

Article

Public Awareness and Engagement with Botanic Gardens Across the Arab Region: A Baseline Survey and Verified Institutional Inventory

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Abstract

The Arab world has produced almost no published data on public awareness of botanic gardens, despite having 53 institutions registered with Botanic Gardens Conservation International (BGCI) across 16 of the 22 League of Arab States (LAS) member states. Between October 2024 and December 2025, we administered an 18-item bilingual (Arabic and English) online questionnaire across the 22 LAS member states via paid Facebook advertising, complemented by an institutional inventory from BGCI GardenSearch and an Arabic–French–English triangulation that identified 16 additional non-BGCI operational institutions. Pearson and Spearman correlations between BGCI count and 6 awareness indicators were computed for the 13 countries with $n \geq 10$. The survey returned 613 valid responses from all 22 nationalities. Among respondents in this Facebook-recruited sample, 87.4% had heard of botanic gardens (95% CI 84.6–89.8) and 98.9% considered them important for conservation, although only 63.5% reported familiarity with their conservation role. Local awareness ranged from 30% (Palestine) to 100% (Sudan, Lebanon). No BGCI–awareness correlation reached $p < 0.05$; Q5 recognition reached marginal significance (Spearman $\rho = 0.525$, $p = 0.065$). We did not detect a statistically significant association between BGCI institutional count and country-level awareness indicators. Because this analysis rests on only 13 countries, the absence of a significant correlation should not be read as evidence that no association exists. The 35-point gap between affirmation of conservation importance and functional familiarity marks the most actionable target for science communication. We disclose the limitations of Facebook-based recruitment and gender imbalance.

Keywords: botanic gardens; public awareness; League of Arab States; Middle East and North Africa; conservation infrastructure; visitor survey; BGCI; ex situ conservation; plant awareness disparity

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1. Introduction

Botanic gardens have changed substantially since their origins as monastic and medicinal collections. Modern institutions combine four functions: ex situ conservation of plant diversity, scientific research on living collections, public education, and recreation [1–3]. Their living collections hold representatives of more than a third of the world's plant species [4], and an increasing share of botanic gardens contributes to climate change research, citizen science, and policy work aligned with the Sustainable Development

Goals [3,5,6]. Recent reviews argue that botanic gardens are scalable platforms for plant health science communication [7] and that they have a mandate to extend their roles into social inclusion, intercultural dialogue, and biocultural conservation [8–10]. The literature on public engagement with botanic gardens has expanded markedly in the past decade, but its geographic coverage is uneven. The Royal Botanical Garden of Madrid surveyed 724 visitors and used a discrete choice experiment to identify strong support for sustainable management practices and willingness to pay higher admission fees if those funds support conservation [11]. A study of 1030 visitors at the peony gardens of Luoyang, China, showed that cultural experience drives conservation engagement through place identity rather than through scientific literacy [12]. A survey of 316 visitors at the Gulele Botanical Garden in Addis Ababa, Ethiopia, found 92.1% awareness of cultural ecosystem services, with education level, age, and visit frequency predicting positive perceptions [13]. Similar visitor surveys have been published from South Africa ($n = 377$) [14], the Canary Islands ($n = 373$) [15], Bangladesh (220 tree species, stakeholder survey) [16], and Italy [17]. Public perception of insect pollinators in Morocco ($n = 301$) [18] and a similar study in Ireland ($n = 613$) [19] extend the methodology to non-garden plant taxa.

The Arab world has produced almost none of this work. We are aware of one published pilot study of public attitudes toward pollinators in Morocco [18], a single proposal for a botanical garden in Iraqi Kurdistan that argued botanic gardens are “almost absent in whole Middle East countries” [20], and a brief account of the 2015 Ecological Restoration Alliance meeting hosted by the Royal Botanic Garden of Jordan in Amman [21]. No regional baseline of public awareness of botanic gardens exists for the 22 member states of the League of Arab States, despite an institutional landscape that includes the El-Orman Garden in Egypt (835 species across 115 families), the Royal Botanic Garden of Jordan (1782 dunum and a 100,000-seedling annual production), the King Abdullah International Gardens of Saudi Arabia, the Le Jardin Majorelle of Morocco (some 800,000 visitors annually), and the Qur’anic Botanic Garden in Qatar.

This gap matters because it leaves regional managers and policy-makers without a reference baseline against which to plan. The 22 member states of the Arab League cover roughly 13 million square kilometers and 470 million people. Vegetation zones range from tropical Comoros and the Asir massif to the hyperarid Empty Quarter, the Mediterranean basin of the Maghreb, and the relict *Juniperus procera* forests of Djibouti’s Day Forest. Botanic gardens registered with Botanic Gardens Conservation International (BGCI) cover this terrain unevenly: Egypt holds ten institutions, Morocco and Tunisia each have five, Algeria, Lebanon, Saudi Arabia, and Palestine each have four, while Bahrain, Comoros, Djibouti, Mauritania, Syria, and Yemen show zero registered institutions [22]. Several of these zero-BGCI countries do contain operational botanical institutions that are not registered with the network. We document sixteen such cases below. A reasonable expectation, holding all else equal, is that countries with denser botanic garden infrastructure will register higher public awareness. This expectation underlies the standard “infrastructure-leads-engagement” model used by international networks to justify capacity-building programs. Whether the expectation holds in a region where institutions are sparse, unevenly resourced, exposed to active armed conflict in several states (Sudan, Yemen, Syria, Libya, Palestine), and embedded in a strong tradition of plant references in religious and folk literature is an empirical question we set out to answer.

We undertook three concurrent tasks. First, we collected a regional public awareness survey using an 18-item bilingual instrument distributed through paid Facebook advertising targeted to all 22 LAS member states, with advertising costs borne personally by the lead author. Second, we compiled a verified institutional inventory using both BGCI’s GardenSearch database and a multi-language search protocol covering Arabic, French, and

English sources. Third, we tested whether documented institutional count predicts public awareness at the country level. We frame our findings as preliminary indicators rather than population-level estimates, and we disclose six specific limitations to guide future probability–sample replication.

The work joins a small but growing literature on botanic garden engagement in the Global South [12,13,16] and to the broader question of whether the standard model of “conservation through infrastructure” holds outside high-income contexts. The Arab region offers a tractable test case because its institutional density is variable, its socio-political environment includes active conflicts and post-conflict reconstruction, and its plant heritage is documented in deep textual traditions that may shape recognition independently of formal infrastructure.

2. Materials and Methods

2.1. Study Design and Aims

We pursued three concurrent aims: (i) to quantify regional levels of botanic garden recognition, familiarity, visitation history, and willingness to engage; (ii) to compile a verified institutional inventory of botanic gardens documented across the region, distinguishing institutions formally registered with Botanic Gardens Conservation International [23] from those operational but unregistered; and (iii) to examine whether documented institutional infrastructure correlates with public awareness at country level. Data were collected between 1 October 2024 and 4 December 2025, a 428-day window, by the lead author, an active staff member at the Qur’anic Botanic Garden of Hamad Bin Khalifa University, Qatar Foundation.

2.2. Survey Instrument

We developed a structured 18-item questionnaire in Arabic and English, with all items presented side by side bilingually. Items addressed five thematic blocks: demographic and geographic information (Q1 nationality, Q2 age, Q3 gender); recognition and local awareness (Q5, Q6); functional knowledge of conservation roles (Q7); visitation history and intent (Q8, Q9, Q10); attitudes toward native plant protection and conservation roles (Q11, Q12, Q13); willingness to engage in activities (Q14, Q15, Q16); perceived quality-of-life contribution (Q17); and respondent priorities for sectoral improvement (Q18). The complete instrument is provided in Supplementary Materials (Supplementary File S1).

2.3. Sampling and Administration

The questionnaire was distributed online through paid Facebook advertising campaigns targeted to residents and citizens of the 22 LAS member states. Advertising costs were borne personally by the lead author. Advertisements were run in both Arabic and English, with geographic targeting set to each of the 22 LAS member states and the audience defined as adults self-identifying with those countries. No demographic or country-level quotas were applied; the distribution of impressions was left to the platform’s optimization. Duplicate responses were screened during data cleaning using the optional contact fields, which were then removed from the de-identified dataset. The instrument was open to any respondent who self-identified as a citizen of any of the 22 LAS member states, regardless of country of residence at the time of response. The choice of Facebook as the primary distribution platform reflects its reach across Arabic-speaking populations; Facebook is the dominant social platform in North Africa and the Levant, and it remains widely used across the Gulf and Yemen.

We disclose, transparently, that this approach yields neither a probability sample nor demographically representative coverage of any country’s general population. Three bi-

ases follow from the recruitment channel. First, sampling is restricted to respondents with internet access and active Facebook use, which excludes older and rural populations more strongly in some countries than others; Facebook penetration is high in Algeria, Egypt, Morocco, and the Levant, and lower in Yemen, Mauritania, and Comoros, partly explaining the imbalance in country-level *n*. Second, the platform’s advertising algorithm preferentially serves impressions to users with prior environmental or scientific interaction, biasing the sample toward respondents already disposed to engage with the topic. Third, the gender distribution of respondents reaching the questionnaire reflects the gender skew of Facebook’s content-serving algorithm in this topic area rather than population-level demographics. Comparable convenience recruitment via online platforms has been used in recent visitor and public perception studies [14,15,18,19], and we follow the same convention while disclosing its limits.

2.4. Sample Characteristics

A total of 613 valid responses were collected from 22 nationalities. Country distribution was uneven, reflecting both population disparities and differential network reach: Algeria (*n* = 156), Syria (*n* = 126), Egypt (*n* = 67), Jordan (*n* = 64), Qatar (*n* = 27), Yemen (*n* = 25), Morocco (*n* = 22), Saudi Arabia (*n* = 19), Libya (*n* = 17), Lebanon (*n* = 14), United Arab Emirates (*n* = 13), Sudan (*n* = 10), Palestine (*n* = 10), Comoros (*n* = 9), Oman (*n* = 8), Tunisia (*n* = 6), Djibouti (*n* = 6), Somalia (*n* = 5), Iraq (*n* = 4), Bahrain (*n* = 2), Kuwait (*n* = 2), and Mauritania (*n* = 1). For country-level statistical analyses, we restricted comparisons to the 13 countries with *n* ≥ 10, to avoid spurious inference from unstable percentages drawn from small samples; for region-wide aggregate analyses, all 613 responses were retained. Respondents were classified throughout by self-reported nationality, not country of residence; a respondent’s reported awareness of a botanic garden “in their country” (Q6) therefore refers to their country of nationality, which may differ from their country of residence at the time of response. Demographic distribution by age and gender is reported in Table 1.

Table 1. Demographic profile of survey respondents (*n* = 613) across the 22 League of Arab States member states.

Variable	Category	<i>n</i>	%	95% CI
Nationality	Sample size ≥ 10 (analysis subset)			
	Algeria	156	25.4	22.2–29.0
	Syria	126	20.6	17.5–23.9
	Egypt	67	10.9	8.7–13.6
	Jordan	64	10.4	8.3–13.1
	Qatar	27	4.4	3.0–6.3
	Yemen	25	4.1	2.8–6.0
	Morocco	22	3.6	2.4–5.4
	Saudi Arabia	19	3.1	2.0–4.8
	Libya	17	2.8	1.7–4.4
	Lebanon	14	2.3	1.4–3.8
	United Arab Emirates	13	2.1	1.2–3.6
	Sudan	10	1.6	0.9–3.0
	Palestine	10	1.6	0.9–3.0

Table 1. Cont.

Variable	Category	<i>n</i>	%	95% CI
Sample size < 10 (excluded from country-level)				
	Comoros	9	1.5	—
	Oman	8	1.3	—
	Tunisia	6	1.0	—
	Djibouti	6	1.0	—
	Somalia	5	0.8	—
	Iraq	4	0.7	—
	Bahrain	2	0.3	—
	Kuwait	2	0.3	—
	Mauritania	1	0.2	—
Age band	Distribution			
	Under 18	3	0.5	0.2–1.4
	18–24	39	6.4	4.7–8.6
	25–34	137	22.3	19.2–25.8
	35–44	232	37.8	34.1–41.8
	45–54	162	26.4	23.1–30.1
	55–64 (band omitted from instrument)	0	0.0	—
	65 and older	40	6.5	4.8–8.8
Gender	Self-identified			
	Male	378	61.7	57.8–65.4
	Female	235	38.3	34.6–42.2
Total		613	100.0	—

2.5. Institutional Inventory: BGCI-Registered Institutions

We compiled a complete inventory of botanic gardens registered with the BGCI GardenSearch database [22] across all 22 LAS member states, verified through direct database query on 2 May 2026.

To produce a defensible reference figure, we adopted an inclusive enumeration: any institution returned by the BGCI GardenSearch query for a given Arab country was retained, regardless of institutional category. Our count, therefore, includes four Commonwealth War Graves Commission cemetery sites that BGCI has historically counted (Dely Ibrahim, Algeria; Heliopolis, Egypt; Beirut, Lebanon; Massicault, Tunisia) and one zoological park with botanical components (Al Ain Zoo, United Arab Emirates).

We adopt this inclusive approach because BGCI itself uses these listings as its institutional baseline; any exclusion would require us to substitute our own classification scheme over BGCI's, which would compromise reproducibility. Where individual institutional types matter for interpretation, we report them in Table S1. The procedure yielded 53 BGCI-registered institutions distributed across 16 of the 22 LAS member states. Six countries reported zero BGCI-registered institutions: Bahrain, Comoros, Djibouti, Mauritania, Syria, and Yemen.

2.6. Institutional Inventory: Non-BGCI Operational Institutions

A central methodological observation of this study is that BGCI registration substantially under-represents the actual botanical institutional infrastructure of the Arab region.

To document this gap, we conducted systematic multi-language web research covering each of the six countries reporting BGCI = 0, plus targeted research in selected countries with BGCI registrations.

Our search strategy combined three languages: Arabic for all 22 LAS countries (primary working language); French for the seven Francophone or formerly Francophone countries (Algeria, Comoros, Djibouti, Mauritania, Morocco, Tunisia, plus French overseas Mayotte for Comoros archipelago coverage); and English as a cross-reference. Search terms combined institutional descriptors “حديقة” (نباتية), “jardin botanique”, “botanic garden”, “arboretum”, “herbarium”) with country and city names.

For an institution to be added to the non-BGCI operational inventory, we required at least one source meeting one of the following criteria: a national or regional government website; a peer-reviewed publication; a national news agency (e.g., SANA, MAP, Petra); a major regional newspaper; a university or research institution publication; or a UNESCO/IUCN/major conservation network listing. The procedure yielded 16 additional operational institutions documented in five countries: four in Syria, three in Bahrain, two in Mauritania, four in Comoros (Mayotte antenna), and two in Djibouti, plus one institution in the United Arab Emirates not previously included in our BGCI extract (the Sharjah Islamic Botanical Garden within Sharjah Desert Park).

We retain a deliberately broad institutional definition (botanic garden, arboretum, plant conservation reserve, national herbarium with associated plant nursery). The breadth follows from the variety of forms botanical institutional capacity takes in resource-constrained contexts. Classification decisions are reported transparently in Table S1 to enable readers to apply alternative inclusion criteria. To prevent the inventory from implying that all documented institutions are equivalent public-facing botanic gardens, each institution is additionally classified in Table S1 into one of five operational categories—(i) public-facing botanic garden; (ii) research- or conservation-oriented botanical institution; (iii) protected area with botanical value; (iv) planned or under-development institution; and (v) institution with unclear or compromised operational status—with separate fields for public accessibility, educational provision, and verification of current operational status. The combined institutional inventory comprises 69 documented institutions: 53 BGCI-registered plus 16 non-BGCI operational.

2.7. Multi-Language Source Verification Protocol

Recognizing that single-language source dependence is a documented form of regional research bias against non-English-language institutional documentation, we applied a triangulation protocol with three confidence tiers, reported in detail in Table 2. Tier 1 (highest confidence): institutions with substantive descriptive content verified across three languages; one institution achieved this tier. Tier 2 (cross-verified): institutions with independent substantive content in at least two languages; 17 BGCI-registered institutions plus 14 non-BGCI institutions reached this tier. Tier 3 (single-source): institutions documented in only one language, typically English-only entries derived from BGCI’s GardenSearch listings without supplementary regional documentation; 35 BGCI institutions and 2 non-BGCI institutions sit at this tier.

Table 2. Multi-language source verification tier distribution across the 69 documented botanic garden institutions in the Arab region.

Tier	Definition	BGCI Institutions	Non-BGCI Institutions	Total	Representative Examples
Tier 1	Substantive descriptive content cross-verified in three languages (Arabic, English, French)	1	0	1	Qur’anic Botanic Garden (Qatar): trilingual sources from BGCI, HBKU/QF Arabic content, French academic literature
Tier 2	Cross-verified in two languages with consistent factual content	17	14	31	Le Jardin Majorelle (Morocco; Arabic + French); Damascus Old City BG (Syria; Arabic + English); CBNM Mascarin (Comoros/Mayotte; English + French)
Tier 3	Single-language documentation only (typically English-only BGCI listings without supplementary regional sources)	35	2	37	Most BGCI-only entries in the Gulf and Maghreb without independent Arabic or French confirmation
Total	Across the inventory of 69 institutions	53	16	69	—

Where: Tier 1 sets the highest verification standard; Tier 3 is the most conservative inclusion criterion. The non-BGCI institutions were deliberately required to meet Tier 1 or Tier 2 standards (14 of 16 reached Tier 2), reflecting the more cautious threshold applied to unregistered institutions.

2.8. Limitations of the Institutional Inventory

We disclose six specific limitations. First, temporal currency: some BGCI listings appear to reflect historical institutional registration without confirmed current operational status, and we were unable to physically verify operational status for institutions in countries we could not visit during the study period. Second, information asymmetry: major institutions generate extensive public documentation while minor institutions, particularly those in conflict-affected or remote contexts, generate little; our database reflects this asymmetry with detailed entries for some institutions and near-blank entries for others. Third, conflicting numerical figures: for several institutions, different sources report substantially different figures for area, species count, or visitor numbers; where conflicts exist, we report the figure from the highest-credibility source and flag the conflict in Table S1. Fourth, classification edge cases: several documented institutions sit on the boundary of “botanic garden” (Al Areen Wildlife Park in Bahrain is primarily a zoological park with botanical components; Day Forest National Park in Djibouti is a relict-forest national park with herbarium-quality vegetation but no horticultural cultivation); we retain these in the inventory because they fulfil documentary and conservation functions analogous to BGCI institutions in the same countries. Fifth, active conflict effects: Soba/Mogran National Botanical Garden, the only BGCI institution in Sudan, has been reported damaged in the 2023–2025 conflict by Arabic-language sources [24]; we retain it in the BGCI count for institutional record-keeping but note its current operational status as compromised. Sixth, the Mayotte question: the four institutions documented for the Comoros entry are physically located on Mayotte, a French overseas department within the Comoros archipelago; the Union of the Comoros (LAS member) does not include Mayotte in its administrative territory, but the islands share archipelago-level flora and conservation networks.

2.9. Statistical Analysis

Country-level descriptive statistics (proportion of “Yes” responses for each binary question) were computed for the 13 countries with $n \geq 10$. The ordinal Q7 item was dichotomized by combining the “Familiar” and “Very familiar” categories into a high-familiarity binary. Region-wide percentages used all 613 responses; weighted means used country-level n as weights, and unweighted means used the full sample. Wilson score 95% confidence intervals were computed for region-wide proportions.

For the correlational analysis, we computed both Pearson product-moment and Spearman rank correlations between BGCI institutional count and six awareness indicators (Q5, Q6, Q7, Q8, Q14, Q17) at the country level ($n = 13$ countries). We pre-specified that $p < 0.05$ would be interpreted as statistically significant and $0.05 \leq p < 0.10$ as marginally significant, with the caveat that small n produces low statistical power and that any inference must be supplemented by qualitative country-level analysis. All analyses were performed in Python 3.12.3 (Python Software Foundation, Wilmington, DE, USA) using the NumPy 2.4.4, SciPy 1.17.1, and pandas 3.0.2 libraries (NumFOCUS, Austin, TX, USA); geographic visualizations used GeoPandas 1.1.3 (NumFOCUS, Austin, TX, USA) and Matplotlib 3.10.8 with Natural Earth Admin 0 country boundaries at 1:50 m resolution.

Analytical code is provided in Supplementary File S3 to enable full reproducibility. The geographic boundaries shown in Figures 1 and 2 are reproduced from the Natural Earth public-domain dataset and are presented for the sole purpose of visualizing the geographic distribution of survey respondents and documented institutions. The depiction of these boundaries does not constitute any endorsement, recognition, or representation by the authors regarding the political status, sovereignty, or territorial claims of any country, region, or territory. Disputed and contested borders may not be depicted in a manner that reflects the views of all parties; the maps are provided as scientific data visualizations only and should not be interpreted as authoritative geopolitical references.

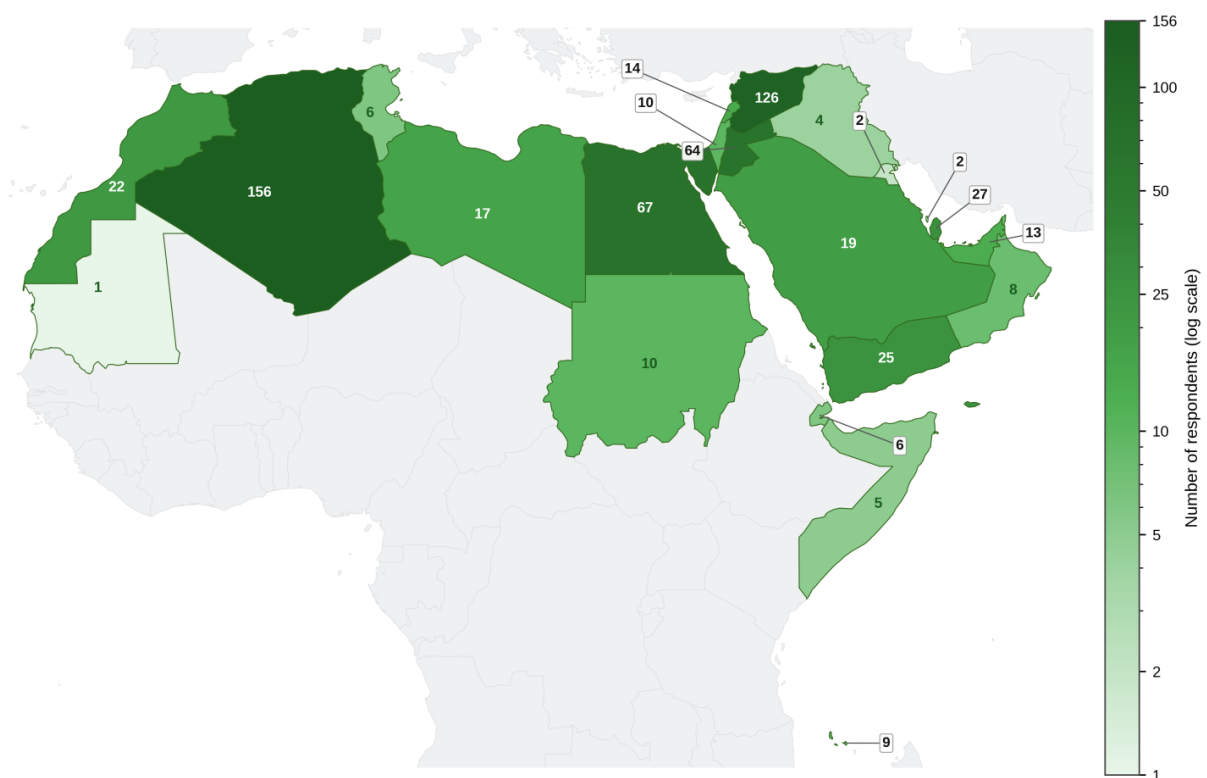


Figure 1. Geographic distribution of survey respondents ($n = 613$) across the 22 member states of the League of Arab States, 1 October 2024–4 December 2025.

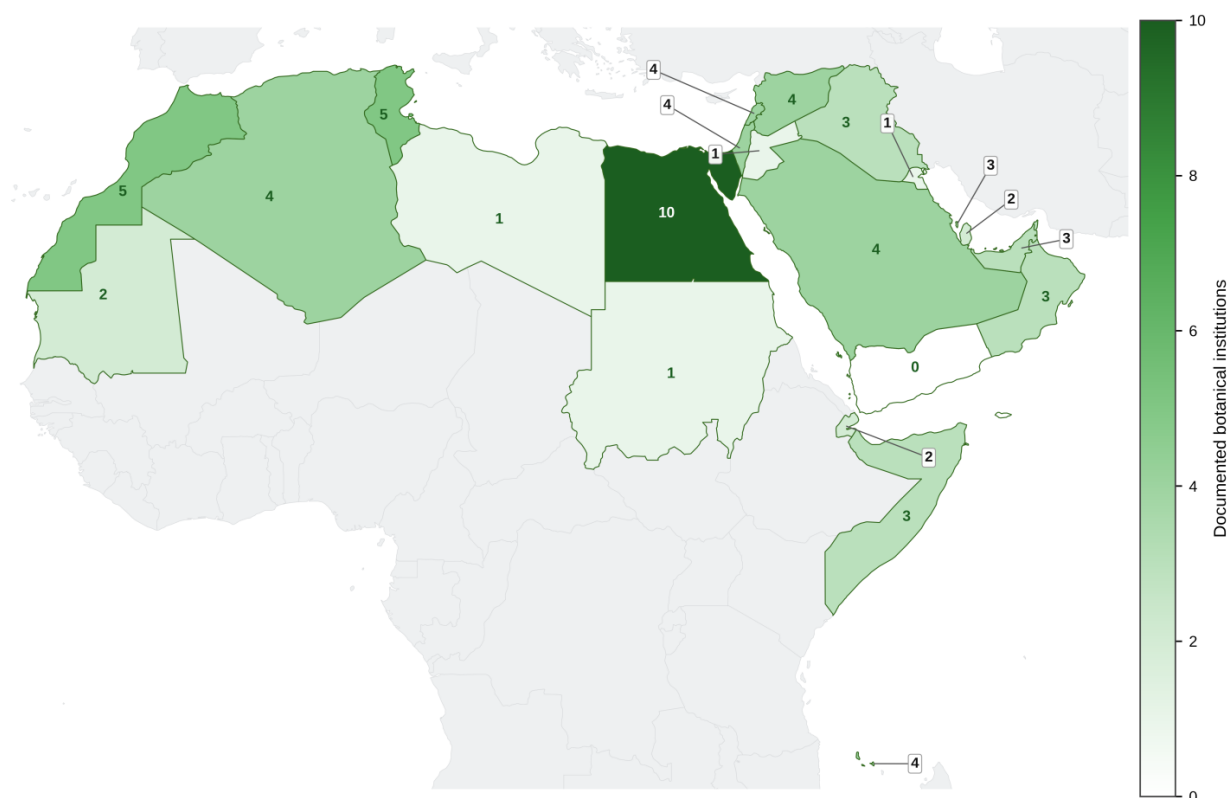


Figure 2. Documented botanic garden infrastructure across the 22 League of Arab States member states. Numbers indicate verified institutions per country, including BGCI-registered and additional non-BGCI operational institutions.

2.10. Use of Generative Artificial Intelligence

In accordance with MDPI policy on the disclosure of generative AI tools [25], the authors disclose the following. During the preparation of this manuscript, the authors used Claude (Anthropic, San Francisco, CA, USA) for assistance with multi-language source aggregation, cross-language verification of institutional data, preliminary statistical computation in Python, and draft preparation of background sections. All factual claims, institutional details, statistical calculations, source citations, and interpretive content were reviewed, verified, and edited by the human authors prior to submission. The authors take full responsibility for the content of the publication. The tool was not used as a source of substantive scientific claims, was not consulted as an authority, and is not listed as an author.

3. Results

3.1. Sample Composition

The 613 valid responses were distributed across all 22 nationalities of the League of Arab States. Geographic distribution is mapped in Figure 1, and demographic composition is summarized in Table 1. Algeria contributed the largest national subsample (156 respondents, 25.4% of the total), followed by Syria (126, 20.6%), Egypt (67, 10.9%), and Jordan (64, 10.4%). Thirteen countries reached the $n \geq 10$ threshold used for country-level analyses, accounting for 600 of the 613 responses (97.9%); the remaining nine countries (Comoros, Oman, Tunisia, Djibouti, Somalia, Iraq, Bahrain, Kuwait, Mauritania) returned 13 respondents combined and contributed only to region-wide aggregates.

Respondents skewed toward middle adulthood: 37.8% were aged 35–44, 26.4% aged 45–54, and 22.3% aged 25–34. The under-18 (0.5%) and 18–24 (6.4%) groups were sparsely

represented, as was the 65-and-older group (6.5%). The age band 55–64 was not offered in the instrument and constitutes a documented limitation. Gender distribution was unequal: 378 respondents identified as male (61.7%) and 235 as female (38.3%). The departures from population-level demographic balance reflect the convenience-sampling approach disclosed in Section 2.3 and limit the generalizability of point estimates without weighting.

3.2. Institutional Inventory

Our verified inventory comprises 69 documented institutions across the Arab region: 53 registered with BGCI and 16 operational but unregistered. The presence of an institution in this inventory does not by itself imply public accessibility or an educational and exhibition function; categories (iii)–(v) in particular include protected areas, planned institutions, and institutions whose operational status is unverified or compromised. Country-by-country distribution is reported in Table 3, with both counts and short descriptive notes for each entry. Geographic distribution is illustrated in Figure 2.

Table 3. Documented botanical institutions across the 22 League of Arab States member states (verified May 2026).

Country	BGCI Registered	Non-BGCI Documented	Total Documented	Notes/Notable Institutions
Egypt	10	0	10	El-Orman; Aswan Botanical Garden; Orman Garden of Giza
Morocco	5	0	5	Le Jardin Majorelle (~800 k visitors/yr); Bouknadel; Marrakech
Tunisia	5	0	5	Includes 1 CWGC cemetery garden
Algeria	4	0	4	Hamma BG (Algiers); ~20,000 children/yr education program
Comoros	0	4	4	Coconi BG; CBNM Mascarine; Aromaoré Ylang-Ylang; Mayotte forest reserve
Lebanon	4	0	4	Includes 1 CWGC cemetery garden
Palestine	4	0	4	Palestine Museum of Natural History
Saudi Arabia	4	0	4	King Abdullah International Gardens (USD 426M project)
Syria	0	4	4	Damascus Old City Bio-Botanical Garden; Damascus Univ Medicinal Garden; Nikitsky Damascus branch (2022); FloraSyria archive
Bahrain	0	3	3	Al Areen Wildlife Park (1976); Al Budaiya BG; planned national BG
Iraq	3	0	3	Kurdistan Botanical Foundation; Erbil
Oman	3	0	3	Oman Botanic Garden (under construction)
Somalia	3	0	3	Mogadishu BG (limited operational status)
United Arab Emirates	2	1	3	Sharjah Islamic Botanical Garden
Djibouti	0	2	2	CERD National Herbarium; Day Forest National Park (5900 ha)
Mauritania	0	2	2	Maata-Moulana medicinal garden; Maghama arboretum (planned)
Qatar	2	0	2	Qur'anic Botanic Garden (HBKU); Aspire Park
Jordan	1	0	1	Royal Botanic Garden of Jordan (Tal Ar-Rumman)
Kuwait	1	0	1	Sheikh Saad National BG
Libya	1	0	1	Tripoli Botanical Garden
Sudan	1	0	1	Soba/Mogran NGB (status compromised by 2023–2025 conflict)

Table 3. Cont.

Country	BGCI Registered	Non-BGCI Documented	Total Documented	Notes/Notable Institutions
Yemen	0	0	0	No documented operational botanic garden
Total (22 LAS countries)	53	16	69	69 documented institutions across 16 of 22 countries with BGCI-registered presence

Egypt is the regional leader by BGCI count, with ten registered institutions including the El-Orman Garden (835 species in 115 families), the Aswan Botanical Garden on Kitchener’s Island (designed in 1898 with 27 squares in a chess pattern across seven sectors), and the Orman Botanical Garden of Giza. Morocco and Tunisia each register five BGCI institutions, with Le Jardin Majorelle of Morocco the most-visited botanical institution in the Arab region (approximately 800,000 visitors per year). Algeria, Lebanon, Saudi Arabia, and Palestine each list four BGCI institutions, though the Palestinian and Saudi entries diverge sharply in resourcing and operational status. Six countries return zero BGCI-registered institutions: Bahrain, Comoros, Djibouti, Mauritania, Syria, and Yemen.

Multi-language verification revealed substantial unregistered institutional capacity in the six BGCI-zero countries, plus selective additions in BGCI-non-zero countries. Syria, listed at zero in BGCI, hosts at least four operational botanical institutions: the Damascus Old City Bio-Botanical Garden (300 species across 30 islands), the Damascus University Medicinal and Aromatic Plants Garden (with 35 active research projects in 2024–2025), a Nikitsky Botanical Garden branch opened in 2022, and the FloraSyria scientific archive. Bahrain hosts three institutions, including Al Areen Wildlife Park (established 1976, 800 ha, 100,000 plants of 80 species, 140,436 visitors recorded in 2010) and Al Budaiya Botanical Park. Comoros records four operational institutions on the French overseas territory of Mayotte, which shares the archipelago’s flora; these include the Conservatoire Botanique National de Mascarin antenna (719 indigenous species, 36–59 endemics) and the Réserve Naturelle Nationale of Mayotte’s forests (2800 ha, established 2021). Djibouti hosts the CERD National Herbarium with an associated medicinal plant nursery, and Day Forest National Park (1939, 5900 ha relict *Juniperus procera* forest, UNESCO World Heritage Tentative List 2015). Mauritania hosts a 0.8 ha medicinal garden at Maata-Moulana (40 species, established 2001) and a planned arboretum at Maghama. Yemen returned zero documented institutions in either category.

Multi-language source verification tier distribution is reported in Table 2. Of the 53 BGCI institutions, only 1 met the highest verification standard of substantive cross-language content in three languages; 17 reached cross-language verification in two languages; the remaining 35 sit at single-language documentation, typically English-only BGCI listings without supplementary regional sources. Fourteen of the sixteen non-BGCI institutions met two-language verification, reflecting our deliberately conservative inclusion criteria for unregistered institutions.

3.3. Region-Wide Indicator Distribution

Proportions of “Yes” responses among the 613 respondents in this Facebook-recruited sample are presented in Figure 3, with 95% Wilson score confidence intervals. Three patterns emerged.

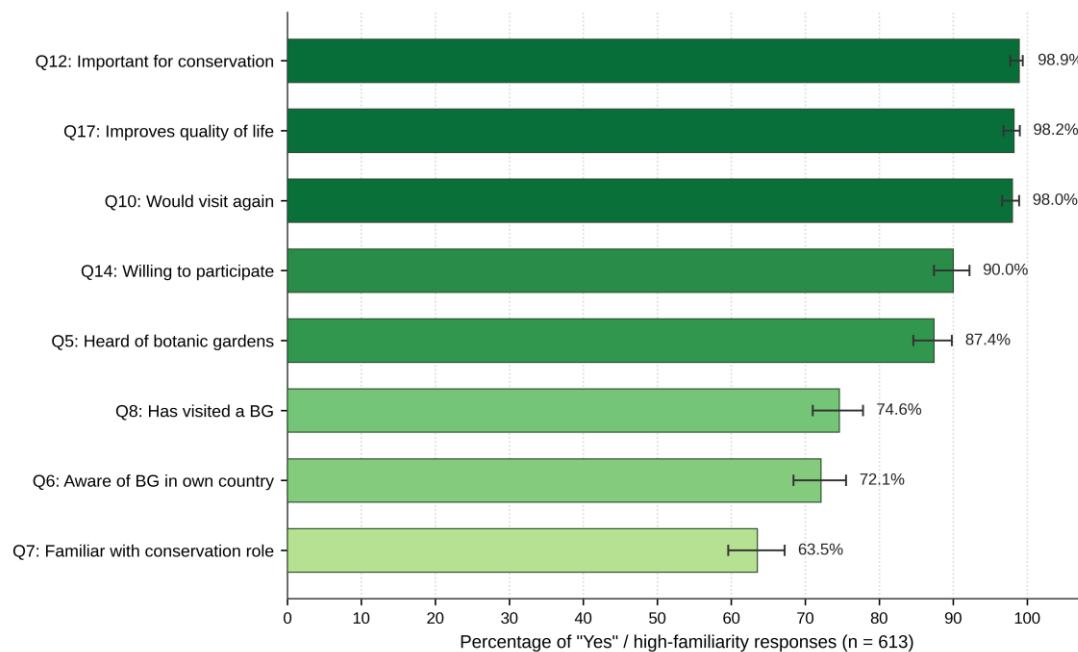


Figure 3. Region-wide distribution of “Yes” responses across awareness, engagement, and attitude indicators ($n = 613$ across all 22 LAS member states), with 95% Wilson score confidence intervals. Color intensity represents the percentage of “Yes” or high-familiarity responses, from low (light) to high (dark).

First, the affirmation indicators were near-ceiling. Q12 (botanic gardens play an important role in environmental conservation) returned 98.9% “Yes” (95% CI 97.7–99.4). Q17 (botanic gardens improve community quality of life) returned 98.2% (95% CI 96.8–99.0). Q10 (would visit a botanic garden again) returned 98.0% (95% CI 96.6–98.9). These three indicators register near-universal endorsement of botanic gardens’ value across the regional sample.

Second, the engagement and recognition indicators were high but below-ceiling. Q14 (willingness to participate in BG activities such as workshops or events) returned 90.0% (95% CI 87.4–92.2). Q5 (heard of botanic gardens) returned 87.4% (95% CI 84.6–89.8).

Third, the operational and competence indicators were moderate. Q8 (has visited a botanic garden) returned 74.6% (95% CI 71.0–77.8); Q6 (aware of a botanic garden in own country) returned 72.1% (95% CI 68.4–75.5); and Q7 (familiar or very familiar with the conservation role of botanic gardens) returned only 63.5% (95% CI 59.6–67.2). The 35-percentage-point gap between region-wide affirmation of botanic gardens’ importance (98.9% on Q12) and functional familiarity with the conservation role (63.5% on Q7) is the most actionable single finding of this study.

3.4. Country-Level Indicator Distribution

Indicator distributions for the 13 countries with $n \geq 10$ are presented in Table 4 and visualized as a heatmap in Figure 4. Q17 (quality of life) and Q14 (willingness to engage) registered uniformly high values across all 13 countries (Q17: 90.0–100.0%; Q14: 80.0–100.0%), confirming that affirmation and intent are regionally near-uniform. Q5 (recognition) was also generally high, ranging from 70.0% in Palestine to 100.0% in Lebanon, Morocco, and Sudan; only Yemen (76.0%) and Palestine (70.0%) sat clearly below the regional weighted mean of 87.4%.

Table 4. Country-level public awareness, engagement, and perception indicators (% “Yes” responses) for the 13 countries with sample size $n \geq 10$.

Country	<i>n</i>	Q5 Heard of BG	Q6 Local Awareness	Q7 Familiar with Role	Q8 Visited a BG	Q14 Willing to Participate	Q17 BG Improves QoL
Algeria	156	89.7	84.0	59.0	82.7	87.2	98.1
Syria	126	81.0	66.7	68.3	64.3	91.3	97.6
Egypt	67	97.0	80.6	85.1	83.6	98.5	100.0
Jordan	64	79.7	56.2	56.2	57.8	85.9	96.9
Qatar	27	88.9	74.1	40.7	66.7	85.2	96.3
Yemen	25	76.0	52.0	52.0	64.0	96.0	100.0
Morocco	22	100.0	90.9	68.2	81.8	90.9	100.0
Saudi Arabia	19	89.5	52.6	73.7	68.4	89.5	100.0
Libya	17	88.2	47.1	70.6	82.4	82.4	94.1
Lebanon	14	100.0	64.3	85.7	92.9	100.0	100.0
United Arab Emirates	13	84.6	92.3	38.5	76.9	84.6	100.0
Palestine	10	70.0	30.0	40.0	60.0	80.0	90.0
Sudan	10	100.0	100.0	80.0	100.0	90.0	100.0
Region-wide (all 22 nationalities)	613	87.4	72.1	63.5	74.6	90.0	98.2
95% Wilson CI (region-wide)	—	84.6–89.8	68.4–75.5	59.6–67.2	71.0–77.8	87.4–92.2	96.8–99.0

Q6 (local awareness) showed the widest country-level variation: Palestine returned 30.0%, Libya 47.1%, Yemen 52.0%, and Saudi Arabia 52.6% on the low end, while Sudan returned 100.0%, the United Arab Emirates 92.3%, and Morocco 90.9% on the high end. Q7 (functional familiarity with the conservation role) returned the lowest aggregate values and the most striking country-level pattern: the United Arab Emirates returned 38.5%, Qatar 40.7%, and Palestine 40.0%, despite the United Arab Emirates’ high local awareness (Q6 = 92.3%) and Qatar’s relatively favorable institutional context. The dissociation between Q6 (knowing a botanic garden exists) and Q7 (knowing what it does) is most pronounced in the Gulf states and is discussed in Section 4.3.

Q8 (visitation) ranged from 57.8% in Jordan to 100.0% in Sudan and Lebanon (94.3%); the regional weighted mean was 74.6%, indicating that approximately three-quarters of respondents had visited a botanic garden at some point, including those in countries with sparse domestic infrastructure.

3.5. Institutional Infrastructure and Public Awareness

The country-level relationship between the BGCI institutional count and each of the six awareness indicators is reported in Table 5 and visualized in Figure 5. None of the six correlations reached the conventional significance threshold of $p < 0.05$. The strongest association, between BGCI count and Q5 recognition, returned a Spearman ρ of 0.525 with $p = 0.065$, marginally significant under a more permissive 0.10 threshold but failing the pre-specified 0.05 cutoff. Pearson r for the same comparison was 0.431 with $p = 0.141$, also non-significant.

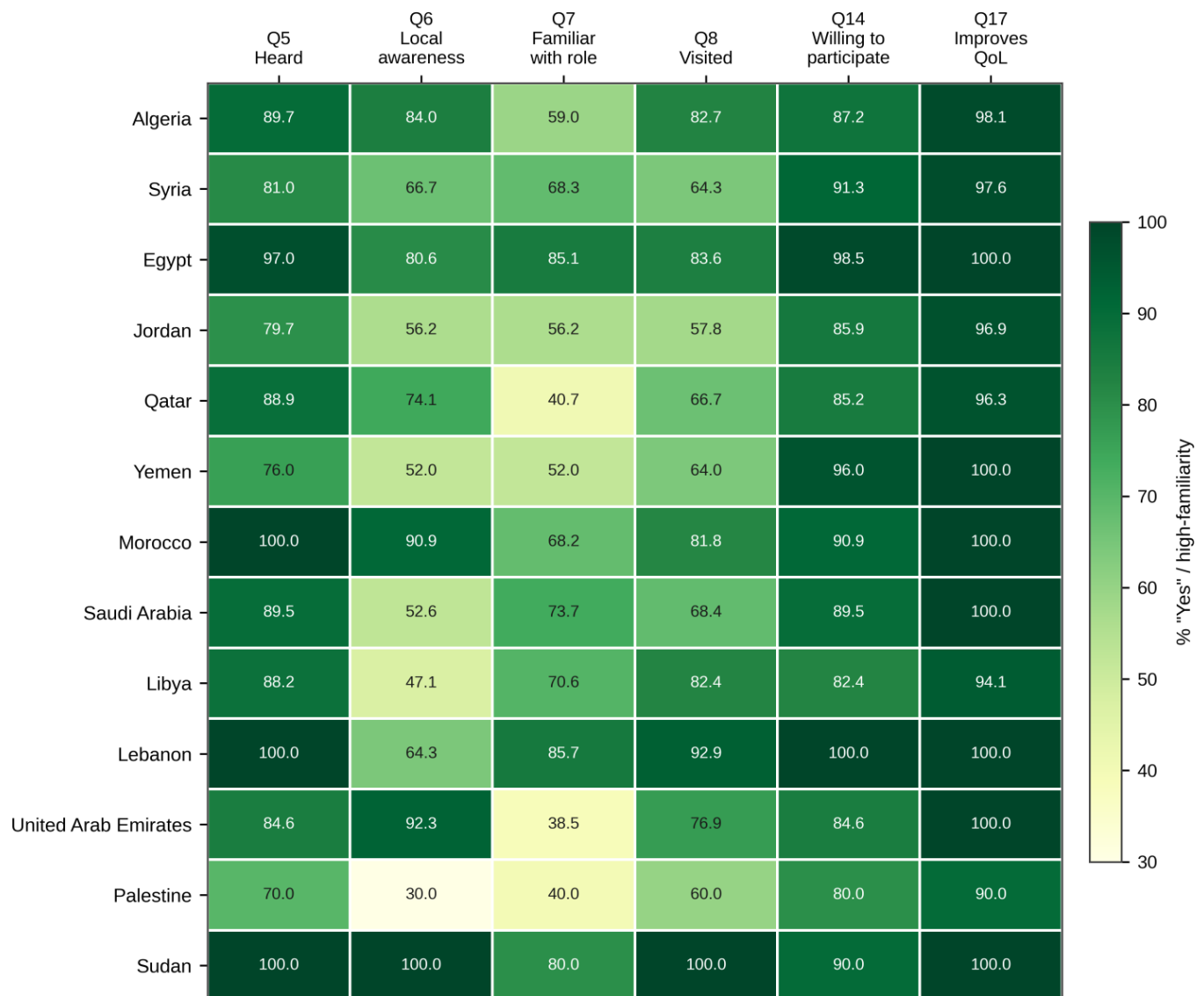


Figure 4. Public awareness, engagement, and perception indicators by country ($n \geq 10$), expressed as percentage of “Yes” or high-familiarity responses.

Table 5. Country-level correlations between BGCI institutional count and six awareness indicators ($n = 13$ countries with sample size ≥ 10).

Awareness Indicator	BGCI Range (Min–Max)	Indicator Range (% Min–Max)	Pearson r	Pearson p	Spearman ρ	Spearman p	Significance
Q5: Heard of botanic gardens	0–10	70.0–100.0	+0.432	0.141	+0.525	0.065	Marginal ($p < 0.10$) †
Q6: Aware of BG in own country	0–10	30.0–100.0	+0.173	0.573	+0.205	0.501	NS
Q7: Familiar with BG conservation role	0–10	38.5–85.7	+0.367	0.218	+0.233	0.443	NS
Q8: Has visited a botanic garden	0–10	57.8–100.0	+0.280	0.354	+0.379	0.201	NS
Q14: Willing to participate in BG activities	0–10	80.0–100.0	+0.349	0.242	+0.115	0.708	NS
Q17: BG improves community quality of life	0–10	90.0–100.0	+0.149	0.626	+0.247	0.415	NS

Where † $0.05 \leq p < 0.10$ (marginal); NS = not significant.

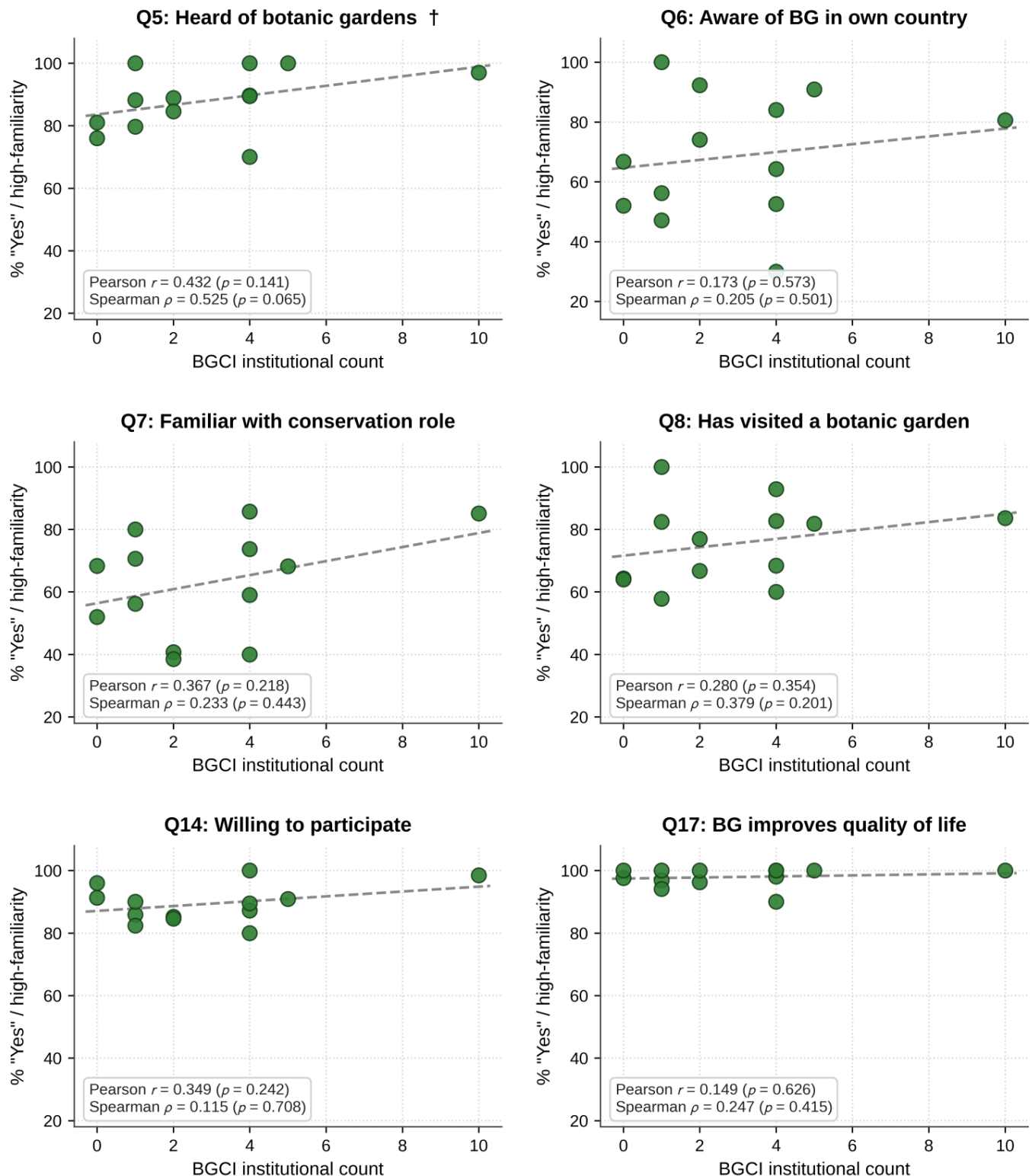


Figure 5. Scatter plots of BGCI institutional count against six country-level awareness indicators ($n = 13$ countries with $n \geq 10$ respondents). Pearson and Spearman correlation coefficients are reported with associated p -values; † indicates marginal significance ($0.05 \leq p < 0.10$). The dashed line indicates the linear best-fit (regression) trend.

The remaining five indicators returned weaker associations: Q6 (Pearson $r = 0.172$, $p = 0.573$; Spearman $\rho = 0.205$, $p = 0.501$), Q7 ($r = 0.367$, $p = 0.217$; $\rho = 0.233$, $p = 0.443$), Q8 ($r = 0.280$, $p = 0.355$; $\rho = 0.379$, $p = 0.201$), Q14 ($r = 0.349$, $p = 0.242$; $\rho = 0.115$, $p = 0.708$), and Q17 ($r = 0.150$, $p = 0.625$; $\rho = 0.247$, $p = 0.415$). The Q14 finding is particularly notable: willingness

to participate in botanic garden activities is essentially unrelated to the number of BGCI institutions in the respondent's country, in either direction.

Inspection of Figure 5 reveals that several country-level points sit far from any underlying linear relationship. Sudan returns $Q5 = 100\%$ on a single BGCI institution that has been reported damaged in the 2023–2025 conflict [24]. Syria returns $Q5 = 81\%$ with zero BGCI institutions, supported by the four non-BGCI institutions documented in Section 3.2. Palestine returns $Q5 = 70\%$ with four BGCI institutions, the lowest $Q5$ value among all countries with $n \geq 10$. The United Arab Emirates returns the lowest $Q7$ of any country (38.5%) despite ranking high in $Q6$ (92.3%) and despite holding two BGCI institutions, including the Al Ain Zoo's botanical components. These outlier patterns are explored further in the Discussion section.

4. Discussion

4.1. The Decoupling of Infrastructure from Awareness

The central finding of this study is that the documented BGCI institutional count did not show a statistically significant association with country-level public awareness of botanic gardens in this sample; given the limited statistical power of an analysis based on only 13 countries, this absence of a detectable association should not be read as proof that none exists. Five of six tested correlations returned p -values above 0.20, and the sixth reached only marginal significance ($p = 0.065$) without meeting our pre-specified threshold. This finding runs against a default assumption that often underlies regional capacity-building strategies: that physical and registered infrastructure drives awareness through accumulated visitor experience and local visibility.

Our result has parallels in the broader public perception literature. The Italian national survey of forest perceptions ($n = 2193$) found that public awareness of forest extent did not track actual forest cover but instead followed media narratives, school curricula, and personal recreation patterns [17]. Public awareness of invasive alien species in South Africa varied with education level, gender, and species density rather than with management intensity [26]. Public engagement with botanical gardens in Australia, evaluated through the Wollemi Pine horticultural release program, was driven not by proximity to the original Wollemi Pine *ex situ* collection but by 1510 home gardeners' personal cultivation of the species [27]. Across these examples, the assumption that infrastructure proximity translates to public awareness fails repeatedly.

Botanic gardens, as institutions, can be seen by the public as visible recreation venues, as research and conservation infrastructure, or as both. The first identity is generated by visitation, the second is generated by communication. Our $Q8$ (visitation) returns 74.6% region-wide, and $Q12$ (importance for conservation) returns 98.9%, which together indicate that respondents have substantial direct experience and high abstract endorsement. The fact that $Q7$ (functional familiarity with the conservation role) sits at 63.5% suggests the gap is in communication about the role rather than in physical access. The implication is consequential for regional strategy. Investment in registration with BGCI, or in physical garden expansion, will not by itself improve public understanding of what these institutions are for.

4.2. The Affirmation–Competence Gap

The most striking single feature of our region-wide data is the 35-percentage-point gap between $Q12$ (98.9% affirm botanic gardens are important for environmental conservation) and $Q7$ (63.5% are familiar or very familiar with what botanic gardens actually do for conservation). $Q7$ measures respondents' self-reported familiarity with the conservation role of botanic gardens, not objective conservation knowledge, and the phrase

“conservation role” may have been understood differently by different respondents. The gap is, therefore, best interpreted as a potential science communication gap rather than as direct evidence of a public conservation literacy deficit. This pattern is consistent with what Ballantyne and colleagues describe as “plant awareness disparity” in their commentary on botanic garden tourism: public audiences tend to endorse plant conservation in the abstract but show much weaker functional knowledge of the conservation activities of botanic gardens [28]. A parallel finding emerged from the Arnold Arboretum visitor study ($n = 530$), which found that Harvard Arboretum visitors had limited knowledge of Charles Darwin’s botanical work despite high general endorsement of evolutionary biology [29].

Our country-level distribution of Q7 (Figure 4) sharpens the pattern. The lowest Q7 values appear in the United Arab Emirates (38.5%) and Qatar (40.7%), two states with high local awareness (Q6 above 70%) and active botanic garden infrastructure. The reading we propose is that respondents in those countries know that botanic gardens exist and have visited them as recreation venues, but have not been exposed to substantive communication about ex situ conservation, seed banking, or regional plant diversity. This is, in principle, a reversible communication problem.

Practical implications follow. First, institutions seeking to improve regional awareness should focus on what they convey to visitors about conservation, not only on attracting visitors. Second, BGCI’s own communications materials, school programs, and signage in member institutions should be evaluated against Q7-style competence questions rather than only Q5/Q8-style recognition questions. Third, the 90.0% Q14 willingness to participate in workshops and events indicates substantial latent demand for the kind of substantive engagement that would close the affirmation–competence gap.

4.3. Country-Specific Patterns and Outliers

Several country-level points in Figure 5 require explanation that goes beyond the region-wide story. We address four notable cases.

The small samples obtained for Sudan ($n = 10$) and Lebanon ($n = 14$) must be read against the conditions in those states during the 1 October 2024–4 December 2025 fielding window. Sudan had been at war since 15 April 2023, with roughly 12 million people displaced—the largest displacement crisis in the world—and widespread communication blackouts limit internet access among the displaced. The survey in Lebanon opened on 1 October 2024, the day Israeli ground forces entered the south, during a period in which about 1.2 million Lebanese were displaced, until the ceasefire of 27 November 2024. The near-uniform responses from these two countries therefore reflect the small number of connected respondents reachable under extreme conditions, and are reported as individual special cases rather than national-level estimates. Sudan returns Q5 = 100%, Q6 = 100%, and Q8 = 100% on a sample of 10 respondents and a single BGCI institution (Soba/Mogran National Botanical Garden) that has been reported damaged in the 2023–2025 conflict [24]. The small Sudanese subsample is internally consistent in its high awareness, suggesting that the respondents reached through our networks were Sudanese diaspora or professionals with prior institutional exposure. The data should not be interpreted as evidence that the Sudanese general population currently maintains 100% awareness of botanic gardens; rather, it is evidence that those Sudanese respondents who completed our online survey under conditions of active conflict had high prior exposure. The COVID-19 pandemic literature on conservation research disruption [30] provides a useful parallel for thinking about how such crises change who is reachable through online survey methods.

Syria returns Q5 = 81% and Q6 = 67% with zero BGCI institutions. Our multi-language verification documented four operational non-BGCI institutions in Syria, including the Damascus Old City Bio-Botanical Garden, the Damascus University Medicinal

and Aromatic Plants Garden, a Nikitsky Botanical Garden branch, and the FloraSyria scientific archive. The Syrian Q5 result is therefore consistent with our institutional inventory once non-BGCI institutions are counted; it would be inconsistent with the BGCI-only count. This is one of the clearest single arguments for the value of multi-language source triangulation.

Palestine returns the lowest Q5 (70%), Q6 (30%), and Q7 (40%) of any country in the $n \geq 10$ set, despite four BGCI-registered institutions including botanical gardens in Bethlehem, Tulkarem, and Birzeit. The Palestinian context is the strongest single piece of evidence in our data that infrastructure presence does not translate into public awareness when access to that infrastructure is constrained by movement restrictions, occupation, and conflict. The Palestinian data should be read alongside, but not as equivalent to, comparable contexts in Iraq, Yemen, and Sudan.

The United Arab Emirates returns Q7 = 38.5% (the lowest of any country) alongside Q6 = 92.3% (the second highest). The combination tells a clear story: respondents know botanic gardens exist in their country, but do not know what they do for conservation. This pattern is well-suited to interpretation through the lens of plant awareness disparity [28] and is, in principle, the most actionable diagnostic in our entire dataset. Communication redesign at the institutional level, oriented around substantive conservation messaging, should be expected to move Q7 substantially.

4.4. *The Hidden Geography of Unregistered Institutions*

Our institutional inventory documented sixteen operational botanical institutions that are not registered with BGCI. Together with the conflict-damaged status of one BGCI institution in Sudan, this finding has implications for regional policy and for the interpretation of any future analyses that rely on BGCI count as a proxy for institutional capacity. Three considerations follow.

First, BGCI registration imposes resource costs (annual fees, reporting requirements, English-language documentation) that small or sub-national institutions in resource-constrained countries may not be able to bear. The Mauritanian Maata-Moulana medicinal garden, the Djiboutian CERD herbarium, the Bahraini Al Budaiya Botanical Park, and the Syrian institutions documented in Section 3.2 are operational by any reasonable definition; their absence from BGCI is a registration artifact rather than an institutional absence. Recent commentary on the role of botanic gardens in the Plant Treaty argues that the international legal architecture itself shapes what counts as a registered institution [31].

Second, language asymmetry in BGCI's documentation channels (almost entirely English) systematically under-represents Francophone and Arabic-language institutions. The Mayotte antenna of the Conservatoire Botanique National de Mascarin, for example, generates substantial French-language documentation but has minimal English-language presence; the Damascus University Medicinal and Aromatic Plants Garden generates Arabic-language documentation, including a 35-project active research register, but appears nowhere in BGCI's English-language listings. This asymmetry is consistent with broader findings on language bias in conservation research representation [9,10].

Third, war and political reconfiguration have reshaped the institutional landscape during this study's data collection window. Sudan's only BGCI institution was reported damaged in 2023–2025, Syrian institutions documented in pre-2011 sources may have been affected, and Yemeni botanical activities documented in pre-conflict periods are unverifiable from publicly available sources at the time of writing. These dynamics are not unique to the Arab region [21], but they are particularly salient for the period covered by our survey and bear on any interpretation of zero-BGCI counts in conflict-affected states.

4.5. Methodological Reflections and Limitations

We disclose six methodological limitations that bear on the interpretation of our findings. First, paid Facebook advertising as the primary recruitment channel produces a sample restricted to active Facebook users; this excludes older and rural populations to differing extents across countries (Facebook penetration is higher in the Maghreb and Levant than in Yemen, Mauritania, or Comoros), and the platform's algorithm preferentially serves impressions to users with prior topical interest. The country-level imbalance in our sample ($n = 156$ from Algeria versus $n = 1$ from Mauritania) reflects this pattern. The convention of online-platform recruitment is established in comparable visitor and public-perception studies [14,15,18,19], but it warrants clearer disclosure than is sometimes given. A further, often-overlooked feature of advertisement-based recruitment is a trust barrier. A segment of users treats sponsored links with suspicion, perceiving them as possible vehicles for malware or fraudulent content, and avoids clicking them. This self-selection compounds the under-representation of older adults and infrequent platform users. Representative proportional sampling was not the design goal of this baseline study, and the uneven country-level sample sizes are expected, given the wide range of national population scales. Probability-sample replication, ideally combining online recruitment with face-to-face administration in priority countries, remains an important next step.

Second, the sample is gender-imbalanced (61.7% male, 38.3% female). This reflects the gender skew of Facebook's algorithmic content distribution for environmental and botanical topics in the Arab region rather than the gender distribution of the underlying populations. The skew limits the generalizability of our point estimates without weighting. Future replications should configure paid advertising with gender-balanced impression targets, or supplement online recruitment with channels that reach women more reliably (for example, partnerships with women's professional networks, university student samples, or face-to-face survey distribution in mixed venues). Because older adults may form an important botanic garden visitor constituency, the gender imbalance and the missing 55–64 band should be read as sources of bias affecting the interpretation of visitation history, awareness, and stated willingness to participate, not merely as gaps in coverage.

Third, the survey instrument did not include the 55–64 age band, which we identified during analysis. The omission is substantive: this age band typically contains a high concentration of professionally established adults with high access to civic institutions, including botanic gardens. Future replications should add the 55–64 band and ideally use 5-year intervals throughout to permit demographically standardized comparison with national census data.

Fourth, the $n = 13$ countries used in country-level correlation analysis yield low statistical power; with this sample size, only correlations of approximately $\rho = 0.55$ or stronger reach $p < 0.05$. Our negative findings should therefore be read as “no detectable strong association” rather than “no association exists”. Replications with broader country coverage ($n \geq 20$) would substantially improve statistical resolution.

Fifth, the BGCI count we use as the institutional infrastructure variable is itself imperfect. As discussed in Section 4.4, BGCI registration is shaped by language, cost, and political factors that are not fully captured by institutional capacity. Future analyses using the broader institutional count (e.g., BGCI plus our verified non-BGCI inventory) may shift the correlation pattern; we report both counts in our Supplementary Materials to enable such re-analysis.

Sixth, because the substantive questionnaire items are predominantly binary or single categorical responses, and the country-level analysis rests on only 13 units, the dataset does not meet the requirements for structural equation modeling or comparable latent-variable techniques. We therefore retain a descriptive and bivariate approach here and

reserve multivariate latent-variable modeling for a planned follow-up study using an instrument purpose-designed with multi-item scales for visitation, cognition, perception, and satisfaction.

4.6. Implications for Practice and Policy

Three practical implications follow from our findings.

First, regional capacity-building strategies should not assume that physical or registered institutional expansion will, on its own, translate into improved public engagement. The 35-point gap between Q12 affirmation and Q7 functional familiarity indicates that the bottleneck is communication, not institutional presence. Resources directed toward signage, school programs, and guided interpretation may yield larger awareness gains than equivalent resources directed toward registration or physical expansion. Comparable conclusions emerge from work on collaborative conservation networks [32], on social inclusion and community engagement at UK botanic gardens [8], and on the digitization of biocultural collections at major Global South institutions [10].

Second, the visibility deficit of non-BGCI operational institutions is a regional asset that is currently undocumented. The Damascus University Medicinal and Aromatic Plants Garden, the Maata-Moulana medicinal garden in Mauritania, and the Day Forest National Park in Djibouti each have functional capacities analogous to BGCI institutions in neighboring countries but are not visible to international networks. Practical work to support BGCI registration, or alternatively to develop an Arab-region complementary network, would expand the documented institutional baseline considerably.

Third, the high willingness-to-engage scores (Q14 = 90.0% region-wide) constitute a regional asset that is currently under-utilized. The combination of high latent demand for educational programs, pre-existing visitor experience (Q8 = 74.6%), and modest functional familiarity (Q7 = 63.5%) is precisely the configuration in which program investment can be expected to deliver substantial measurable returns. Comparable findings on educational programming at the Bali Botanic Garden, the Tulipa karyotype program at Greek high schools [33], and the Trinity College Botanic Garden long-term monitoring framework [34] provide concrete starting points for regional adaptation.

5. Conclusions

This study reports the first regional baseline of public awareness, perceptions, and engagement regarding botanic gardens across the 22 member states of the League of Arab States. Five findings hold up against the limitations we disclose.

First, public affirmation of botanic gardens as important for environmental conservation is near-universal in the regional sample (98.9%), as is willingness to visit again (98.0%) and willingness to participate in activities (90.0%). The Arab region is not a context of indifference toward botanic gardens.

Second, functional familiarity with what botanic gardens actually do for conservation is substantially weaker (63.5%). The 35-point gap between affirmation and competence is the most actionable single finding of this study.

Third, we did not detect a statistically significant association between BGCI institutional count and country-level public awareness of botanic gardens at conventional thresholds. The strongest correlation (Q5, Spearman $\rho = 0.525$, $p = 0.065$) is suggestive rather than conclusive and should be retested in a larger country-level sample; the remaining indicators return p -values between 0.20 and 0.71. Because this analysis rests on only 13 countries, this should not be read as evidence that no association exists. Channels other than registered institutions appear to drive recognition.

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Conflicts of Interest: The authors declare no conflicts of interest.

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