

## Urban–rural contrasts in Arbor Week in South Africa

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TREES PROVIDE PEOPLE WITH ENVIRONMENTAL benefits. Greening projects have been implemented worldwide, but many of them have frustratingly low participation levels. In South Africa, tree-planting campaigns such as the national Arbor Week are generally aimed at schools. Because of the remoteness of rural schools, there are urban/rural disparities in standards of education, infrastructure and support provided at schools, and hence we hypothesized that these disparities would be mirrored in tree-planting activities associated with national Arbor Week. In the study reported here, 236 urban and rural schools were assessed by means of postal surveys and subsampled via direct interviews, as to their participation in Arbor Week activities, the provision of trees, constraints to participation, and the perceived benefits of planting trees. Very few urban schools had never participated in any Arbor Week activities, whereas one-fifth of rural ones had never participated in any way. Urban schools participated in a greater number of Arbor Week activities than rural schools, including tree-planting, displaying posters and having speeches. Thus, overall information about Arbor Week is lacking in rural areas compared to urban ones. Rural schools derived more benefits from planting trees, with shade and education being the primary benefits overall. Rural schools were supplied with trees by NGOs, whereas urban schools received trees from individual or company donations. The major constraints to tree-planting are livestock damage, water shortages, vandalism and theft. These obstacles need to be addressed in a holistic fashion in order to improve the participation and success of National Arbor Week as a vehicle for tree-planting and environmental awareness.

### Introduction

Trees provide rural and urban communities with a diverse range of environmental goods and services.<sup>1–3</sup> Tangible goods derived from trees include fuelwood, construction and carving timber, fruit, fibre, medicine, fodder, oils/dyes and shade.<sup>4–6</sup> These goods are consumed directly, or may be harvested and sold in either a raw or processed form. Trees may also provide significant ecosystem services such as nutrient cycling and soil enrichment, habitat amelioration, carbon sequestration, air purification, wind-breaks, reduction in soil erosion and storm water run-off, and habitats and

food for other species.<sup>1,2</sup> Less tangible benefits of trees in rural and urban landscapes relate to their aesthetic and cultural values, and contribution to overall human well-being.<sup>2</sup>

Because of the acknowledged significance and value of trees to human and environmental well-being, government agencies, local municipalities, conservation bodies and non-governmental organizations (NGOs) worldwide sponsor or implement tree planting programmes, including woodlots, agroforestry, plantations, urban forestry and household plantings.<sup>2,7–9</sup> These are frequently in tandem with broader environmental education and training initiatives. One tree planting campaign that is observed in over fifty countries worldwide is National Arbor Day (or Week). In southern Africa, several countries, including South Africa, Malawi, Namibia, Lesotho and Zimbabwe, have annual tree planting days, or weeks. In Zimbabwe, it is national policy that every household is required to plant a tree on the designated day, each year.<sup>10</sup>

Arbor Day originated in 1872 in the United States and was celebrated for the first time in South Africa in 1975. Each year an indigenous tree is nominated, the first of which was South Africa's national tree, the yellowwood (*Podocarpus* species). In 1996 two species were nominated, and the celebration of Arbor Day was extended to a national Arbor Week, from 1 to 7 September. National Arbor Week is now the annual national campaign managed by the Department of Water Affairs and Forestry (DWAFF) to promote environmental awareness and sustainability through planting and maintaining indigenous trees throughout South Africa, especially in previously disadvantaged communities.<sup>11</sup>

Government-initiated Arbor Week projects are often aimed at schools, where a large number of young people are exposed to tree planting, and therefore can learn to appreciate the values of trees from an early age. There is a positive correlation between actual participation in such environmental activities and subsequent improved appreciation of and engagement with the environment,<sup>8,12,13</sup> which it is assumed may spill over to the wider family. However, in

common with other developing countries, many of the schools in rural districts of South Africa are situated in impoverished communities and are therefore poorly financed and lack even the most basic infrastructure and communication facilities. There are disparities in the standard of education received by rural and urban pupils and, consequently, in their future opportunities.<sup>14</sup> We postulate that the urban/rural education disparities will be mirrored in Arbor Week events, from which many rural schools are probably isolated. They are either unaware of these events, or do not have the necessary resources and infrastructure to collect, plant and maintain trees.

There has been no quantitative examination on the efficacy of national Arbor Week in South Africa, nor in many of the other countries in which it is held. Within the context of the above, therefore, this paper presents a study that aimed to determine the prevalence of, and the urban/rural disparities in, the implementation of national Arbor Week in our schools. The hypothesis tested was that there is a bias towards urban schools, manifest through greater involvement in Arbor Week activities and therefore that Arbor Week is more effective in urban schools. We attempted to address the following key questions in both the rural and urban setting: (1) What proportion of schools participate in Arbor Week activities, and which activities dominate? (2) By whom are trees provided? (3) What are the perceived benefits of planting trees? and (4) What are the obstacles to greater participation and success?

### Study localities

The study was conducted in two localities, one in the Eastern Cape province (Makana municipality), and one in Mpumalanga (Mbombela municipality). They were selected on the basis of being areas well known to the researchers. Makana municipality covers an area of 4221 km<sup>2</sup> and is home to approximately 74 500 people.<sup>15</sup> The economic centre is Grahamstown, which is also home to the bulk of the urban residents, with a few also in the small settlements of Alicedale and Riebeeck East. Over 90% of the municipality is under livestock- or game-farming and ecotourism. Mean annual rainfall is 580 mm, concentrated in early summer and autumn. There is a diverse range of vegetation types, but most of the area falls in the Thicket Biome. Within the municipality, 50% of the labour force is employed, although two-thirds of households (67%) earn less than R2000 per

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month. A significant proportion of the population (30%) are in school. Households engage in multiple livelihood activities, although small-scale arable agriculture and tree growing is not particularly common in the broader region.<sup>5</sup>

In contrast, the Mbombela municipality is slightly smaller in size (3330 km<sup>2</sup>), but has over six times the population (474 800).<sup>15</sup> Mean annual rainfall is 750 mm, and the main vegetation is Sour Bushveld. The municipal centre is Nelspruit, which is also the provincial capital, attracting many job-seekers. In 2001, just under two-thirds (62.3 %) of the adult population were employed, despite one-quarter (24.8 %) having no schooling. One-third of the population are in school. Most (73%) earn less than R2000 per month and are reliant upon a range of income-generating activities within the household unit. Many utilize local natural resources for domestic consumption and for sale. Many households in the lowveld cultivate home gardens and have some fruit trees within the homestead.<sup>5</sup>

## Methods

The urban and rural definitions implied in this study were not related to population size and density; instead they were a product of surrounding areas (agricultural or commercial), and the provision of bulk services such as water and sanitation. 'Rural' was used as a collective term for all non-urban areas and consisted of those without access to piped water and sanitation inside dwellings and generally surrounded by agricultural or grazing land. Rural schools therefore included farm schools and those in small informal settlements. Urban areas were those within towns or built-up areas and formal townships, usually surrounded by industry or residential areas where piped water and sanitation were accessible within the dwellings or within close proximity.

A two-tier approach was used. First, an initial sample of 236 schools (118 schools in each locality) was approached by means of a postal survey. Since postal surveys often have poor returns, an incentive was offered to supply trees for Arbor Week 2003 on a draw-card system. Second, a smaller random sample of 58 was used for direct interviews: 35 schools in Mpumalanga and 23 in the Eastern Cape. A postal survey was sent to the principals of 118 schools (primary and secondary, but excluding pre-primary) in each of the two localities, which covered all the schools in Makana and 98.9% of schools in Mbombela. This survey was general and required information on the

**Table 1.** Participation levels (%) of rural and urban schools in Arbor Week.

	Urban	Rural	<i>P</i>	Significance
% never participated	2.6	19.7	0.010	*
% that participate every yr	73.7	62.5	0.193	NS
% that plant trees	95.0	76.7	0.011	**
% using posters	67.5	43.3	0.014	**
% hosting speeches	65.0	38.3	0.007	**
% developing educational exercises around Arbor Week	37.5	33.3	0.413	NS
Number of activities engaged	2.7 ± 1.2	1.9 ± 1.4	<i>T</i> = 2.66; <i>P</i> < 0.01	*
Number of benefits cited	1.7 ± 1.0	2.1 ± 1.0	<i>T</i> = -1.47; <i>P</i> > 0.05	NS
Number of sources of trees	1.8 ± 0.8	1.5 ± 1.0	<i>T</i> = 1.22; <i>P</i> > 0.05	NS
Number of problems cited	0.9 ± 0.7	1.3 ± 0.9	<i>T</i> = -1.94; <i>P</i> = 0.05	NS
Number of trees planted	7.0 ± 5.7	9.2 ± 6.0	<i>T</i> = -1.27; <i>P</i> < 0.05	NS

\*Significant; NS, not significant.

age of the school, whether or not the school participates (or participated) in Arbor Day/Week, reasons for not participating, and their initial and most recent involvement. The survey provided choices for activities held during Arbor Day/Week (speeches, posters, planting trees, and other), and provided options for source of the trees (if any) (bought by school/teacher, government department, donation from private company or individual, NGO, and other). A stamped, self-addressed return envelope was included with this survey. Returned postal surveys are not entirely representative of the population.<sup>16</sup> Only respondents that are personally motivated to complete and return the questionnaires will do so, and the results can therefore not be generalized to the entire population.

The direct interviews were administered by means of a structured questionnaire containing mostly open-ended questions. Of the schools interviewed, 21 were urban schools and 37 were rural, and were conducted with the school principal, or a teacher recommended by the principal. The interview questions related to the perceived benefits derived from planting trees, problems with participation in Arbor Week and the maintenance of trees. The number and condition of the surviving trees, planted in the past five years, were assessed according to categories. Survival of trees was used as one index to assess the long-term success or effectiveness of Arbor Week tree planting activities. The condition categories were related to trees that had been planted in the past five years: 1, none surviving; 2, trees in poor condition, branches damaged, trees dry; 3, trees in moderate condition; few damaged branches; 4, trees in good condition, cared for; and 5, trees well tended, protected from frost and stabilized.

Data were analysed on STATISTICA using Fisher's exact tests (to measure the degree of difference between the categorical data of two samples) and *t*-tests (to

determine the difference between the means of the urban and rural samples in number of attributes, such as number of activities and benefits).

## Results

Twenty weeks after posting, the return on the postal surveys was 31.4% overall; 32.2% from Mpumalanga, and 30.5% from the Eastern Cape. In total, 55 schools from Mpumalanga were assessed, and 46 from the Eastern Cape (combining postal surveys and direct interviews). Only 2.6% of urban schools had never participated in Arbor Week, compared to 19.7% of rural schools (Table 1). Significantly more rural schools had never participated in Arbor Week in any form and fewer schools participated annually. Tree planting was the most common Arbor Week activity (Table 1), with almost all urban schools and three-quarters of rural schools undertaking it. Significantly more urban schools planted trees (*P* < 0.05), used posters (*P* < 0.05) and had speeches during that period than did rural schools (*P* < 0.01). The number of activities in which schools partook varied (Fig. 1a). Overall, urban schools held a greater number of Arbor Week activities (*P* < 0.01) than did rural schools; 2.7 ± 1.2 activities and 2.0 ± 1.4 activities, respectively.

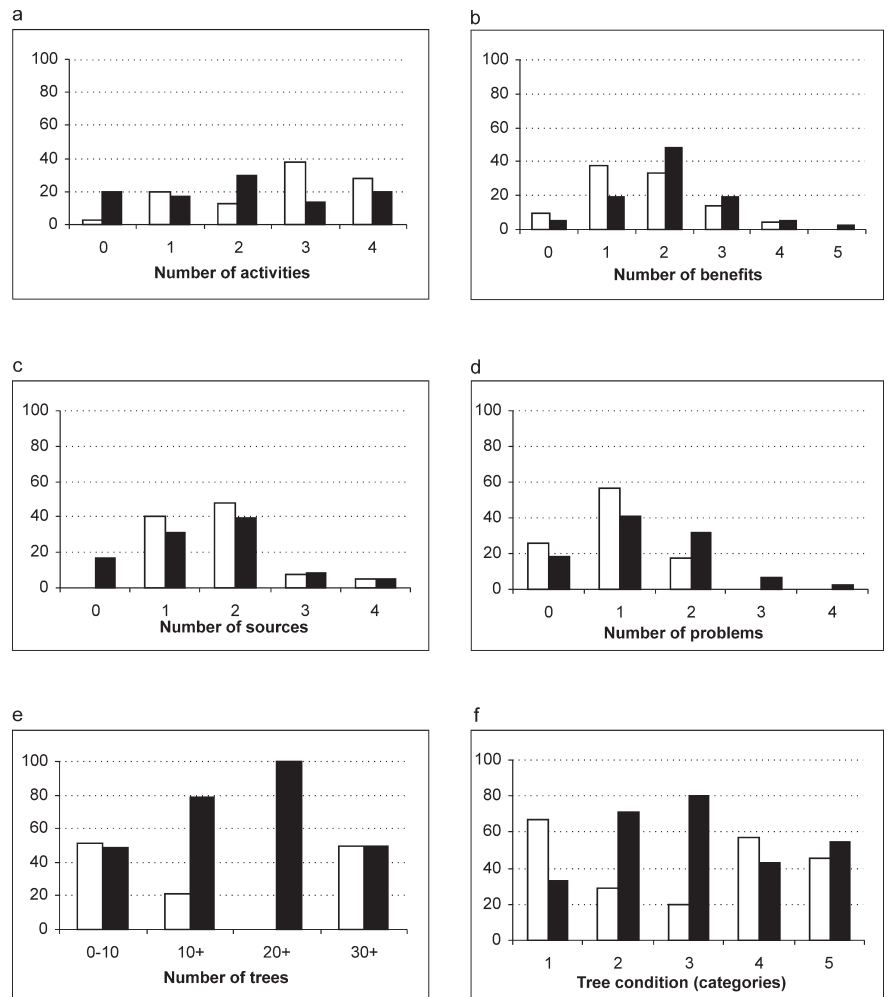
The number of trees per school was categorized into groups of 10, and reflected those that had been planted over the past five years and were still surviving. Most schools had planted between zero and 10 trees and managed to sustain them (Fig. 1e). A few (mainly rural) schools managed to maintain between 10 and 20 trees. Where rural schools have the means, they are successful at maintaining many trees, sometimes more than 30. However, there was no difference in the number of trees planted between rural (9.2 ± 6.0) and urban (7.0 ± 5.7) schools (Table 2). In general, the condition of the trees was moderate to good (Fig. 1f). The

best two categories had similar percentages of urban and rural schools. All the schools reported that they did not necessarily plant the Tree of the Year each year, as often it was not available or not suited to their climate. All interviewed schools planted indigenous trees, sometimes interspersed with exotics such as fruit trees. Some schools had vegetable gardens as well as trees. These vegetable gardens received priority for water provision and fencing for protection from domestic livestock and chickens. In both urban and rural settings, the primary responsibility for tree planting fell to the learners themselves (Table 4). Subsequent maintenance of the trees fell to learners, teachers, and in some schools, gardeners. Urban schools were more likely to have gardeners than were rural schools ( $P < 0.05$ ).

The primary source of trees was through company or personal donations (Table 2), to both urban and rural schools, although significantly more so to urban ones ( $P < 0.05$ ). The second most common source was government departments (of Education, Water Affairs and Forestry, and Environmental Affairs), which supplied trees to just under half of all schools in both rural and urban areas. The local office of the education department (Circuit Office) was categorized as separate from other government departments because they are a direct link between schools and the education department, whereas other government departments are not so closely involved with the schools. The Circuit Office provided trees only to rural schools, and only in Mpumalanga. Many urban schools also purchased their own trees. Other schools stated that supply was variable and they did not know from one year to the next whence their trees might come. The majority of schools wished for more trees than they received. The significance of the number of schools that received no trees and of those that wanted more trees was high ( $P < 0.05$ ). The number of sources of trees was similar for urban and rural schools, with the exception that there were no urban schools in the zero category, that is, there were no urban schools that had no source of trees (Fig. 1c). Urban schools had  $1.8 \pm 0.8$  sources of trees, whereas the corresponding figure for rural schools was  $1.5 \pm 1.0$  (Table 2).

**Perceived benefits from tree planting at schools**

Most urban and rural schools declared that planting trees yielded benefits to them (Table 3). The primary benefits reported were shade provision and using trees for



**Fig. 1a-f** (left to right, top to bottom). Y-axes are all percentage (%). X-axes vary as indicated. (f) Percentage of trees (in urban and rural schools) in different conditions. Categories 1–5 range from worst to best condition: 1, all trees planted in the last five years are dead; 2, trees in poor condition, broken and dry; 3, trees in moderate condition, few branches broken; 4, trees in good condition; 5, best condition, stabilized and protected from frost. White bars, urban schools; black bars, rural schools.

education. Other benefits mentioned were reduced soil erosion, provision of oxygen and fruit, medicinal uses, aesthetic and traditional purposes, and protection from lightning. The only significant difference between urban and rural

schools was that trees were used for windbreaks in rural schools but not urban ones ( $P < 0.05$ ). There was no significant difference between the number of benefits reported between the two groups, with rural schools listing an average

**Table 2.** Levels of participation (%) by different people in planting and maintaining trees.

	Urban	Rural	Fisher's exact test <i>P</i>	Significance
Pupils plant the trees	100.0	93.9	0.368	NS
Schools want more trees	52.4	87.2	0.004	*
Only indigenous species	100.0	93.8	0.359	NS
Vegetable gardens	14.3	36.4	0.070	NS
Who maintains the trees:				
– Pupils	47.6	66.7	0.134	NS
– Teachers	38.1	36.4	0.561	NS
– Gardeners	66.7	33.3	0.016	**
Sources of trees:				
– Government departments	48.7	45.9	0.471	NS
– School/teacher buys trees	40.0	16.4	0.008	*
– Circuit office	0.0	6.6	0.127	NS
– Donations	72.5	54.1	0.048	*
– NGOs	10.0	26.2	0.037	*
– No trees provided	0.0	16.4	0.004	*

\*Significant; NS, not significant.



**Table 3.** Perceived benefits (% respondents) of Arbor Week or tree planting in general.

	Urban	Rural	Fisher's exact test <i>P</i>	Significance
Some benefits gained	90.5	94.6	0.459	NS
Benefit from shade	47.6	64.9	0.157	NS
Oxygen provision	0.0	16.2	0.057	NS
Reduced erosion	4.8	5.4	0.705	NS
Windbreaks	0.0	18.9	0.034	*
Educational purposes	57.1	32.4	0.059	NS
Fruit provision	4.8	21.6	0.087	NS
Aesthetic purposes	42.9	32.4	0.303	NS
Medicinal use	0.0	5.4	0.402	NS
Traditional purposes	9.5	2.7	0.294	NS

\*Significant; NS, not significant.

of  $2.1 \pm 1.0$  benefits compared to  $1.7 \pm 1.0$  benefits reported by urban schools (Table 2). Most schools reported only one or two benefits (Fig. 1b).

**Associated problems or constraints**

Significant differences were evident between urban and rural schools with respect to problems relating to water shortages ( $P < 0.01$ ) and livestock damage ( $P < 0.01$ ) (Table 4). All urban schools were found to be properly fenced. There was more livestock damage to trees in rural areas and where there was less fencing ( $P < 0.001$ ). Insufficient water was predominantly a rural problem, although mainly in Mpumalanga. Other problems in both rural and urban schools included an admitted disinterest in tree planting, transport problems to collect trees, lack of knowledge, insufficient funds or staff to care for trees, and theft. A problem with some schools in the Eastern Cape existed where schools used a platoon-system (more than one school using the same building and alternating between occupying it in the morning or the afternoon) and therefore no school assumed ownership of the gardens or trees. Overall, there was no significant difference between urban and rural schools in terms of the mean number of reported problems (Table 2).

**Discussion**

This study has shown a strong degree of participation in Arbor Week activities by both rural and urban schools, with the planting of a few trees being the main activity. Participation and planting were greater in urban schools than in rural ones. However, rural schools tended to plant a greater number of trees, despite the frequently cited problems of livestock damage and insufficient water to maintain the trees, especially small ones. Whilst the majority of schools stated that they would like more trees, a lack of space was becoming a problem for urban schools. In the future, therefore, Arbor Week activities for urban schools might expand to include the neighbouring communities and other public space in the vicinity.

Urban schools participated in a greater diversity of activities, as well as in a greater number of activities than did rural schools. Yet generally, rural schools had more trees than their urban counterparts, and were more eager for additional trees. Most rural schools were supplied with trees by NGOs, whilst urban schools were supplied by donations from individuals and companies. The main problems associated with rural areas were water shortages and livestock damage, and the associated lack of adequate fencing.

**Table 4.** Levels of constraints to participation (%) in Arbor Week, specifically in planting trees.

	Urban	Rural	Fisher's exact test <i>P</i>	Significance
Water shortage	4.4	40.9	0.001	**
Inadequate fencing	100.0	51.5	0.000	**
Livestock damage	13.0	43.2	0.011	**
Vandalism of trees	26.1	9.1	0.070	NS
Theft of trees	0.0	6.8	0.276	NS
Lack of staff	4.4	2.3	0.572	NS
Lack of funds	4.4	9.1	0.435	NS
Trees are not a priority	8.7	2.3	0.269	NS
Lack of knowledge	8.7	2.3	0.269	NS
Lack of space	4.4	4.6	0.730	NS
No problems	26.1	18.2	0.325	NS

\*Significant, NS, not significant.

Urban areas were challenged more by vandalism and theft. These findings suggest, first, that more attention needs to be provided to rural schools to eliminate the disparity in participation, and second, that a more holistic approach, including both material and information components, is required to minimize the obstacles when providing trees to schools. Making fencing available to schools that do not have sufficient fencing for each tree provided, will help over and above simply providing trees. The provision of water tanks to supply sufficient water will not only benefit the trees, but also gardening activities and general sanitation around a school. In some cases, the taps had been locked because the schools could not afford to pay for water, and refused to start paying for something that was previously provided at no charge. Most of the urban schools received water via the municipal bulk water system, which is not the case in many rural areas. Schools will benefit also from information on the actual planting of trees, as well as educational materials on the value of trees (we observed a few situations where trees had been planted whilst still in their bags).

Much of the previous literature relates to tree planting activities by individuals, rather than institutions such as schools.<sup>5,17-22</sup> The benefits of trees are widely recognized at the local level, but whether or not individuals actively plant trees is influenced by a complexity of circumstances as well as the broader institutional and socio-economic context in which the farmer or individual operates.<sup>18,19</sup> Tree planting is a long-term investment, and therefore promoted under conditions with long-term security and stability within the local area.<sup>17-19,22</sup> At the household level in South Africa, previous work has shown that the main reasons rural households plant trees are for shade, aesthetics and fruit,<sup>5,20,21</sup> paralleling findings elsewhere in southern Africa.<sup>10,17</sup> Tangible products from the trees, such as fuelwood and browse material, are usually regarded simply as by-products, and not the primary reason for planting in the first place. The cultural benefits or associations with trees have been little explored. For small-scale farmers, tree planting is usually associated with economic returns, that is, they are seeking to sell products such as fruit or timber.<sup>4,17</sup> In both situations, planting is limited if the perceived constraints are too great. In southern Africa a common deterrent to planting has been the lack of adequate fencing or protection and consequent damage to the trees by

livestock.<sup>17,20</sup> Our study corroborated this earlier work.

At the more institutional level, adoption of environmental education initiatives (as opposed to solely tree planting) is a complex phenomenon. The presence of a motivated and knowledgeable individual is key, as are peer pressure, duration of the initiative and institutional infrastructure.<sup>12</sup> Thus, the more commonplace and socially acceptable tree planting becomes, the more likely it is that schools and communities will be encouraged to get involved.<sup>3,8</sup> But in promoting tree planting, trees need to be available, so too the means to maintain them. Simply teaching the benefits of trees without direct experience of them and demonstrating what action to take does not promote active learning and thus lessens the likelihood of learners transferring the learning experience to their own home environment.<sup>13</sup>

With less than half of the schools receiving trees from government departments, it appears that there is an opportunity for greater government support to increase Arbor Week benefits to schools, especially by making trees available. Some rural schools have never been approached about Arbor Week and were not even sure what the week represented. These schools were receptive to the idea of planting trees and were prepared to maintain them. Greater government involvement need not just be within the context of Arbor Week, but also more broadly through agroforestry initiatives, the national Land Care programme, the supply of biomass energy and the like. Focusing on economically useful species can increase participation.<sup>18</sup> In South Africa, the majority of rural households consider that it is the government's responsibility to provide trees for communal rural areas.<sup>20</sup> Donations from individuals and companies are greater to urban schools, possibly because of the closer proximity. The role of NGOs was more apparent in rural schools. In our study, most of the schools that were supplied with trees have only one or two suppliers, although rarely did both of them provide trees during the same year. Thus, there is uncertainty from year to year regarding supply, and when external agencies do not provide trees, teachers use their own money, or school funds, to purchase at least one tree from the nearest source. Such uncertainty limits forward planning and participation. Most of the schools that do not want more trees were restricted by lack of space, or lack of fenced space. Others had limited resources (water or funding) to look after

more trees and saw them as an added burden on their already limited finances. In such instances we recommend that Arbor Week initiatives not be curtailed, but rather extended to other public areas in the local community (clinics, halls, churches, sports grounds) as well as learners' homesteads. This will serve to reinforce the central messages of Arbor Week as well as increase the number of trees planted, which is currently relatively small for most schools.

Most urban and rural schools therefore do organize a range of activities around trees and tree planting during Arbor Week. However, participation and awareness is higher in urban schools than in rural ones. Thus, a conscious strategy and allocation of resources is required to redress this imbalance. There is also need for a more reliable distribution of trees so that schools can plan ahead, as well as a more holistic approach towards facilitating and supporting tree planting campaigns during Arbor Week and the rest of the year. The provision of educational materials and fencing would be of key strategic value.

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