban parks	Streets	Total
Good	12 (12%)	27 (27%)	20 (20%)	59 (19.6 %)
Average	57 (57%)	53 (53%)	60 (60%)	170 (56.7%)
Poor	31 (31%)	20 (20%)	20 (20%)	71 (23.7%)
Total	100	100	100	

respondents stated the present status of plantations as “average” (53%), while (27%) respondents stated the status of plantations as “good”, and only (20%) considered the status of plantations as “poor”. The *P*- value showed that there is statistically significant relationship between respondent’s education, profession, age and views about the present status of plantation in urban parks (Table 14). Regarding the planation of streets, the majority of the respondents considered the status of plantation “average” (60%), while 20% of the respondents classified it as “good” and (20%) of the respondents considered the planation status of streets “poor”. The *P*- value showed that there is statistically significant relationship between respondent’s education, profession and views about the present status of plantation along streets of residential areas (Table 14). Overall, the majority (56.7%) of respondents considered the status of the plantation “average,” while (23.7%) stated “poor” and only (19.6%) stated “good” (Table 2).

Respondents level of satisfaction with the current roadside/public park/street conditions

The results of the satisfaction level with the planation of roadsides revealed that the majority of respondents (60%) were dissatisfied with the planation, and only 40% of the respondents were satisfied with the planation of roadsides (Table 3). The *P*- value showed that there is statistically non-significant relationship between respondent’s gender, education, profession, age and level of satisfaction about the present status of plantation along roadside (Table 14). The satisfaction level of respondents about the plantation of urban parks showed that the majority of the respondents (56%) were satisfied, while (44%) of the respondents showed dissatisfaction with the urban park’s plantations. The *P*- value showed that there is statistically significant relationship between respondent’s education, profession and level of satisfaction about the present status of plantation in urban parks (Table 14) Respondents from streets

showed (55%) satisfaction with the planation of streets while (45%) were dissatisfied with the planation level of streets. The *P*- value showed that there is statistically non-significant relationship between respondent’s gender, education, profession, age and level of satisfaction about the present status of plantation along streets of residential areas (Table 14). Overall, (50.3%) respondents showed satisfaction and (49.7%) were not satisfied with the planation of roadside/urban park/street (Table 3).

Table 3: Frequency distribution of the respondents according to the satisfaction with the plantation status of roadside/public park/street.

Response	Roadside	Urban parks	Streets	Total
Yes	40	56	55	151 (50.3 %)
No	60	44	45	149 (49.7%)
Total	100	100	100	

Table 4: Frequency distribution of the respondents according to the knowledge about the term sustainable plantation.

Response	Roadside	Urban parks	Streets	Total
Yes	10	20	14	44 (14.7%)
No	90	80	86	256 (85.3%)
Total	100	100	100	

Knowledge of respondents about sustainable plantations

Results regarding the knowledge of the term “sustainable planation” showed that, at the roadsides, the majority of respondents (90%) had no knowledge of sustainable planation. Only 10% of the respondents had knowledge about sustainable plantations (Table 4). The *P*- value showed that there is statistically significant relationship between roadside respondent’s gender, education, profession, and knowledge about sustainable plantation (Table 14). (80%) respondents of urban parks had no knowledge about sustainable plantations, while only (20%) had knowledge about sustainable plantations. The *P*- value showed that there is statistically significant relationship between urban park respondent’s gender, education, profession, age and knowledge about sustainable plantation (Table 14). On the streets, 86% of respondents were unaware of sustainable plantations, while 14% were. The *P*- value showed that there is statistically significant relationship between street respondent’s education, profession, and knowledge about sustainable plantation (Table 14). Overall, a major portion of the respondents (85.3%) had no

knowledge about sustainable plantations, and only (14.7% had knowledge about sustainable plantations (Table 4).

Opinion of the respondents about the sustainable status of plantation of roadside/public park/street

The respondents were questioned about the sustainable status of plantations along roadsides/public park/street. The results of the roadside planation survey revealed that (71%) of respondents thought roadside planation was not sustainable; while only (29%) thought roadside planation was sustainable (Table 5). The *P*- value showed that there is statistically non-significant relationship between roadside respondent's gender, education, profession, age and opinion about sustainable status of roadside plantation (Table 14). Regarding the sustainability of urban park plantations, (52%) of the respondents considered it sustainable and (48%) termed it not sustainable. The *P*- value showed that there is statistically significant relationship between urban park respondent's gender, education, profession, and opinion about sustainable status of urban park plantation (Table 14). (55%) of respondents considered the planation of streets not sustainable, but according to (45%) respondents, streets have sustainable plantation. The *P*- value showed that there is statistically significant relationship between street respondent's education, profession, and opinion about sustainable status of street plantation (Table 14). Overall results showed that (58%) of the respondents considered that plantation on the roadside/public park/street as not sustainable and only (42%) stated it as sustainable (Table 5).

Table 5: *Frequency distribution of the respondents about the sustainable status of plantation of roadside/public park/street.*

Response	Roadside	Urban Parks	Streets	Total
Yes	29 (29%)	52 (52%)	45 (45%)	126 (42%)
No	71(71%)	48(48%)	55 (55%)	174 (58%)
Total	100	100	100	

Respondent's level of knowledge about native trees

Different questions were asked of respondents related to native trees (definition of native trees, name of a few native trees). According to the answers of the respondents, their knowledge level was judged and rated in three categories (high, medium, and low). Results from roadside respondents revealed that the majority of the public (68%) have a low level of

knowledge, (26%) respondents had a medium level of knowledge, and a high level of native tree knowledge was observed in only (6%) respondents (Table 6). The *P*- value showed that there is statistically significant relationship between roadside respondent's gender, education, profession, and knowledge about native trees (Table 14). Results from urban park respondents revealed that most people have low levels of knowledge about native trees (49%), while (41%) have a medium level of knowledge and only (10%) have a high level of knowledge about native trees. The *P*- value showed that there is statistically significant relationship between urban park respondent's genders, education, profession, age and knowledge about "native trees" (Table 14). Results from street respondents showed that the majority of the respondents have a medium level of knowledge (52%), while (47%) have a low level of knowledge and only (1%) have a high level of knowledge about native trees. The *P*- value showed that there is statistically significant relationship between street respondent's gender, education, profession, and knowledge about "native trees" (Table 14). Overall, the majority of the respondents has a low level of knowledge (54.7%); followed by (39.7%) respondents with a medium level of knowledge, and only (5.6%) respondents have a high level of knowledge about native trees (Table 6).

Table 6: *Frequency distribution of the respondents according to the knowledge level about native trees.*

Response	Roadside	Urban parks	Streets	Total
High	6 (6%)	10 (10%)	1 (1%)	17 (5.6%)
Medium	26 (26%)	41 (41%)	52 (52%)	119 (39.7%)
Low	68 (68%)	49 (49%)	47 (47%)	164 (54.7%)
Total	100	100	100	

Respondents level of knowledge about exotic trees

Different questions were asked of respondents related to exotic trees (definition of exotic trees, and the names of a few exotic trees). According to the answers of the respondents, their knowledge level was judged and rated in three categories (High, Medium, and Low). Results from roadside respondents revealed that the majority of the public (86%) have a low level of knowledge. Only (8%) respondents had a medium level of knowledge, and a high level of exotic tree knowledge was observed in only (6%) respondents (Table 7). The *P*- value showed that there is statistically significant relationship between roadside respondent's gender, education, profession, and knowledge about

“exotic trees” (Table 14). Results from urban park respondents revealed that most people have low levels of knowledge about exotic trees (72%), while (24%) have a medium level of knowledge and only (4%) have a high level of knowledge about exotic trees. The *P*- value showed that there is statistically significant relationship between urban park respondent’s genders, education, profession, age and knowledge about “exotic trees” (Table 14). Results from street respondents showed that the majority of the respondents have a low level of knowledge (84%), while (15%) have a medium level of knowledge and only (1%) have a high level of knowledge about exotic trees. The *P*- value showed that there is statistically significant relationship between street respondent’s gender, education, profession, and knowledge about “exotic trees” (Table 14). Overall, the majority of the respondents has a low level of knowledge (80.6%); followed by (15.7%) respondents with a medium level of knowledge, and only (3.7%) respondents have a high level of knowledge about exotic trees (Table 7).

Table 7: Frequency distribution of the respondents according to the knowledge level about exotic trees.

Response	Roadside	Urban parks	Streets	Total
High	6 (6%)	4 (4%)	1 (1%)	11 (3.7%)
Medium	8 (8%)	24 (24%)	15 (15%)	47 (15.7%)
Low	86 (86%)	72 (72%)	84 (84%)	242 (80.6%)
Total	100	100	100	

Respondents preferences for similar or diverse trees in their surroundings

This question was asked to judge the public’s liking of plantation patterns in their surroundings. At roadsides, (68%) of respondents liked to see a variety of trees, and only (32%) wanted to see similar types of trees around (Table 8). The *P*- value showed that there is statistically significant relationship between roadside respondent’s education, and preferences for similar or diverse trees in their surroundings (Table 14). In urban parks, (58%) of respondents liked to see a variety of trees, while 42%) wanted to have similar types of trees around their surroundings. The *P*- value showed that there is statistically significant relationship between urban park respondent’s education, profession, age and preferences for similar or diverse trees in their surroundings (Table 14). (85%) respondents of streets wanted to see a variety of trees, and only (15%) wanted to see similar trees in their surroundings. The *P*- value showed that there is statistically significant

relationship between street respondent’s gender, education, profession, and preferences for similar or diverse trees in their surroundings (Table 14). Overall, (70.3%) of respondents want to see a variety of trees, while only (29.7%) want similar trees in their surroundings (Table 8).

Table 8: Frequency distribution of the respondents according to their likeness about similar or variety of trees around them.

Response	Roadside	Urban parks	Streets	Total
Similar trees	32 (32%)	42 (42%)	15(15%)	89(29.7%)
Variety of trees	68 (68%)	58 (58%)	85(85%)	211(70.3%)
Total	100	100	100	

Table 9: Frequency distribution of the respondents according to their opinion, about the responsibility of roadside/public park/street plantation.

Response	Roadside	Urban parks	Streets	Total
Government	55 (55%)	45 (45%)	36 (36%)	136 (45.3%)
Public	6 (6%)	7 (7%)	23 (23%)	36 (12.0%)
Both	39 (39%)	48 (48%)	41(41%)	128 (42.7%)
Total	100	100	100	

Opinion of respondents, according to their opinion, about the responsibility of roadside/urban park/street plantation

To evaluate the respondent’s perception regarding responsibility regarding the planation of roadside/urban park/street they were asked about their opinions. (55%) respondents from roadsides considered that roadside planation is the responsibility of the government, while, (39%) considered it the responsibility of both the public and the government, and only (6%) considered roadside planation as the public’s responsibility (Table 9). The *P*- value showed that there is statistically significant relationship between roadside respondent’s age and opinion about the responsibility of roadside plantation (Table 14). In urban parks, (48%) stated that the planation of urban parks is the responsibility of both the public and the government, while, (45%) respondents considered it the duty of the government and only (7%) considered the planation of urban parks a public responsibility. The *P*- value showed that there is statistically significant relationship between roadside respondent’s education, profession, age and opinion about the responsibility of urban park’s plantation (Table 14). Majority of street respondents (41%) considered street plantation as the responsibility of both public and government

while, (36%) considered it government responsibility and only (23%) considered it public responsibility. The *P*- value showed that there is statistically significant relationship between street respondent's education, profession, and opinion about the responsibility of street plantation (Table 14). Overall, (45.3%) respondents considered that planation of roadside/urban park/street as the responsibility of government while, (42.7%) opinioned that it should be the responsibility of both public and government and only (12%) considered it public responsibility (Table 9).

Table 10: Frequency distribution of the respondents according to their satisfaction with the efforts of government to improve greenery (plantation) level.

Response	Roadside	Urban parks	Streets	Total
Yes	48 (48%)	58 (58%)	62 (62%)	168 (56.0%)
No	52 (52%)	42 (42%)	38 (38%)	132 (44.0%)
Total	100	100	100	

Opinions of respondents according to their satisfaction with the efforts of the government to improve greenery (plantation) level

Respondents were asked about their satisfaction level with the efforts of the government in improving roadside/urban park/street plantations. On roadside plantations, (52%) of respondents were dissatisfied, while (48%) were pleased with the government's efforts to improve roadside plantations (Table 10). The *P*- value showed that there is statistically significant relationship between roadside respondent's profession and satisfaction with the efforts of the government to improve greenery (plantation) level (Table 14). In urban parks, (58%) respondents showed satisfaction with government efforts, and (42%) were not satisfied with the efforts of the government in improving plantation of urban parks. The *P*- value showed that there is statistically significant relationship between urban park respondent's profession and satisfaction with the efforts of the government to improve greenery (plantation) level (Table 14). (62%) respondents from streets showed satisfaction with the efforts of the government and (38%) were not satisfied with government efforts in improving the planation of streets. The *P*- value showed that there is statistically significant relationship between street respondent's profession and satisfaction with the efforts of the government to improve greenery (plantation) level (Table 14). Overall, (56%) respondents were satisfied and (44%) were not satisfied with the government's

efforts in improving the roadside/urban park/street plantations (Table 10).

Opinions of respondents about the need to launch a plantation campaign

Respondents were questioned about the need to launch a plantation campaign on the roadside/urban park/street. Results showed that (90%) respondents from roadsides agreed and only (10%) disagreed with the need to launch a plantation campaign along roadsides (Table 11). The *P*- value showed that there is statistically significant relationship between roadside respondent's age and opinions about to launch a plantation campaign (Table 14). A majority of respondents (76%) from urban parks agreed with the need to launch a plantation campaign, while (24%) stated that there was no need to launch a plantation campaign. The *P*- value showed that there is statistically non-significant relationship between urban park respondent's gender, education, profession, age and opinions about to launch a plantation campaign (Table 14). (95%) respondents want a plantation campaign in the streets, while (5%) suggested that there is no need to launch a plantation campaign in the streets. The *P*- value showed that there is statistically significant relationship between street respondent's education, profession and opinions about to launch a plantation campaign (Table 14). Overall, (87%) respondents agreed and (13%) did not agree with the need to launch a plantation campaign on the roadside/urban park/street (Table 11).

Table 11: Frequency distribution of the respondents about the need of launching a plantation campaign.

Response	Roadside	Urban parks	Streets	Total
Yes	90 (90%)	76 (76%)	95 (95%)	261(87.0%)
No	10 (10%)	24 (24%)	5 (5%)	39 (13.0 %)
Total	100	100	100	

Table 12: Frequency distribution of the respondents about their willingness of joining a planation campaign.

Response	Roadside	Urban parks	Streets	Total
Yes	72 (72%)	48 (48%)	80 (80%)	200 (66.7%)
No	28 (28%)	52 (52%)	20 (20%)	100 (33.3 %)
Total	100	100	100	

Opinions of respondents about their willingness to join a planation campaign

Respondents were questioned about their willingness to join a plantation campaign on the roadside/urban

park/street. Results showed that (72%) respondents from roadsides wanted to join, and only (28% did not want to join the plantation campaign along roadsides (Table 12). The *P*- value showed that there is statistically significant relationship between roadside respondent's education, age and willingness to join a plantation campaign (Table 14). A majority of respondents (52%) from urban parks did not want to join the plantation campaign, while (48%) stated that, they wanted to join the plantation campaign. The *P*- value showed that there is statistically significant relationship between urban park respondent's education, profession and willingness to join a plantation campaign (Table 14). (80%) of the respondents showed willingness to join, while (20%) showed no willingness to join a plantation campaign in the streets. The *P*- value showed that there is statistically significant relationship between street respondent's education, profession and willingness to join a plantation campaign (Table 14). Overall, (66.7%) of respondents indicated a willingness to participate, while (33.3%) indicated a lack of interest in participating in a roadside/urban park/street plantation campaign (Table 12).

Opinions of respondents about the suggestions for the improvement of the roadside/urban park/street plantation Suggestions were asked from respondents regarding the improvement of roadside/urban park/street plantations. On roadsides, (48%) respondents suggested plantation of trees, (26%) suggested proper care and maintenance, (16%) suggested ornamental trees and only (10%) suggested clean water availability for the improvement of roadside plantation (Table 13). The *P*- value showed that there is statistically significant relationship between roadside respondent's gender, education, profession and suggestions for the improvement of roadside plantation (Table 14). In urban parks, (40%) suggested plantation of trees, (23%) suggested plantation of ornamental plants, (22%) recommended clean water availability, and only (15%) suggested proper care and maintenance for the improvement of urban park plantations. The *P*- value showed that there is statistically significant relationship between urban park respondent's gender, education, profession, age and suggestions for the improvement of urban park's plantation (Table 14). A majority of street respondents (49%) suggested tree plantation, (22%) suggested clean water availability, (21%) suggested proper care and maintenance, and only (8%) suggested the plantation of ornamental

plants for the improvement of street plantation. The *P*- value showed that there is statistically significant relationship between street respondent's gender, education, profession and suggestions for the improvement of street plantation (Table 14). Overall, (45.6%) suggested tree plantation, (20.6%) suggested proper care and maintenance, (18%) suggested clean water availability, and only (15.7%) suggested plantation of ornamental plants for the improvement of roadside/urban park/street plantation (Table 13).

Table 13: *Frequency distribution of the respondents about the suggestions for the improvement of the urban plantation.*

Response	Roadside	Urban parks	Streets	Total
Tree plantation	48 (48%)	40 (40%)	49 (49%)	137(45.6%)
Ornamental plants	16 (16%)	23 (23%)	8 (8%)	47 (15.7 %)
Clean water availability	10 (10)	22 (22%)	22 (22%)	54 (18.0%)
Proper care and maintenance	26 (26%)	15 (15%)	21 (21%)	62 (20.6%)
Total	100	100	100	

This study investigates public perceptions of roadside, urban park, and street plantations, as well as knowledge of sustainable plantations, native trees, and exotic trees. Through this study, the public's willingness to join the plantation campaign and suggestions for future recommendations and improvements to the roadside/urban park/street in Faisalabad were studied. In view of our survey results, the plantation status of Faisalabad is not good and almost half of the respondent showed dissatisfaction with the present plantation. There is a dire need to improve the plantation status of the city of Faisalabad. All the management responsible for plantations in Faisalabad must devise a plantation strategy to enhance the plantation level. According to [Younis et al. \(2018\)](#) the urban planners must establish a vision of the purpose and value of urban forests, and available resources must be appropriately targeted. In our study, respondents showed a greater willingness to be a part of the plantation campaign and also considered that, along with the government; the public must have to take part in plantation development and maintenance. For sustainable development of plantations in urban areas, during the planning process it is worthwhile considering the choice of local public ([Younis et al., 2018](#)). This depicts that, in order to properly manage the urban plantation, policymakers and practitioners must use

Table 14: *P-values of the chi-square test of responses about the present status of roadside, urban park and street trees in residential areas, plantations and knowledge of urban trees of respondents.*

Chi square	Plan- tation status	Satisfac- tion with planta- tion	Knowl- edge about sustainable plantation	Present status of sustaina- bility	Knowledge about na- tive trees	Knowl- edge about exotic trees	Vari- ety or similar trees	Respon- sibility of plan- tation	Satisfac- tion with Govern- ment work	Need of plan- tation campaign	Wants to join plantation campaign	Sugges- tion for improve- ment
Roadside plantations												
Gender	0.065	0.375	0.000*	0.205	0.013*	0.022*	0.590	0.346	0.238	0.334	0.323	0.007*
Education	0.029*	0.504	0.000*	0.555	0.000*	0.000*	0.005*	0.241	0.218	0.064	0.000*	0.000*
Profession	0.489	0.076	0.038*	0.497	0.00.004*	0.008*	0.163	0.575	0.011*	0.080	0.414	0.000*
Age	0.071	0.456	0.060	0.097	0.123	0.285	0.305	0.048*	0.446	0.036*	0.000*	0.053
Urban park plantation												
Gender	0.110	0.151	0.000*	0.249	0.001*	0.000*	0.073	0.107	0.577	0.166	0.948	0.000*
Education	0.001*	0.035*	0.000*	0.000*	0.000*	0.000*	0.002*	0.006*	0.113	0.148	0.006*	0.015*
Profession	0.039*	0.013*	0.000*	0.000*	0.000*	0.000*	0.038*	0.006*	0.013*	0.092	0.009*	0.000*
Age	0.007*	0.192	0.000*	0.005*	0.000*	0.000*	0.000*	0.003*	0.502	0.570	0.812	0.002*
Street trees in residential areas												
Gender	0.730	0.738	0.221	0.738	0.032*	0.003*	0.000*	0.131	0.250	0.444	0.532	0.000*
Education	0.013*	0.310	0.003*	0.010*	0.001*	0.000*	0.008*	0.001*	0.177	0.009*	0.000*	0.000*
Profession	0.000*	0.004*	0.000*	0.008*	0.041*	0.007*	0.000*	0.002*	0.029*	0.001*	0.000*	0.002*
Age	0.472	0.721	0.566	0.582	0.00.858	0.980	0.536	0.581	0.608	0.762	0.330	0.494

multiple types of interaction, such as education, to influence local people's actions and views (Almas and Convey, 2016).

Unfortunately, our survey results revealed that the majority of the general public has very little knowledge and understanding of sustainable plantations, as well as native and exotic trees. The survey showed participant's limited and inconsistent understanding reflects a larger issue of concern about how to interact with locals, especially those who aren't already engaged in urban plantation issues. Participation of the community in the establishment and upkeep of urban green areas is essential (Younis *et al.*, 2008). It has been stated by Riaz *et al.* (2012) that communities with a strong desire to contribute for the establishment of green spaces and tree planting are more sustainable than parks and green areas with no community involvement. Sarwar (2002) also reported that with the community involvement brings improvement in development and maintenance of urban green spaces. Lack of knowledge by the public about native and exotic tree species may leads to the choice of species for the landscape, which may disturb the ecological functioning of an ecosystem. Local residents are concerned about environmental issues and are willing to pay a higher price for ecologically friendly items (Russo and Fouts, 1997; Laroche *et al.*, 2001; Yue

et al., 2011). It is the need of the hour to encourage public for tree plantation but at the same time public awareness related to beneficial use of native trees and risks associated with the over use of exotic trees must be addressed via different campaigns on social media as well as electronic media. Locals should be educated on the usage of native flora, as proposed by Peppin *et al.* (2010). To raise public awareness of native plants, educational programmed should be launched, as well as technical and scientific information for landscape contractors through nursery catalogues, plant lists, and etc., (Alam *et al.*, 2017). People who know about urban tree programmes and forestry services are more inclined to provide money and support the aims of tree planting programmes (Zhang and Zheng, 2011). Furthermore, awareness of common native species is associated with good opinions regarding urban biodiversity, native species, and overall environmental awareness (Kurz and Baudains, 2012). Public awareness related to environmental issues is essential because, if people' behaviors are governed by their knowledge and attitudes, then teaching citizens about municipal urban forestry plans should assist accomplish the long-term goals outlined in such plans.

Respondents when inquired about the suggestions to improve the urban plantation. Most respondents

suggested (45.6%) plantation of trees to improve the environmental functioning of the city. Keeping in view of our results, all the authorities responsible for plantation in Faisalabad must develop a proper plan to direct towards a sustainable plantation pattern. To successfully implement a plantation policy, public awareness campaigns and programs related to the use of native and exotic trees must be initiated at the local government level.

Conclusions and Recommendations

For developing the sustainable urban plantation, it is necessary that general public must have knowledge about native and exotic trees. Without community involvement it is not possible to develop and maintain plantation in urban areas. The local government should also have to work on sustainable plantation development which is only possible when local public have the awareness about the potential benefits and risks associated with native and exotic trees. Public awareness campaigns and programs about native and exotic trees must be initiated at government level. Electronic and print media may also play his part in providing general information about native and exotic tree uses in urban landscape. The government should also have to rethink about plantation strategy in order to develop city plantation on sustainable scale.

It is the need of the hour to enhance the plantation of urban areas to combat the problem of climate change. To enhance the plantation status, both local public and Government should play a positive role in term of plantation installation and management. Public awareness about the proper use of native and exotic plants should be carried out to improve public knowledge about the importance of native and exotic flora.

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Novelty Statement

Knowledge about native and exotic trees is necessary for the sustainable development of plantation. Public awareness campaigns and programs about native and

exotic trees must be initiated at government level.

Author's Contribution

Muhammad Umair Shafique: Designed the experiment and questionnaire.

Muhammad Muzamil Ijaz and Adnan Younis: Helped in data collection and manuscript write-up.

Arslan Tufail, Syed Muhammad Hamayun Tahir and M. Abdul Salam Khan: Data analysis and proofreading.

M. Saleem Akhtar Khan, Munawar Hussain Almas and Usama Bin Arif: Helped in relevant literature and format setting.

Conflict of interest

The authors have declared no conflict of interest.

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