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Conservation of Botanicals Used for Dental and Oral Healthcare in Ekiti State, Nigeria

Kayode, Joshua and Omotoyinbo, Michael Ayorinde

Department of Plant Science, University of Ado-Ekiti, Ado-Ekiti, Nigeria.

E-mail: josmodkay@yahoo.com

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ABSTRACT

A combination of social surveys and direct field observations was used to identify and determine the abundance status of chewing stick botanicals in the tree zones of Ekiti State, Nigeria. Voucher specimens of the botanicals identified by the respondents were collected, identified and relevant information on them were documented. The relative abundance of the identified species was determined based on their accessibility when required. Thus species were classified into two groups, abundant species and scarce species. A total of 49 species belonging to 26 families were identified as being used for dental and oral health care in the study area and the various similarity measurements revealed that similar plant species were used in the three zones of the study area. Most of these species were indigenous species, the introduced species constituted 18% of the total number of the species used. Only 31% of the botanicals were cultivated in the study area and these species were cultivated mainly for other uses apart from the production of chewing sticks. The relative abundance test revealed that 34 of the species could be described as being abundant while 15 species (31 %) of the species were scarce. The major sources of these scarce species were the forests which were located far from the household areas. Chewing sticks acceptability tests conducted among the urban dwellers in the study area revealed that the use of chewing sticks cut across gender, age, educational and economic strata. However, the use of chewing sticks among the urban dwellers was governed by species availability rather than preference. Strategies that would enhance the conservation of the chewing sticks botanicals were proposed.

Keywords: Conservation, botanicals, dental and oral healthcare, Ekiti State, Nigeria.

INTRODUCTION

Chewing sticks constitute an important non-wood forest product (NWFP) in Ekiti State, Nigeria where tooth cleaning with botanicals had formed part of the cultural norms. Thus despite the recent civilization, Isawumi (1978a) asserted that in Nigeria, teeth are first cleaned with chewing sticks prior to the use of modern tooth paste and brush.

Like all other NWFPs, the importance of chewing sticks, particularly to the relative low cases of dental caries and maintenance of strong teeth, are often unrecognized and/or pronounced. Some of the botanicals used as chewing sticks are now known to have a restricted occurrence in the study area where a disturbing trend of deficits of forest resources is now widely acclaimed.

At present, a gross dearth of literature on chewing sticks botanicals abounds in Nigeria. The existing few, such as El-Said *et al.* (1971), Enwogu (1974), Rotimi *et al.* (1988), Akande & Hayashi (1998), Ugoji *et al.* (2000), as well as Adekunle & Odukoya (2006), were concentrated on the antimicrobial properties of some of the botanicals while Isawumi (1978a, b, c and 1979) focused mainly on the anatomical description of some of these species. Unfortunately, all these studies had failed to consider the abundance status of the chewing stick botanicals with a view to determine the species that requires conservation and prescribe sustainable strategies for such. Thus, the study being reported here aimed to achieve these objectives.

MATERIALS AND METHODS

A combination of social surveys and direct field observations (after Lipp 1989, Kayode 2002, 2005) was used in this study, which was conducted between June 2006 and May 2007. Ekiti State (Figs. 1 and 2) was divided into three zones based on the existing political delineation (after Kayode 2004). The zones are Ekiti Central (EC), Ekiti North (EN) and Ekiti South (ES). In each zone, five rural communities that are still relatively far from urban influence were selected. The communities were, 1. Epe 2. Ipole-Iloro 3. Ido-Ile 4. Aba-Igbogun 5. Araromi-Obu 6. Eda 7. Iro-Oke 8. Aba-Oyo 9. Ogbese 10. Omi-Ogun 11. Igede 12. Itapaji 13. Ipere 14. Ifinsin and 15. Ewu. In each community, twenty respondents were randomly selected and interviewed. The interviews were conducted with a fairly open framework that allowed for focused, conversational and two-way communication (after Moinar 1989).

Also in each community, group interviews were conducted in order to determine

group consensus on the chewing sticks botanicals. Four groups, each of which consisted of five individuals were interviewed in each community. Key informants made up of health, community development and forestry officials in each zone as well as dental officials of the Ekiti State Ministry of Health were also interviewed to provide secondary information on the use of chewing sticks in the study area.

Voucher specimens of the botanicals identified as sources of chewing sticks by the respondents were collected identified and relevant information on them were documented. The specimen were later treated and deposited at the herbarium of the Department of Plant Science, University of Ado-Ekiti, Ado-Ekit, Nigeria.

The relative abundance of the identified species was determined based on the time of their being assessable when required. Thus species were classified into two groups:

- (a) Abundant Species: those that could be fetched within 6 hours of need, and
- (b) Scarce Species: those that could only be fetched after 6 hours of need.

Similarity measures between the sampling zones were determined as:

- (a) Index of Similarity (IS), according to Kayode (1999):

$$IS = 2C \times 100 / (A+B),$$

- (b) Jaccard Index (S), according to Gurevitch *et al* (2002):

$$S = C / (A+B+C),$$

- (c) Sorensen-Dice Index (S_{SD}), according to Gurevitch *et al* (2002):

$$S_{SD} = 2C / (A+B+2C),$$

- (d) Ochioi Index (S_O), according to Gurevitch *et al* (2002), $S_O =$



- (e) Asymmetrical Similarity (S_{AS}), according to Gurevitch *et al* (2002):

$$S_{AS} = B / (B + 2C).$$

Where A is the number of species in first site only, B is the number of species in second site only, and C is the number of species in both sites.

Chewing sticks acceptability tests were carried out among the urban dwellers in the study area. Five urban towns were selected in each zone and 10 urban dwellers were randomly selected from each town. The respondents were interviewed with the aid of semi-

structured matrix. The data obtained from this test was subjected to statistical analysis using the χ^2 test.

RESULTS AND DISCUSSION

A total of 49 species belonging to 26 families were identified as being used for dental and oral health care in the study area (Table 1), and the various similarity measurements (Table 2) revealed that similar plant species were being used in the three zones of the study area. Most of these species were indigenous species. The introduced species among them are *A. occidentale*, *A. indica*, *A. Juss*, *C. aurantifolia*, *D. erecta*, *H. rosa-sinensis*, *M. indica*, *P. guajava*, and *T. cacao*. The introduced species constituted 18% of the total number of the species used. Only 15 out of the 49 species, representing 31% of the botanicals were cultivated in the study area (Table 3) and these species were cultivated mainly for other uses apart from the production of chewing sticks. Thus the provision of chewing sticks was considered as being secondary and/or tertiary products from the species. The cultivated species were mostly valued for their fruits, medicine, erosion control, hedgerow and shade (Table 3).

Results from the relative abundance test revealed that 34 of the species could be described as being abundant while 15 species, which constituted 31 % of the species were scarce (Table 4). The major sources of these scarce species were the forests which were located far from the household areas. Table 5 shows the socioeconomic classification of urban respondents. All the respondents were familiar with the use of chewing sticks while 95% of the respondents confirmed having used chewing sticks before the study. Thus the use of chewing sticks cut across gender, age, educational and economic strata. The study however revealed that urban dwellers use of chewing stick species was governed by species availability, usually purchased from retailers, rather than preference.

The relatively high proportion of indigenous chewing stick species confirmed the previous assertions of Kayode *et al.*, (1997) and Kayode (2004) that in the utilization of botanicals, preference of dwellers in the study area had always been skewed towards the indigenous species rather than the exotics. This preference had been attributed to the long time familiarity with the indigenous species and their ethnobotanical utilization among the rural populace (Kayode and Kadeba 2001). Most of the indigenous species were developed from wildlings. Apart from the apparent lack of willingness to invest in tree planting due to increasing occurrence of land fragmentations and the time taken for trees to mature, there is a general lack of silvicultural knowledge of the indigenous species. Most of the indigenous

species are high light demanders hence they are poorly represented in the sapling stage of the existing secondary forests of the study area. Most of them reproduce poorly and lacked the ability to withstand environmental calamities such as burning.

All the 15 species found to be scarce in this study (Table 4) could be said to be endangered. Most of them have stems, roots and/or leaves that are used ethno medicinally. Moreover, their collection methods have been predatory and annihilative. Such methods of collection as previously observed by Homman (1994) entailed the destruction of source(s) at such a rate that regeneration has been slower than the rate of extraction. Some of the parts collected are often discarded later. The barks of roots and stems served as important sources of chewing sticks (Table 1) in most of the identified botanicals. Debarking of stems and roots had been identified as one of the highest destructive extractive technique commonly observed in Nigeria (Fasola and Egunyomi 2002). Studies by Cuningham (1988), John (1988) and Peters (1996) had revealed that debarking often kills plant species. Although most of the chewing sticks species were perennials, most, as observed by Shinwari and Khan (2000) required prolonged period of growth with considerable number of years required to reach flowering and fruiting stage, thus minimizing their regenerating possibilities. The relative regrowth capabilities of the indigenous trees and shrubs in the study area were not studied. Thus, predation and annihilation usually results in increasing scarcity of species.

Field observation during the study revealed that there is an increasing conversion of valuable natural environment to monoculture plantation of exotic timber and agriculture in the study area, thus there is the likelihood of the continued erosion of botanical diversity and the common traditional values of the 'minor forest products' such as chewing sticks. Most of the identified species were essentially rich in natural products, most of which were relatively free of side effects, thus they may become the base for the development of medicine, a natural blueprint for the development of new drugs.

In conclusion, an urgent conservation strategy should be evolved to preserve these species for the use of the present and future generations. Such strategy should encourage the domestication of botanicals identified, improve their methods of harvesting and processing, research further on the biology of the spices with the aim of providing clue to their ecology, enlighten the populace about the dangers in the loss of biological diversity, and accommodate the indigenous farmers in both planning and execution of the strategy. Also, in-situ and ex-situ conservation methods should be embarked upon. These, according to Shinwari and Khan (2000) should involve the protection of plant species in their natural habitats followed by ex-situ devices by growing important species and subsequently re-introducing them into their natural environment.

REFERENCES

- Adekunle, A. A. and Odukoya, K.A. (2006) Antifungal Activities of Ethanol and Aqueous Crude Extracts of Four Nigerian Chewing Sticks. *EthnoBotanical Leaflets* <http://www.siu/~ebl/leaflets>
- Akande, J.A. and Hayashi, Y. (1998) Potency of extract contents from selected tropical chewing sticks against *Staphylococcus aureus* and *Staphylococcus auricularis*. *World Journal of Microbiology and Biotechnology* 14: 235-238.
- Cunningham, A. B. (1988) Collection of wild plant food in Tembe Thonga Society: A guide to Iron age gathering activities? *Annals of the Natal Museum* 29(2): 433-446.
- EL-Said, F., Fadulu, S. O., Kuye, J. O. and Sofowora, E. A. (1971) Native cures in Nigeria Part II: The antimicrobial properties of the buffer extract of chewing sticks. *Lloydia* 34: 172 – 174.
- Enwowu, C.O. (1974) Socio-economic factors in the dental caries prevalence and frequency. *Nigerian Caries Research* 8:155-177.
- Fasola, T. R. and Egunyomi, A. (2002) Bark extractivism and uses of some medicinal plants. *Nigerian Journal of Botany* 15: 26-30.
- Gurevitch, J., Scheiner, S. M. and Fox, G. A. (2002) *The ecology of plants*. Sinauer Associates Inc. Publishers, Massachusetts, USA., p. 15.
- Homman, A. K. O. (1994) Plant extractivism in the Amazon: Limitations and possibilities. Pp. 34-57. In M. Ctusener -God and I. Sachs (Eds.). *Extractivism on Regional Development*, MAB Digest 18, UNESCO, Paris.
- Isawumi, M. A. (1978a) Nigerian chewing sticks. *Nigerian Field* 43 (2): 50-58.
- Isawumi, M. A. (1978b) Nigerian chewing sticks. *Nigerian Field* 43(3): 111-121.
- Isawumi, M. A. (1978c) Nigerian chewing sticks. *Nigerian Field* 43(4): 161-170.
- Isawumi, M. A. (1979) Nigerian chewing sticks. *Nigerian Field* 44: 21-28.
- Johns, A. D. (1988) Effects of 'selective' timber extraction on rainforest structure and composition and some consequences for frugivores and folivores. *Biotropica* 20: 31-37.
- Kayode, J., Ibitoye, O. A. and Olufayo, O. (1997) Private participation in taungya agroforestry in Ondo -Ekiti Region: Problems and prospects. *International Journal of Urban and Regional Affairs* 1(1): 54-57.

- Kayode, J. (1999) Phytosociological investigation of compositae weeds in abandoned farmland in Ekiti State, Nigeria. *Compositae Newsletter* 34: 62-68.
- Kayode, J. and Kadeba, O. (2001) Indigenous fuelwood tree species in rural areas of Ekiti State, Nigeria. *African Scientist* 2(4): 111-116.
- Kayode, J. (2002) Conservation and ethnobotanical exploration of compositae in Ekiti State, Nigeria. *Compositae Newsletter* 37: 79 – 83.
- Kayode, J. (2004) Conservation Perception of Endangered Tree Species by Rural Dwellers of Ekiti State, Nigeria. *Journal of Sustainable Forestry* 19(4): 1-9.
- Kayode, J. (2005) Ethno botanical survey and conservation of medicinal compositae species in Benin Kingdom, Nigeria. *Compositae Newsletter* 42: 48-54.
- Kayode, J. (2006) Conservation of indigenous medicinal botanicals in Ekiti State, Nigeria. *Journal of Zhejiang University SCIENCE-B* 7 (9): 713-718.
- Lipp, F. J. (1989) Methods of Ethno-pharmacological field work. *Journal of Ethno-pharmacology* 25: 139-150.
- Molnar, A. (1989) *Community Forestry: A rapid appraisal*. FAO. Rome, p. 60.
- Peters, C. M. (1996) Observations on the sustainable exploitation of non-timber tropical forest products: An ecologist's perspective. Pp. 19-41. In M. Ruiz-Perez and J. E. M. Arnold (Eds.), *Current issues in non -timber forest products research*, CIFOR-ODA, Rogor Camp Workshop.
- Rotimi, V.O., Laughon, B.E., Bartlett, J.G. and Mosadomi, H.A. (1988). Activities of Nigerian chewing sticks extracts against bacteriodes -gingivalis and bacteriodes-melaninogenicus. *Antimicrobiological Agents and Chemotherapy* 32(4): 598-600.
- Shinwari, M. I. and Khan, M. A. (2000) Folk use of medicinal herbs of Magalla Hills National Park, Islamabad. *Journal of Ethnopharmacology* 69: 45-56.
- Ugoji, E, Egwari, L. O. and Obisesan, B. (2000) Antibacterial activities of aqueous extracts of ten African chewing sticks on oral pathogens. *Nig. Journal of Internal medicine* 3(1): s7-11.

Table 1. List of chewing sticks botanicals in Ekiti State, Nigeria.

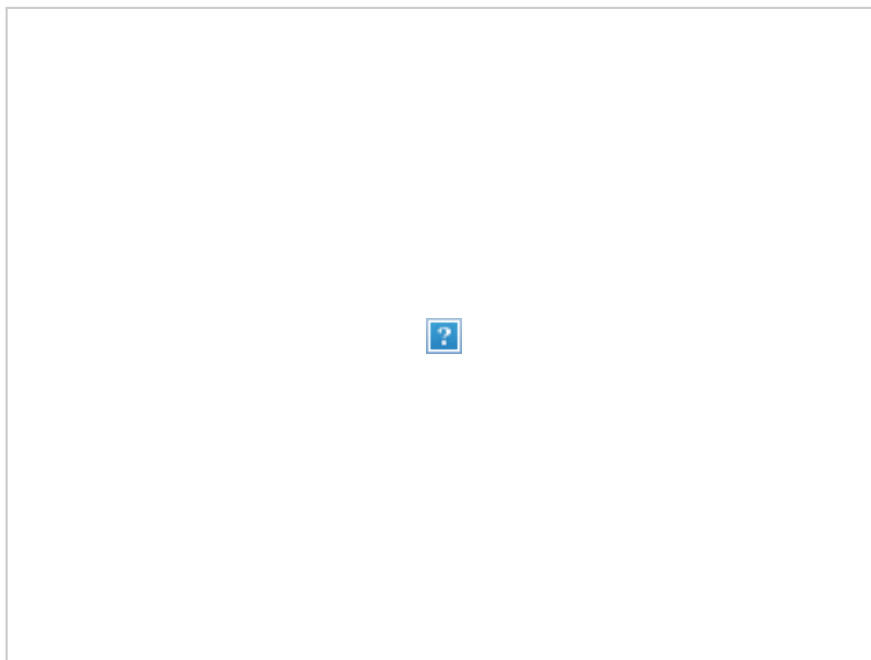
S/N	Local Name	Botanical Name	Family	Part Used
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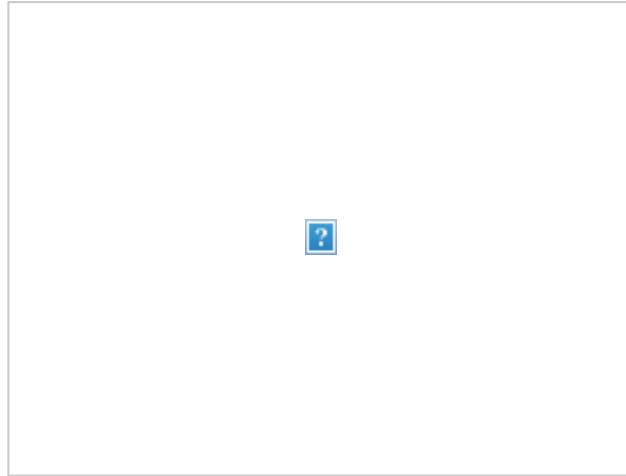
1.	Adodo yelo	<i>Duranta erecta</i>	Verbenaceae	stem
2.	Afefe	<i>Trema orientalis</i>	Ulmaceae	stem
3	Agunmaniye	<i>Gliricidia sepium</i>	Fabaceae	stem
4	Ahuun	<i>Alstonia boonei</i>	Apocynaceae	stem
5	Ajekobale	<i>Croton zambesicus</i>	Euphorbiaceae	stem
6	Akomu	<i>Pycnanthus angolensis</i>	Myristicaceae	stem
7	Aliofero	<i>Aloe vera</i>	Asphodelaceae	stem
8	Arusa	<i>Bridelia micrantha</i>	Euphorbiaceae	stem
9	Arumu	<i>Cynometra vogelii</i>	Caesalpiniaceae	stem
10.	Arunje	<i>Harungana madagascariensis</i>	Clusiaceae	stem
11	Ata	<i>Capsicum annum</i>	Solanaceae	stem
12	Atampara	<i>Phaulopsis imbricata</i>	Acanthaceae	stem
13	Atori	<i>Glyhaea brevis</i>	Tiliaceae	stem
14	Ayin	<i>Anogeissus leiocarpus</i>	Combretaceae	stem
15.	Dongoyaro	<i>Azadirachta indica</i>	Meliaceae	stem
16.	Efirin	<i>Ocimum gratissimum</i>	Asteraceae	stem
17	Egun eja	<i>Diospyros monbuttensis</i>	Ebenaceae	stem
18	Eesin	<i>Alchornea cordifolia</i>	Euphorbiaceae	stem
19	Ewuro	<i>Vernonia amygdalina</i>	Asteraceae	stem/roots
20.	Ogege	<i>Jatropha multifida</i>	Euphorbiaceae	stem
21.	Guafa	<i>Psidium guajava</i>	Malvaceae	stem
22.	Hibisicosi	<i>Hibiscus rosa-sinensis</i>	Malvaceae	stem
23.	Ifon	<i>Olex subscorpoidea</i>	Olacaceae	stem
24.	Isin eye	<i>Blighia sapida</i>	Sapindaceae	stem
25.	Iseketu	<i>Sida acuta</i>	Malvaceae	stem

26. Ito	<i>Milletia thonningii</i>	Fabaceae	stem
27. Iya / pepe	<i>Alchornea laxiflora</i>	Euphorbiaceae	stem
28. Iyeree	<i>Zanthoxylum xanthoxyoides</i>	Rutaceae	stem/root
29. Kaju	<i>Anacardium occidentale</i>	Anacardiaceae	stem
30. Kasia	<i>Senna siamea</i>	Fabaceae	stem
31. Koko	<i>Theobroma cacao</i>	Sterculiaceae	root
32. Lapalapa funfun	<i>Jatropha curcas</i>	Euphorbiaceae	stem
33. Lapalapa pupa	<i>Jatropha gossypifolia</i>	Euphorbiaceae	stem
34. Mangoro	<i>Mangifera indica</i>	Anacardiaceae	stem
35. Ogan	<i>Combretum racemosum</i>	Combretaceae	stem
36. Ogbase	<i>Sarcocephalus latifolius</i>	Rubiaceae	stem
37. Okuta	<i>Garcinia mannii</i>	Clusiaceae	stem
38. Orogbo	<i>Garcinia kola</i>	Clusiaceae	stem
39. Orombo lemonu	<i>Citrus aurantifolia</i>	Rutaceae	stem
40. Orokoro	<i>Mallotus oppositifolius</i>	Euphorbiaceae	stem
41. Otomporo	<i>Sida corymbosa</i>	Sterculiaceae	stem
42. Otupe	<i>Carpolobia lutea</i>	Polygalaceae	stem
43. Pako-Ijebu	<i>Massularia acuminata</i>	Rubiaceae	stem
44. Piao	<i>Persea gratissima</i>	Lauraceae	stem
45. Udi	<i>Termilia schimperiana</i>	Combretaceae	stem
46. Uoo	<i>Buchholziia coriacea</i>	Capparaceae	stem
47. Ule	<i>Calliandra portoricensis</i>	Fabaceae	stem
48. Ura	<i>Bridelia ferruginea</i>	Euphorbiaceae	stem
49. Ure	<i>Clerodendrum buchholzii</i>	Verbenaceae	stem

Table 2. Similarity measures on the occurrence of tree flora in the three zones of the study area.

Zones	ES(%)	S_J	S_{SD}	S_O	S_{AS}
EN-EC	87	3.03	0.47	2.08	3.33
EN-ES	100	3.33	0.50	2.45	3.33
EC-ES	87	3.03	0.47	2.08	3.33

**Fig: 1:** Map of Nigeria showing Ekiti State of Nigeria.



KEY: X: Ekiti Central , Y: Ekiti South, Z: Ekiti North.

Fig. 2: Map of Ekiti State Showing the study sites used.

Table 3. List of cultivated chewing sticks botanicals in Ekiti State, Nigeria.

Species	Major products obtainable from cultivation
<i>A. occidentale</i>	Fruits and medicine
<i>A. indica</i>	Medicine and wind control
<i>A. vera</i>	Medicine
<i>C. annuum</i>	Fruits
<i>C. aurantifolia</i>	Fruits
<i>G. sepium</i>	Yam Stakes, fuel wood, fodder, wind control
<i>H. rosa-sinensis</i>	Ornamental
<i>J. curcas</i>	Boundary and erosion control
<i>J. gossypifolia</i>	Boundary and erosion control
<i>J. multifida</i>	Boundary and erosion control
<i>M. indica</i>	Fruits and medicine
<i>P. gratissima</i>	Fruits

<i>S. siamea</i>	Wind control and shade
<i>T. cacao</i>	Fruits
<i>V. amygdalina</i>	Leafy vegetable and medicine

Table 4. List of scarce chewing sticks species in Ekiti State, Nigeria.

Species	Other major folk products obtainable from the species
<i>A. boonei</i>	Timber, Medicine form its leaves, stem and roots
<i>A. leiocarpus</i>	Timber, Medicine from its stems and seeds
<i>B. ferruginea</i>	Medicine from its roots, stems and leaves
<i>C. buchnoizii</i>	Medicine form its leaves and roots
<i>C. zambesicus</i>	Medicine form its stem, roots and leaves
<i>G. kola</i>	Edible fruits. Medicine from its stem, roots and leaves
<i>G. mannii</i>	Medicine from its stem and roots
<i>H. madagascariensis</i>	Medicine from its stem and roots
<i>M. acuminata</i>	Medicine from its stem and roots
<i>M. thonngii</i>	Medicine from its stem and roots
<i>O. subscorpoidea</i>	Medicine from its stem, roots and leaves
<i>P. imbricata</i>	Medicine from its stem
<i>P. angolensis</i>	Timber, Medicine from its stem, roots and leaves
<i>T. orientalis</i>	Medicine from its stem and leaves
<i>Z. xanthoxyoides</i>	Medicine from its stem and roots

Table 5. Socio-economic classification of respondents' urban dwellers in Ekiti State, Nigeria.

Feature	Description	% of Respondents			
		EN	ES	EC	AVERAGE TOTAL
SEX	Male	35	30	32	32.0%
	Female	65	70	68	68%
AGE	Less than 10years	2	1	2	2%
	Between 1-50 years	30	28	33	31%
	Above 50 years	68	71	66	68%
LITERACY STATUS	Literate	60	36	38	38%
	Illiterate	60	64	62	63%
ECONOMIC STATUS	Small	42	40	41	41%
	Medium	30	33	30	31%
	Large	28	27	29	28%