

# Situational analysis and promotion of the cultivation and utilisation of the *Moringa oleifera* tree in selected sub-Saharan Africa countries

H M Kwaambwa<sup>1</sup>, L Chimuka<sup>2</sup>, M Kandawa-Schulz<sup>3</sup>, N M Munkombwe<sup>4</sup>, and J M Thwala<sup>5</sup>

<sup>1</sup> Polytechnic of Namibia, School of Health and Applied Sciences, Windhoek, Namibia,

<sup>2</sup> School of Chemistry, University of the Witwatersrand, Johannesburg, South Africa.

<sup>3</sup> University of Namibia, Faculty of Science, Windhoek, Namibia

<sup>4</sup> University of Zambia, Chemistry Department, Lusaka, Zambia

<sup>5</sup> University of Swaziland, Chemistry Department, Kwaluseni, Swaziland

\* Author to whom all correspondence should be addressed to: Tel: +264 61 2072583, Fax: +264 61 207 2442, Email: [hkwaambwa@polytechnic.edu.na](mailto:hkwaambwa@polytechnic.edu.na), [hmkwaambwa@yahoo.com](mailto:hmkwaambwa@yahoo.com)

## Abstract

Malnutrition, poverty and lack of safe drinking water and sanitation are serious problems in developing countries, especially sub-Saharan Africa. The *Moringa oleifera* (MO) tree could be the solution to these problems due to its medicinal, nutritional and water purification. The aim of the study was to assess and promote the cultivation and utilisation of the MO in 5 SADC countries namely Botswana, Namibia, South Africa, Swaziland and Zambia. The study was done between September 2010 and March 2011. It was found that the tree is generally used for nutritional and medicinal purposes except in Namibia where another species is found. The prices of the products vary from country-to-country. The information about the benefits of the MO was well received although a lot still needs to be done in order to benefit from this sustainable resource.

**Keywords:** HIV/AIDS, Malnutrition, Leaf powder, *Moringa ovalifolia*, *Moringa oleifera*, Nutrition, Poverty

## Introduction

Malnutrition is a major factor in the often high rates of infant mortality in the tropics and sub-tropics. In the poorest countries, as many as one child in five dies during infancy. Worldwide it is estimated that seven million people die each year from hunger-related causes, and the vast majority of these deaths are caused by chronic under nourishment. According to the SADC international conference on poverty and development held in Pailles, Mauritius, in 2008 [1], the region should not experience the ills of poverty and/or lack behind in development because it is endowed in natural resources. Approximately 45% of the total population lives on 1 US\$ per day. Malnutrition ranges from 44% to 72% across the region with an average of 36.1%. Life expectancy has been declining over the years from about 60 years to slightly below 40 years as of 2008. Infant mortality rates remain for most countries in the SADC region above 50 per 100 births. The above figures reflect the gravity of the poverty situation in the region.

Poverty is complex and takes a variety of forms, it is characterised by lack of income, lack of access to means of production and livelihood systems and general deprivation and exclusion arising from socio-political and socio-cultural circumstances. Overall poverty is due to a lack of opportunities to make choices and utilize one's potential to its maximum. Considerable investments have been made by governments and aid agencies in programs designed to prevent *malnutrition, poverty and lack of safe drinking water and sanitation* (World Bank [2], 2007). For instance, approaches to prevent malnutrition have included school lunch programs, nutrition education, introducing exotic vegetables, and even campaigns to periodically give children massive doses of vitamin A. A major drawback to these approaches is the dependence on imported solutions and outside personnel, and progress can quickly dissipate once the program funding dries up.

While successfully treating malnutrition is good, preventing it is much better. Malnutrition is brought on by a multitude of causes: lack of education, poverty, famine, parasites and impure drinking water are but some of them. A program which focuses on correcting micro-nutrient deficiencies alone

will not fully eradicate malnutrition until these other causes are addressed. With poverty and recurrent food shortages a fact of life in the SADC region, we therefore believe that we must explore alternative cost effective, accessible and affordable therapies that can improve health and well being and prolong lives of people infected with HIV and AIDS. To lead a healthier life, all people, whether HIV-infected or not, need to meet their daily energy, protein and micronutrient requirements by eating a variety of foods. Maintaining good nutritional status helps to build and support the immune system, allowing the body to fight infection.

Furthermore, there is an undeniable link between water quality and HIV and AIDS. HIV infection has reached epidemic proportions. The HIV and AIDS epidemic poses an inescapable challenge to the world at large and to Africa in particular. According to the Joint United Nations Programme on HIV and AIDS (UNAIDS), AIDS has killed more than 25 million people since it was first recognised on 1 December 1981, making it one of the most destructive pandemics in recorded history [3]. According to estimates from the UNAIDS 2010 AIDS Epidemic Update, around 30.8 million adults and 2.5 million children were living with HIV at the end of 2009 [4]. According the report, some 2.6 million people became infected with HIV, including an estimated 370,000 children during 2009. Most of these children are babies born to women with HIV, who acquire the virus during pregnancy, labour, or through breast milk. Drugs are available to minimise the dangers of mother-to-child HIV transmission (MTCT), but these are still often not reaching the places where they are most needed. Women are particularly affected by HIV in sub-Saharan Africa. Southern Africa accounts for around 40% of the global total of women living with HIV. While the epidemic seems to have stabilised in many parts of the region, a significant proportion of people are living with the disease. HIV strikes across lines of race, gender and social standing, however, informal settlements have been shown to have the highest incidence of HIV. AIDS may not be a water-related disease, and HIV is not spread via contaminated water or poor hygiene. Yet there is a more important link between HIV and AIDS and water than people realise. Easy access to safe and sufficient water and sanitation is indispensable for people living with HIV and AIDS (PLWHA). Diarrhoea

and skin diseases are among the most common opportunistic infections in people living with the disease. For some patients, diarrhoea can become chronic, weakening them even more. In order for HIV-infected people to remain healthy as long as possible and for people with AIDS to reduce their chances of getting diarrhoea and skin diseases, clean and adequate water supply and sanitation facilities are of the utmost importance, especially if people do not have access to antiretroviral (ARVs) treatment. Clean water is also needed to take medicines. Good-quality water is also crucial for HIV-positive mothers who cannot breast feed their babies for fear of infecting them. Unsafe water used in infants feed increases the risk of diarrhoeal diseases and infant mortality. Clean water is needed to bath patients and for washing soiled clothing and linen. Finally, water is needed to keep the house environment and toilet clean in order to reduce the risk of opportunistic infections.

Persons living with AIDS are susceptible to many types of illness from food-borne pathogens. A massive effort is needed to cushion the impact of the epidemic, and nutritional care and support should be integral elements of any action taken. An evidence-based response is required to alleviate the overall burden of malnutrition and to reduce the severity and complexity of the impact that HIV and AIDS and malnutrition have on each other. Good nutrition is important in tackling HIV and AIDS.

The *Moringa oleifera* (MO) tree, or “miracle tree” as it is sometimes called, could be the solution to the developing world problems of nutrition, water quality and poverty discussed above. The MO is a tropical plant belonging to the genus Moringaceae. It grows rapidly even in marginal soils, demands little or no horticultural attention and possess a hardness that enables it to survive prolonged periods of drought. The tree is native of northern India, but is now widely cultivated throughout the tropics and is found in many countries of Africa including some SADC countries. It is a multipurpose tree with most of its parts being useful for medicinal and commercial applications in addition to its nutritional value and water treatment (see Table 1) (Ramachandran [5], Morton [6], Markar [7], Fuglie [8,9], Rickter

[10], Fahey [11]. Table 2 shows the nutritional content of fresh and dry leaves whereas Table 3 shows a gram-for-gram comparison in some nutrients composition of fresh and dried leaves to other foodstuffs. Clearly the MO is more potent than most foods.

The MO project approach has shown, for instance in many regions e.g. in south-western Senegal, very impressive results in reducing the incidence of malnutrition. A major advantage of MO is the fact that it is a local resource. This contrasts with many of the ongoing programs designed to fight malnutrition which depend on imported products and outside donor support.

Treatment of water to render it fit for human consumption is an immense challenge in all countries. In developing countries, the quality of drinking water is often hazardous to human health. Studies have identified that a protein extract from MO seeds is an effective flocculent/coagulant to aid purification and, as mentioned above, can replace aluminum and iron salts, and synthetic polymers that are commonly used but can be hazardous to health. For example, Alzheimer's disease and similar-health related problems have been associated with residual aluminum in treated water. The protein, apart from being non-toxic, has further great advantages because it is entirely biodegradable, it has significantly reduced volume of sludge and has no effect on the pH and conductivity of the water. Furthermore, there are useful products extracted from its seeds. The residual solids can be used as animal feed and fertiliser and the shell of the seed can be activated and used as an adsorbent. Ultimately, the coagulant protein for water treatment is obtained at extremely low or zero cost.

In this paper we report on the situational analysis and promotion of the cultivation and utilization of the MO tree as a sustainable intervention to address malnutrition, poverty, and safe drinking water and sanitation problems in five sub-Saharan Africa countries carried out from September 2010 to March 2011. The aim of the overall study was to assess how the nutritional, medicinal and water purification properties of the MO tree are used and can be used/promoted to mitigate the problems of HIV and AIDS,

and poverty in selected SADC countries. The study was to be used to further assess the status of the prevailing conditions in the target areas, capture and establish some current qualitative and quantitative data for specific indicators against which data collected in the future will be compared to so as to measure progress and impact of MO tree utilisation in solving the above-mentioned problems.

Table 1: MO plant parts and their benefits

<b>Tree part</b>	<b>Uses or benefits</b>
Leaves	Nutritional, medicinal, biomass, plant growth hormone, forage
Flowers	Nutritional, medicinal, honey
Pods	Nutritional, medicinal
Bark	Medicinal, rope making, gum for turning hides
Roots	Medicinal
Gum	Medicinal
Wood	Paper, animal feed, medicinal, alcohol production
Seeds	Water treatment, food, cosmetics, cooking oil, lubricant

Table 2: Mean nutritional values of 100 g of MO fresh leaves and leaf powder

	Amount in Fresh leaves	Amount in Leaf powder
Dry matter	20-25%	90-95%
Proteins	2-3 g	20-26 g
Total ash (= total minerals)		8-11 g

<b>Minerals</b>		
Calcium (Ca)	350-550 mg	1600-2200 mg
Potassium (K)	200-500 mg	800-1800 mg
Magnesium (Mg)	80-120 mg	350-500 mg
Phosphorus (P)	50-120 mg	200-600 mg
Iron (Fe)	5-8 mg	18-28 mg
Manganese (Mn)	1.2-1.5 mg	5-9 mg
Zinc (Zn)	0.4-0.6 mg	1.5-3 mg
Copper (Cu)	0.2-0.3 mg	0.7-1.1 mg
<b>Vitamins</b>		
Vitamin C	120-200 mg	15-100 mg
Vitamin A (as b-carotene)	1500-4000 mg eq. retinol	4000-8000 mg eq. retinol
Vitamin E (as a-tocopherol)	150-200 mg	80-150 mg

Table 3: Comparison of some nutrients composition of the fresh and dried leaves of MO with other foodstuff

Nutrient in foodstuff	<b>Fresh Leaves</b> Gram for gram, fresh leaves contain about:	<b>Dried leaf powder</b> Gram for gram, fresh leaves contain about:
Vitamin A of carrots	4 times	10 times
Vitamin C of oranges	7 times	$\frac{1}{2}$ times
Calcium of milk	4 times	17 times
Potassium of bananas	3 times	15 times
Iron of spinach	$\frac{3}{4}$ times	25 times
Protein of yogurt	2 times	9 times

## **Methodology**

### **Study Design/Approach**

The first step of the study involved a literature review of the available information about the benefits of MO and how it is or has been used in alleviating problems of malnutrition for PLWHA and children, poverty, water treatment problems and treatment of certain ailments/diseases. The situational analysis included determining the present cultivation methods, the uses of the plant in the region by indigenous folk (either as food, medicinal uses or as fodder), the distribution and cultivars of the each in each country, the non-governmental organisations and government agencies involved in promoting or which are able to promote the cultivation and utilisation of MO to mitigate malnutrition. Other uses would be to address issues of poverty, safe drinking water, sanitation, and the marketing of the MO products in the region. Questionnaires, interviews, field surveys, pamphlet and workshops on MO cultivation and utilisation were used as research and teaching tools. Questionnaires were designed in order to obtain qualitative and quantitative data.

The language barrier was identified to be a possible constraint in the communities where the study was carried out. Most of the respondents in the traditional community could not communicate in English and for this reason translators or research consultants were engaged. In some cases, the questionnaire and brochure were translated into local languages to make sure the participants understood the content on their own.

### **Selected Countries**

The selected SADC countries were Botswana, Namibia, South Africa, Swaziland and Zambia. Only five countries were chosen due to the short timeframe available to carry out the study. It was assumed that this was a representative enough sample of SADC countries that could provide sufficient information of how the problems of malnutrition, poverty, safe drinking water and sanitation in the whole of SADC region can be mitigated by the MO tree.



## Sampling

The sampling varied from country to country for a number of reasons. For instance, workshops were held only in Botswana, Swaziland and Zambia. The study areas varied considerably in terms of population such that it was not possible to have uniform sample sizes. The details of the sampling procedures done in each participating country are described in section 4.4 below.

## Data collection/Teaching

Questionnaires, interviews, field surveys, pamphlet and workshops on MO cultivation and utilisation were used as data collection and teaching tools in all five countries with slight variations. For instance, in South Africa and Namibia workshops were not done as much as in other countries. In these two countries the emphasis was to be on situational analysis of the cultivation and utilisation of Moringa. South Africa is quite vast such that identification and organisation of workshops would have been highly complicated due to the way rural communities are organised; whereas the 3 countries where workshops were held have similar community settings thereby making comparisons possible. In South Africa, a workshop and questionnaire survey were conducted at the community of Atteridgeville informal settlement situated west of Pretoria. Two visits were made also to a Moringa farmer in Tooseng village in Limpopo province who is a major supplier of Moringa products (i.e. seeds, seedlings, leaf powder and oil). The first visit was to gather information about the cultivation method used, products sold and names of other MO farmers known countrywide. The second trip was with community leaders from the Atteridgeville informal settlement for them to learn the cultivation and processing of MO products. Namibia has another type of species of the Moringa family called *Moringa ovalifolia* and the study areas visited has only this type of species. This type is unique to this country and not much is known about its cultivation. The tree is readily available in the north-west of Namibia. A forest of Moringa known as Sprokiewoud, or the Phantom Wood, near Okaukuejo in the Etosha Game Reserve, is the tree's best-known setting in Namibia. It is on this basis that the study

in Namibia was slightly different from the other 4 countries which have the MO. So, in addition to the above, the study in Namibia which was mainly a survey on the biodiversity of the *Moringa ovalifolia* in the country focused on the determination of the cultivation methods, if any, and on the assessment the possibilities of domestication and gather information on indigenous knowledge (planting, use, marketing, selling) about the *Moringa ovalifolia*. The study is important in that comparisons with the MO can be done in future studies in terms of the potential of the two species in nutritional benefits and water purification properties.



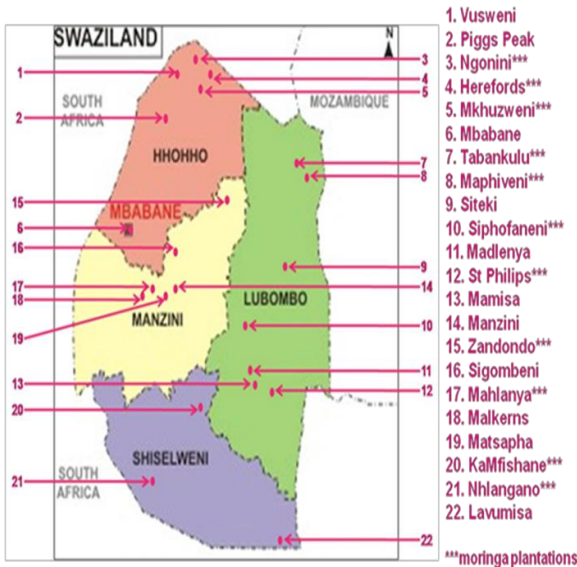
Questionnaires were designed in order to obtain qualitative and quantitative data. Some of the questions were used to obtain information on what participants know about MO and what strategies are used by communities to tackle health and nutritional challenges. From the questionnaires, an analysis of Moringa cultivation and distribution was done. The brochure on Moringa

gave information about some of the nutritional benefits, the cultivation from seeds, the water treatment and the processing of leaves for leaf powder for consumption. The workshops were used to explain the content of the brochure and distribute seeds and seedlings. The seeds for distribution were purchased from individuals with Moringa trees in Botswana, South Africa and Zambia. The seedlings for distribution were either cultivated from seeds purchased or purchased from local growers. In Botswana, the workshops were mostly held at both high schools and communities whereas in Swaziland and Zambia workshops were held in communities in rural areas. In Botswana and Swaziland the brochure was translated into a local language. Questionnaires were either collected after the workshop or participants were allowed to take them home to complete and were then collected by the project research assistants. The areas/regions/schools where the workshops were held are given in Table 4. Figure 1 shows the maps of Botswana and Swaziland indicating the locations of the study areas.

Table 4: Workshop centres and areas of study in different countries (SSS: Senior Secondary School; CJSS: Community-aided Junior Secondary School)

<b>Botswana</b>	<b>Namibia</b>	<b>South Africa</b>	<b>Swaziland</b>	<b>Zambia</b>
Ghanzi SSS, Shakawe CJSS, Gaborone SSS, St Joseph's College (Gaborone), Motswakhumo CJSS(Lentsweleta), Lentsweletau Kgotla, Ipelegeng CJSS, Kopong Kgotla, Motswasele CJSS(Molepolole), Mogoditshane CJSS(Gaborone), Motswedi CJSS(Gaborone)	Tsiseb Conservancy, Doro !Nawas Conservancy, Kamanjab, Okaukuejo (Etosha National Park), Halali (Etosha N. Park)	Atteridgeville	Hhohho, Lubombo, Manzini and Shiselweni	Mbabala (20 km from Choma town), Sipatunyana (40 km from Kalomo town)

Swaziland (22 local communities) showing the locations of the study areas.



### Ethical Considerations

Contact was made through, and permission was granted via local and tribal authorities. In Botswana, for instance, the contact persons in schools were the headmasters or deputy headmasters and in villages it was the chiefs. A letter of introduction was written and signed by the supervisor of this study for the research assistants distributing questionnaires. Included in the letter was an explanation of the kind of research that was being conducted and why it was necessary to conduct this research. A similar caption was included in the questionnaire. Furthermore participants were assured of the confidentiality of their taking part in the study. The participants in the questionnaire were assured that the interview was voluntary and the information provided would strictly be confidential and anonymity would be respected by the study team. All participants therefore participated willingly.

### Results and Discussion

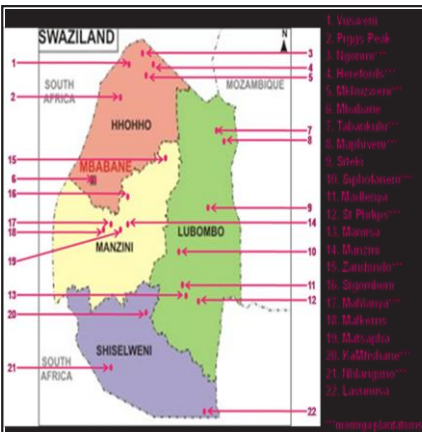
#### Knowledge and knowledge gaps about Moringa

The results obtained about the knowledge of Moringa in the SADC region reveal



that the plant is generally known although the percentages are quite low. However, because of no coordinated efforts taking place to increase knowledge

gaps in each country studied, the study found that the actual usage is quite low. In Swaziland, for instance, from a total of 565 interviewees in 22 communities from the four regions, 95 (16%) have seen a Moringa tree and out of these only 50 people (10.4%) use it as a food, fodder or for water treatment. Another group of 36 people (6.4%) have heard about it but do not use it. The use in water purification, however, is not very well known as only 2 respondents out of 565 use it to clean their drinking water. Moringa farmers were also interviewed about the different cultivation methods employed in Swaziland. Moringa is mainly cultivated from seeds which are imported from India and Mozambique. Very few plants are grown from branch cuttings. Two cultivars of tree/plant were identified viz: MO (which is the common cultivar) and *M. stenopetala* (identified from two farmers).



The part of the study conducted in Botswana found that out of the 349 questionnaires distributed in 22 communities and schools, 62% (218) of the respondents indicated knowledge of Moringa (Figure 2). From the responses, people are generally aware of the tree through a television program that was shown just before the study period, hearing from neighbours and from government Forestry departments.

People are also aware of the nutritional and medicinal benefits of the tree although there are serious misconceptions as to what it can do. Most of the claims such as cure for HIV and AIDS are misleading because they have not been scientifically proven. However, no respondents use the tree for water treatment although only one respondent had heard of its water treatment properties.

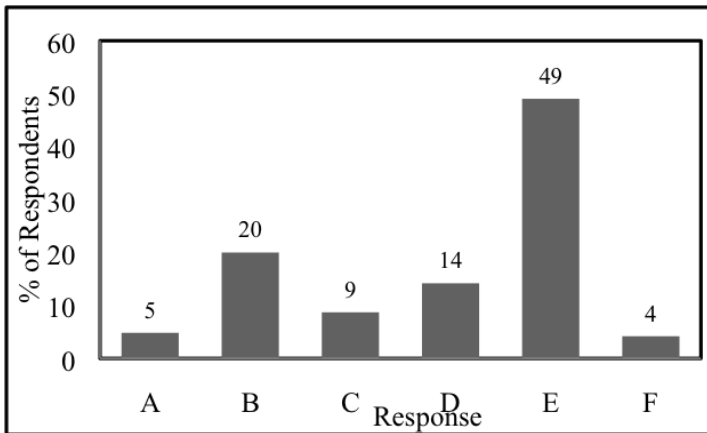


Figure 2: The percentage of respondents out of 310 in Botswana indicating where they had seen or heard about MO tree (A = Saw it in the wild; B = Grown within our community; C = Saw it at a community training; D = Have it at home in our yard or farm; E = Never heard or seen it before; F = Other).

The results of the interviewees at the three settlements in Namibia revealed that all participants had seen *M. ovalifolia* tree before in the wild. None of the respondents reported growing the tree. With regards to water treatment, all three communities make use of tap water for drinking, and therefore do not treat water on their own. The roots of the tree are used to relieve chest pain. They dig out the roots, crush them, boil them and drink the water. The pulp of the tree is used to treat women after giving birth. 90% of respondents from Okaukuejo reported that the tree was useful during rainy season, whereby people drink the water trapped at the junction of the tree trunk. Although all respondents at Halali indicated to have seen the tree, none of them knew or had heard of the uses of the tree.

Although the sample size in the Zambian study was small, most participants (79%) knew about the Moringa plant while 75% had seen the plant within their communities, and 75% had heard about its uses. All participants from Sipatunyana had a vernacular name for it as *Zakalanda*. Only one participant had a tree at home and it was grown from a branch cutting. Participants also indicated that their previous experience of growing Moringa was by Care International, World Vision and DAPP from which they had only received verbal instructions on the plant.

No detailed study through questionnaires was conducted in South Africa. Only one study was done to a total of 30 people in Atteridgeville community, west of Pretoria. Prior to this study, none of the interviewees from this group had heard, used or seen the Moringa tree. Most of the knowledge dissemination about Moringa in the country, especially in Limpopo Province, had been through the Lammangata Moringa project. Lammangata Moringa was officially launched in March 2009 in the rural area of GaMphahlele, Limpopo, with the aim of harnessing the nutritional and healing power of the Moringa tree to stem malnutrition and alleviate food insecurity in economically disadvantaged communities in South Africa. Thus far, over 500 families and child-care projects have received their own Moringa seedling. Despite these efforts, knowledge on Moringa is still low/scanty as seen from the study carried with Atteridgeville community. More information on dissemination is needed especially using community radio stations and workshops as these directly reach those less advantaged. The obtained results cannot represent a national picture as more detailed survey is needed. However, the findings/results could correctly reflect in other parts of the country where most of the communities are uneducated and have no access to media such as TV and newspapers.

### **Moringa distribution**

The study carried out revealed that Moringa is being grown in various parts of these countries. In South Africa, it is only recently that Moringa growing started whereas in other countries it has been going on for much longer. Hence, in Botswana, Swaziland and Zambia much bigger MO plants are found countrywide. Namibia has been endowed with another species called

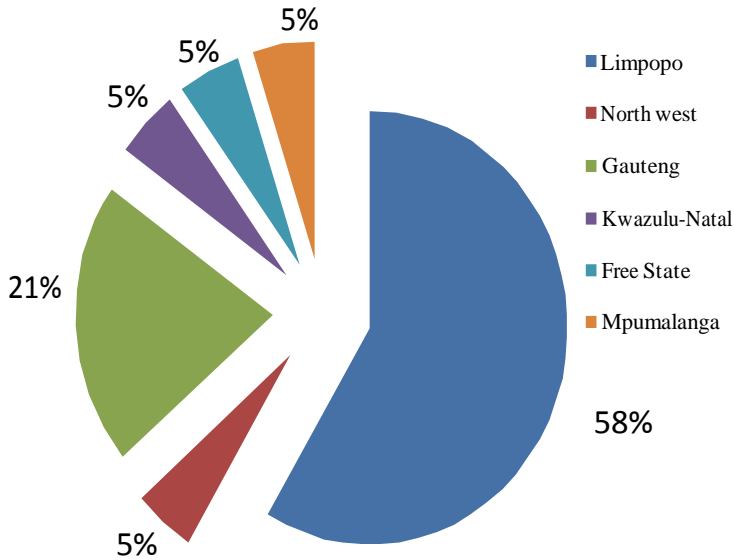
*M. ovalifolia* which has existed for decades in selected areas. The distribution of Moringa in each individual country differs with Swaziland perhaps having the highest distribution numbers per square km.

The Swaziland study found that from the twenty two areas surveyed, Moringa plantations were found in 13 areas (59%). Out of these, areas of success in cultivation for seed production are located in the dry Lowveld (eastern part of the country) and the midlevel. The Highveld (the western part of Swaziland) is characterised by wet summer conditions and very cold winters) is not suitable for Moringa growth, only one plantation was identified in this region. These trees are also planted in shaded houses due to the cold and very wet conditions.

A study of the distribution of Moringa tree among small scale farmers in South Africa identified 18 farmers with more than 100 plants. Limpopo province is leading the way with 58% farmers followed by Gauteng at 21% (Figure 8). Other provinces such as Northern Cape, Western Cape and Eastern Cape are not listed as no data was available. The results in Figure 3 are not surprising because Moringa cultivation in the country is relatively new. MO has been identified as the only variety being grown. The major player in the cultivation and distribution is the Lammangata Moringa project which has sold over 3700 seedlings countrywide. This explains why Limpopo has the highest distribution. The spreading of Moringa cultivation to other provinces has happened within the past one year. It will be therefore interesting to see how Moringa trees will perform in the long run because of variations mostly in weather. However, the current distribution is encouraging and hopefully Moringa will be found in every corner of the country.



Figure 3: The distribution of Moringa in South Africa.



In Botswana the Moringa seems to be found sparsely all over the country. It is interesting that not all the people interviewed who have the tree(s) at their homes know about its nutritional and medicinal benefits. There is quite a sizeable number of farmers and individuals who know about its benefits. Another interesting observation, especially in Gaborone is that most the homes where the tree was found are either occupied by residents of Indian origin or that home had previously been occupied by residents of Indian origin. This is because they are aware of and knowledgeable of the tree's benefits from their country of origin where the Moringa is known to have originated. The government Forestry departments across the country have been distributing and selling the MO and other (mainly fruit) plants

(e.g. Pommer granate, Paw Paw, Palm tree, Hen & Chicken, Kurra jong, Mango, Thuja, Duranta, Peach, Ficus Benjamin, Guava, Fig, Honey suckle, Jacaranda, Purple heart, Hibiscus, Bauhanian, Bouganvelliia, Apple, Naarjies, etc.). At the moment, there is no NGO which is solely involved

in promoting the utilisation of the Moringa products as the case in other countries such as South Africa, Zambia and Swaziland. The exception is the National Agency for the Control of AIDS (NACA) which in 2011 also started to distribute medicinal and nutritional plants including MO to communities in Botswana.

The Botswana College of Agriculture (BCA) was in the past to conduct research into the growing of Moringa plant species from different countries but this project stalled when the expatriate lead researcher left the country 4 years ago. One farmer in Mahalapye who is a medical doctor has a plantation of over 200 trees and has been selling leaf powder and seed oil until a year or so ago when his interest shifted to growing the *Jatropha* tree. All these institutions have in one way or another contributed to the distribution of Moringa trees countrywide.

*M. ovalifolia* (also known as Phantom or Ghost tree), which is the main Moringa species in Namibia, is restricted in its distribution in the wild in the north-western half of the country where it mainly grows on rocky hills (see Figure 4). This tree is widely spread in Namibia e.g.

- singly scattered on dry rocky slopes along the edge of the Namib from southern Angola to the vicinity of the Helmeringhausen and reaching as far east as Grootfontein.
- a few young Moringa trees very near to and east of the B1 just south of Tsumeb.
- along the extension of B1 where it leads into Tsumeb (where they have been successfully planted).
- on the two dolomite hills near Halali in Etosha.
- well-known “Sprokieswoud” or ‘enchanted forest to the west of Okaukuejo.
- growing naturally on two hills on the Moringa Safari Farm about 60 km from Okahandja to Karibib on a D2156 route. The farm claims to have about 630 Moringa trees.

The tree is reported to grow easily from a seed, and can be transplanted easily. The data about the distribution of this species was obtained through the senior curator (a taxonomist) of the National Herbarium and by contacting relevant officials and researchers working in different regions. The areas where specimens of *M. ovalifolia* were collected have been identified. As mentioned earlier, the distribution of Moringa trees along the western half of the country means that most of these areas are in the desert where there are no people living there. The sites presented in Table 4 above were selected based on availability of nearby local communities, records of collections from these areas (National Herbarium), and information obtained from key people contacted.

The MO is found and/or grown in many parts of Zambia. Commercial farmers are growing the tree on the Copperbelt, and in/around Mkushi and Lusaka. In nearly all provinces, the villagers are encouraged by NGOs (DAPP and HOPE) to have these trees in their backyards. Christian organizations that care for the sick also grow it. The distribution in Zambia, hence, is as follows: Central Province in the Kapiri Mposhi area; Copperbelt – introduced by an organization called National Institute for Scientific and Industrial Research (NISIR); Luapula Province – introduced by Sisters of Mercy in 1998; Lusaka – Grown by NISIR and local farmers; North Western Province in the Kabompo area; and Eastern province in the Chipata.

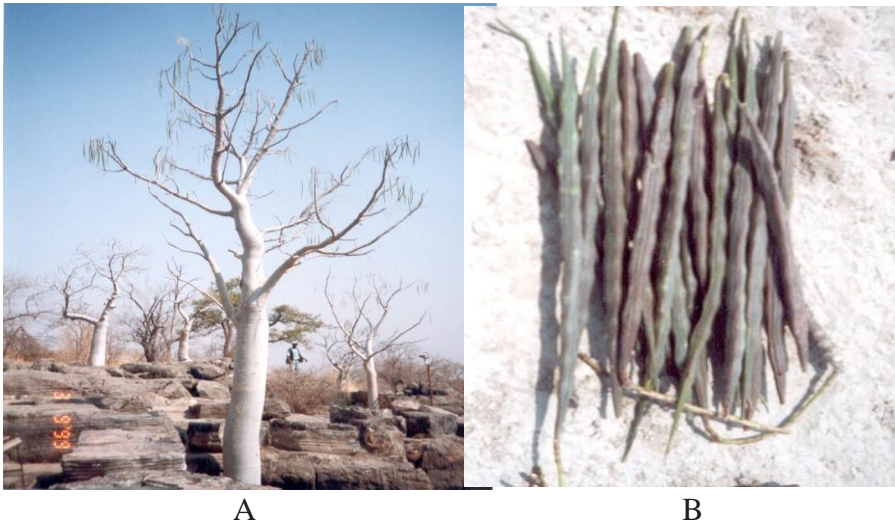


Figure 4: A. *Moringa avoliifolia* trees (A) on one of the two dolomite hills near Halali in Etosha Game Reserve. B. *Moringa avoliifolia* pods from a forest of *Moringa* known as Sprokiewoud, or the Phantom Wood, near Okaukuejo in the Etosha Game Reserve.

### **Medicinal uses and combating of symptoms of HIV and AIDS**

Moringa leaves are predominantly used as food in many SADC countries. The use as cure for HIV and AIDS is also a common misconception found in countries such as South Africa, Botswana and Swaziland. Some people within the region are promoting it as a cure for HIV and AIDS.

In Swaziland, of the 565 people who participated in the survey, only 10.4% use Moringa for purposes other than as food and medicine. It is being used to treat different ailments such as ulcers, headaches, influenza and general body malaise. HIV patients also use it to improve their health conditions. One HIV positive woman interviewed who is currently using the Moringa claimed that her health condition has greatly improved since she started using the leaf powder in her diet. At some point she was bed-ridden but

when she started using it she felt better and was able to move around. Some members of the community attested to this. The only disappointing factor in the testimony was her withdrawal from using antiretroviral drugs as soon as she started using the leaf powder. This demands an urgent need for more training and information to communities on the role of Moringa in health.

Besides being used as a food supplement in Botswana, there are claims of how the tree cures a number of ailments. The medicinal uses mentioned by the respondents include curing a number of ailments such as ankle and knee diseases, pain killer, high blood pressure, flu, diabetes, asthma, arthritis, skin diseases and wounds, HIV and AIDS, stomach cramps, cancer, weakened immune system, leg wounds, cleanse the body and reduce fatigue or tiredness, etc. Some respondents also mentioned that the leaf powder improves appetite and digestion, cleanses the body and reduce fatigue or tiredness. Oil can also be extracted from the seeds.

From the responses above, it can be said that people are generally aware of the benefits of the tree although there are serious misconceptions as to what it can do as medicine. Most of the claims such as cure of HIV and AIDS are misleading because they have not been scientifically proven. This is the issue that needs further investigation because people on ARVs may stop taking them. There is a big knowledge gap that needs to be addressed by future research with regard to the benefits of the MO tree.

In Namibia, the medicinal uses of *M. ovalifolia* mentioned during the survey included using roots for chest pain relief and pulp to treat women after giving birth.

Zambian study found that Moringa is mainly used for nutrition purposes as a vegetable and food supplement particularly leaf powder. The centres that care for the sick also use it for nutritional purposes. There were no cases reported of its use as medicine, water treatment and cosmetics.

In South Africa, Moringa is used as a food supplement. During an interview

with the owner of Lammangata Moringa she gave an account of how Moringa usage in village has completely eliminated malnutrition. Each village home has a Moringa tree donated by the Lammangata Moringa project. The owner also gave a testimony of people infected with HIV and AIDS taking Moringa leaf powder supplements who were eventually able to lead a normal life after being bed ridden. The fresh leaves are cooked like any other vegetable and eaten by the community. Dry leaves are added as supplements in various dishes just like spices are added and also added in tea as supplements. Figure 5 shows Moringa dried leaf powder used as nutrient supplement sold in South Africa. However, a survey carried among the Atteridgeville informal community settlement in Pretoria West found out that no one was using Moringa as medicine or for combating the symptoms of HIV and AIDS.



Figure 5: Moringa dried leaf powder used as nutrient supplement sold in South Africa.

### Moringa promotional strategies

Demonstration workshops were held in Zambia, Botswana, and Swaziland and partly in South Africa. Workshops involved a brief presentation on:

- the uses with emphasis on its nutritional benefits and water treatment
- cultivation of the MO from seeds
- processing of leaves for leaf powder

The presentation was based on the MO brochure and pamphlets were distributed at each study/workshop centre. The presentation was followed by distribution of seedlings and seeds. The workshops were well received as the participants were happy to learn about the benefits of Moringa and how it can be grown. Seeds were given to the participants to go and plant. Most of these have germinated and many new people in the region now own Moringa. In South Africa, seedlings were grown as no supplier of seeds was found. In Botswana, Swaziland and Zambia seedlings were also given out to participants when available.

In Swaziland, a demonstration workshop was held in the Mamisa area. This area is part of the dry lowveld region where the tree grows very well. Even though it grows in this area, only one of the 55 workshop participants had a tree at home. This is because most of the residents of this area did not know about Moringa. From the people interviewed in the area, 95% had not seen a tree nor heard about it at all. The seeds and seedlings were distributed to workshop participants and community leaders.

In Botswana, it was discovered that the television broadcast prior to this investigation played a major role in making a lot of people interviewed aware of Moringa and its benefits. Demonstration workshops were held in Ghanzi, Shakawe, Maun, Lentsweletau and Kopong. Figures 7 below shows some Shakawe CJSS staff and Kopong villagers lining up to receive seedlings, seeds and brochures of MO. Furthermore, the brochure was distributed to students in Ghanzi, Shakawe, Maun and a number of schools in and around Gaborone.

In South Africa, workshops were held at the Atteridgeville informal settlements. The first one was held near the site where Moringa plants have now been planted. The second meeting was held at the Municipality offices

in Atteridgeville. This is also where questionnaires were distributed. More than 30 people attended, mostly elderly women. The benefits of the tree were explained and the brochure was handed out. The community was excited to hear about the Moringa and what it can do to alleviate poverty. Figure 9 shows the site where the tree has been grown. This is on land of , about 10 hectares, that belongs to Tshwane Municipality but has been given to the community for the Moringa project. So far more than 100 plants have been planted on the site. The first harvest of the Moringa leaves has been performed already because the trees seem to grow very fast. About 380 grams of Moringa dry leaf powder was obtained which was distributed to the most needy members of the Atteridgeville informal settlement community. These were identified by community leaders who were research assistants on the project.

In Zambia, workshops were held in order to promote Moringa cultivation and utilisation in 2 selected communities. An inventory was prepared for the participants and how many seedlings had germinated. The cultivation promotion carried out introduced 34 participants in Mbabala with a sum total of 746 plants and 22 growers in Sipatunyana with about 306 plants. As control experiment so as to get first hand experiences the growers may face in cultivating the tree, the lead researcher planted 100 trees on piece of land in Kalomo.

The Namibia study was not mandated to hold workshops but it was discovered that Moringa needs to be promoted aggressively in Namibia for the following reasons:

- There is no MO cultivar documented with the National Herbarium of the National Botanical Research Institute (NBRI) and many people are unaware of the two species.
- The distribution of *M. ovalifolia* in Namibia along the western half of the country means that most of these areas are in the desert where there are no communities of people living there.

One of the most encouraging promotional strategies of the study was the idea of forming national Moringa Associations and a Southern African



Moringa Association. This was the resolution of the workshop held in South Africa involving the study team members and South African stakeholders (government and private). The associations were to coordinate Moringa activities in each country in SADC and also at SADC level. These national associations will lobby government on policies related to Moringa use and growing. The SADC association can further encourage unified messages and standards on Moringa products. However, participants felt that more research was needed on the requirements, especially the legal ones before an association can be formed. It was also agreed that a SADC Moringa association should be formed first while individual country representatives should go and investigate the possibilities of forming national associations. The SADC association when formed should represent countries within SADC that were represented at the workshop and these are South Africa, Botswana, Swaziland, Namibia and Zambia. Other countries in SADC should be encouraged to join later on. The national associations could have provincial associations which should be under national associations and these in turn will be under the SADC association. It was agreed that members of the JEAPP project from various countries should be part of the interim structure to investigate the possible formation of the SADC association. An interim committee was set up with at least 2 representatives from the 5 represented SADC countries. The terms of reference for the interim structure chosen are:

- Review structure of the SADC Moringa association and corresponding national associations.
- Review other associations at SADC and national levels so as to understand how Moringa association can be formed.
- Come up with a draft constitution for SADC Moringa association.
- Review and collect legal requirements for such an association in each country and at SADC level.
- Recommend functional structure of both SADC and national associations.

- Collect data base of Moringa growers on each country and in SADC region.
- Convene a meeting for the formation of SADC and/or national associations on Moringa.
- Seek funding for a meeting for the formation of SADC and/or national Moringa associations.

The meeting further resolved that the interim committee should convene a meeting in May 2011 in South Africa for the formation of SADC and/or national Moringa associations. The association's main function would be to promote the processing and marketing of Moringa products so that they meet the following criteria:

- Good quality and attractive to consumers.
- Processed well and procedure should be emphasized.
- Contain scientific data such as nutrient composition.
- Contain directions for usage.
- Approved by a national or international standard depending on the customer.
- Should be bar-coded for traceability.
- Reasonable pricing structure

The other important aspect discussed that could enhance marketing is branding. Branding labels such as "proudly SADC label", grown and processed in the SADC, fair trade or organic labelling, global GAP accreditations, etc., could be used as promotional marketing strategies to assist the growers. The following items were agreed that a product should have name, contact details of seller, processing procedure, nutritional content, weight/composition, car code, date packaged and expiry date.

As an additional strategy the Moringa market needs to be studied and promoted. Events such as Moringa day should be encouraged where product range can be displayed and/or the communities can taste and try the different products. Food competition, creativity, value-addition or research into other Moringa products should be promoted. Brochures on Moringa should also be given out to the public. Advertisements through various media channels should be encouraged including community radio stations.

### **Promotion of Moringa by NGOs and Government Agencies**

Non-government organisations (NGOs) and some government agencies have played and continue to play important roles in the region in promoting the cultivation and utilisation of Moringa. The actual number and role differ from country to country in the region. Swaziland and Zambia seems to be leading with many NGOs involved.

Botswana is the only country where there is no known NGO actively involved in the promotion of the tree. This scenario may soon change with the recent involvement of the government agency called NACA and TV broadcast. The government Forestry departments have also played a key role in Botswana in the supply of seeds and trees to individuals throughout the country. However, it was observed that no information was provided as to the tree's benefits and cultivation. Key players in Botswana are therefore government Forestry departments spread across the countries and local farmers.

In Swaziland non-governmental organisations were identified to facilitate the dissemination of information among community members and to train individuals on Moringa cultivation. Some community social workers are already involved in informal one-on-one information dissemination and teaching about the Moringa. These workers are eager to be part of the team that will provide training to their respective communities. Some NGOs are also fully involved in cultivation and utilisation of MO among some community members. The NGOs, government ministries, associations and farmers which are key partners in Swaziland in facilitating the dissemination of information

among community members are New Life Homes (KaMfishane), Vusumnotfo (Ngonini), Impala Development Services, Pasture Valley (Nhlangano), Maphiveni Carepoint (Maphiveni), Herefords Carepoint (Herefords), Christian Family Church International (Tabankulu), Guba (Malkerns), Somtongo Carepoint (Lavumisa), Sizanani Bomake Farmers Association (Lavumisa) , Mamisa Community Committee (Mamisa), University of Swaziland, Swazi Secrets and governmental ministries (i.e. Ministry of Health & Ministry of Agriculture).

In South Africa, not many key partners have been identified and their role has mostly been to provide funding and involvement on the ground helping grow the plants with communities. The study reviewed that no NGOs were identified to facilitate the dissemination of information among community members and to train individuals on cultivation. However, a number have provided funding especially to Lammangata Moringa project for the above to be realised. Some of these that have been involved in funding are Star Fish Great Heart Foundation and Southern African Trust.

A number of NGOs were identified in the Zambian component of the study just like in Swaziland. These play similar roles as mentioned in the Swaziland study above. Some of these NGOs involved in the promotion of the MO tree are Mututa Memorial Day Care centre, World Vision, Care and Hope, Sipatunyana Rural Centre, Mbabala, Mututa Day Care Center and Christian organizations and Zambia Development Agency (ZDA).

The Namibian component of the study also identified organisations as key players in the promotion of Moringa. These include National Herbarium of Namibia, NBRI, Ministry of Agriculture, Water and Forestry, Etosha Ecological Research Institute, Etosha National Park, Ornamental Nurseries Development Project in North West Conservancies, Welwitschia Development Trust, Conservancies, i.e. Doro!nawas, Huab, and Sorri Sorris.

## Assessment of Moringa Marketing

The study found that the leaf powder, seeds, seeds powder, seedlings and oil are being sold in countries of study except Namibia. The main product on the market as a food supplement and for medicinal purposes is the leaf powder. Generally, the prices varied from country-to-country as shown in Table 8 and even area-to-area in the same country.

The market assessment in Swaziland found only two retail shops located in Manzini and Mbabane that sell Moringa powder to the general public. The rest of the powder sellers identified are the farmers. The marketing strategy in this country could in future be designed such that the products are first accepted by the high income earning group of the Swazi market so as to establish a sense of acceptability to the low earning groups. It is believed that once the product is accepted by elites of the country, the product will be better positioned and easy to market to the rest of the country. The different prices in local markets are listed in Table 8.

Table 8: Local market Moringa prices

Country	Price of leaf powder	Price per seedlings/ plant
Botswana (Pula)	40 – 60 for 100 g	10 -75
South Africa (ZAR)	40 – 120 for 40 g	40 – 60
Swaziland (ZAR)	20 – 70 for 50 g	10 – 20
Zambia (ZAR)	40 – 60 for 100 g	20 - 50

In South Africa, most of the Moringa growers have just recently planted the seeds and seedlings. Not many suppliers of Moringa related products are available in the country. Lammangata Moringa project is the main supplier and sells seeds, seedlings, dry leaf powder and a dry leaves. There are people who buy in bulk to resell in other areas at a profit. The price for 40 g of leaf powder varies from ZAR 40 to ZAR 120 depending on the region. The marketing component of the study in Botswana found that MO products are

sold by individuals especially in markets, work places and shopping malls. The seed powder was found to be sold for P40 - P50 in markets for medicinal purposes. The sellers were unwilling to disclose what ailments the powder was used to treat. Prices for trees for planting also vary from as low as P10 to as high as P75 each. In most cases, the size of the tree matters although for some sellers this factor does not matter at all. The price of seeds also varies from about P300 – P450 per kg. In Zambia MO leaf powder and seeds are sold on the streets of Lusaka on nearly every stand that sells traditional medicine. NGOs as well as individuals also sell both products. The prices are variable and generally about ZAR 20 for a seedling from a government agriculture centre and ZAR 40 for 100 g of leaf powder.

The prices were, generally, found to be too high for the people who need the products the most and that is, the poor. The need to grow more Moringa trees in the region is thus imperative so that there can be an abundance of the products and this will ultimately bring down the prices. In countries like South Africa, there is one major supplier and demand cannot be met. The other problem is that in most cases, the products are not properly labelled as per market requirements. This raises health concerns as some unscrupulous people may take advantage of this knowledge and sell wrong or sub-standard products or products that are not really of Moringa origin. Many of the mentioned problems can be minimised with the formation of national Moringa associations and even SADC association to be mandated in setting product standards, processing protocols, marketing and also provide other vital information about the tree's benefits.

## **Conclusion**

The project aimed at conducting a survey on the cultivation and the use of MO in selected SADC countries, its distribution, identifying NGOs and government agencies involved in the promotion of Moringa as well as assessing the marketing of products. The above objectives were met with minimal constraints. Interviews were conducted in selected areas in the study countries to gather information on the cultivation and use of Moringa in

these countries. NGOs and government agencies were contacted about their possible roles (if any) in Moringa promotion. Some of the NGOs are already involved in the promotion and supply of seedlings. The government agencies contacted have not yet begun promotions except the forestry department in Botswana which is involved in the distribution and selling of seedlings to communities and individuals. Moringa farmers were also identified in different regions in the country and an analysis of marketing in the selected SADC countries was done. The different suppliers of Moringa were identified and the respective prices in local markets. The study also identified serious knowledge gaps about the medicinal and nutritional benefits and the water treatment properties of MO. There is also need to correct, through education, the misconceptions about the tree's medicinal benefits especially the fact that some people feel that MO can cure HIV/AIDS. These issues need to be addressed for the benefit of the communities to mitigate the effects of poverty, malnutrition and HIV and AIDS.

Moringa cultivation and utilisation in the region has great potential. This is evident from the general acceptance of this plant by people both in rural and urban areas. Most of the people interviewed are eager to plant the tree for personal and commercial purposes. The wide distribution of Moringa in different rural areas is also a positive aspect towards its cultivation to full potential. Promotion of Moringa in rural communities can be augmented by NGOs and social workers who have shown willingness to teach masses about its benefits. However, more training of communities is needed to realise the full potential of the tree especially cultivation from both seeds and branch cuttings, processing of the products such as leaf powder, packaging and marketing. In all the communities surveyed, nearly all trees were grown from seeds only. Since there is no evidence of its usage in cosmetics and very little knowledge about its use for water purification, there is an opportunity in teaching communities about these aspects for income generation and sanitation, respectively. The cultivation of Moringa can also provide job opportunities to local entrepreneurs because of the vast uses which include, among others, water purification, cosmetics, food supplement, medicine and fodder.

Although *Moringa* is a plant that has received attention in many countries, due to the high nutritional value of its leaves, it is still underutilised. It is, therefore, recommended that acceptability studies in communities be initiated and that *Moringa* could be considered as a source of supplementation in households' diets where the need requires micronutrient supplementation. Intervention programmes have to be designed and investigated and health workers in rural clinics and disadvantaged communities could be educated on the attributes of *Moringa* so that could in turn educate the mothers of malnourished children. This is an inexpensive and natural method of alleviating malnutrition. Apart from being used as food, *Moringa* has other uses like its medicinal applications, water purification, seed oil and use of the green leaves as green manure which could be beneficial to disadvantaged communities.

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