Wild fruits as a cheap and available source of micronutrients
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Abstract
In the world we find a lot of local communities with specific sets of wild food sources that they know and use. Among these we find wild fruits, with a rich local knowledge base on use and eating habit. These are fruits that have not been domesticated and whose use, nutritional and economic value has been overlooked to a large extent. As they are not getting adequate attention, they are also not yielding the maximum potential that they have. By reviewing existing studies, this potential will be shown. Looking at some wild fruits in Africa, and the micronutrient deficiencies in the diets, there are a lot of gaps that these fruits could fill. For example, *Ziziphus spina-christi* is an excellent source of vitamin C, iron, potassium and zinc, and a good partial source of calcium, magnesium, and copper. *Foxtail* spina is an excellent source of iron, and a good partial source of calcium and magnesium. *Adansonia digitata* is a very good source of vitamin C, and a good partial source of iron, magnesium and calcium. *Cordia africana, Carissa edulis* and *Physalis minima* are good sources of beta-carotene as vitamin A. Several more such fruits show similar properties. As these fruits are locally available, cheap, well known, and used simply educating people to use them in a targeted manner can help meet special micronutrient needs we have for iron, vitamin A, iodine, zinc and folate sources.

Background
We find a lot of lesser known but locally used plants all over the world. These indigenous plants and fruits make substantial contributions to food security, improved health and nutrition, medicinal treatment, income generation, cultural heritage, and environmental protection both in the drought periods and normal seasons (Akinrinsile et al. 2006; Bharucha & Pretty 2010; Järnecke & Hölschle-Zelekon 2006). A global review of several studies looking at the importance of wild plants and animals an average of 120 species were found to be used per community. Although there are around 30000 known edible plant species in the world, out of which 7000 have been cultivated, just 30 crop plants are used by people to meet 93 percent of the energy needs, while above 60 percent of this is met from only three crops: rice, maize and wheat (FAO 1997; Fowler & Hodgkin 2004; Ross & Loftas 1995). These underutilized plants are not only disappearing from their common landscapes where they grew, but also the knowledge base on their use and processing is also getting forgotten and disappearing with previous generations (Burlingame et al. 2009; FAO 1997; Hewitt 2007; Järnecke & Hölschle-Zelekon 2006; Kahane et al. 2013a; Ross & Loftas 1995; Shephard 2005; Toledo & Burlingame 2006).

In developing countries, nutrition and food availability are strongly interlinked (Dal Falco et al. 2011; Ferns & Hager 2009; Feyissa et al. 2011; Goerner et al. 2011; Gregory et al. 2005; Kahane et al. 2013a; Ladek et al. 2011; Müller & Krawinkel 2005; Toledo & Burlingame 2006). Malnutrition is still a dominant factor in the cause of disease and death in the developing world, with basic lack of protein and energy foods and deficiencies in iron, iodine, vitamin A, zinc and folate being the dominant factors (Kennedy et al. 2003; Müller & Krawinkel 2005). The same picture is present in Ethiopia at the current time, with perhaps less mention of zinc and folate deficiency (FAO 2010). Whether it be in the visible form or the hidden form, malnutrition is affecting the lives of 1.02 billion people, causing 300,000 deaths and is responsible for 60% of child deaths occurring yearly (Bharucha & Pretty 2010; Kennedy et al. 2003; Müller & Krawinkel 2005) which was 20,000 daily in 2013 (Biesalski 2013).

Method
In a study undertaken to evaluate the nutritional value of a wild fruit *Cordia africana*, eaten in Ethiopia, it became apparent that the potential these wild fruits have to meet nutritional needs has not been adequately explored. Looking at the most important nutritionally lacking micronutrients in the diets of Africa, and doing a literature search it became clear how underutilized these fruits are. This is a literature review to show some of these fruits and how they can be used.

Results
The literature review showed the following potential fruits, among many others. The review showed that there is potential for these fruits to meet the iodine needs, and that of wild leafy vegetables to meet the folate needs (Haldemann, Ah, Blanc, & Blondeau, 2005; van der Walt, Ibrahim, Bezaudienhout, & Loots, 2009). However specific African wild fruits were not found, making recommendation difficult. The pictures of the fruits and basic nutritional facts are presented as follows:

![Figure 1. Ziziphus spina-christi](image1)

*Ziziphus spina-christi*, a fruit eaten mostly dry but also fresh. It has 71.99 ± 17.85 mg Iron/100 gm, 1.18 ± 0.23 mg Copper/100 gm, 65.72 ± 8.08 mg Zinc/100 gm, 867.03 ± 3539.6 mg Potassium/100 gm, 135.5 ± 23.5 mg Sodium/100 gm, 339.5 ± 53.5 mg Calcium/100 gm, and 76.3 ± 2.3 mg Magnesium/100 gm fruit (Osman & Ahmed, 2009), 20.8 mg ascorbic acid/100 gm fruit (Eromosele, Eniomoso, & Kukuzhiza, 1991). Making it a good source for vitamin C, iron, potassium and zinc.

![Figure 2. Ficus sycomorus](image2)

*Ficus sycomorus*, a fruit eaten both fresh and dry. It has 24.38 mg Iron/100 gm, 865 mg Calcium/100 gm, and 212 mg Magnesium/100 gm fruit (Loo, Calvert, & Govind, 2004). Making it a good source of iron.

![Figure 3. Adansonia digitata](image3)

*Adansonia digitata*, a fruit eaten both fresh and dried. It has 337 mg ascorbic acid/100 gm, 4.4 mg Iron/100 gm, 60 mg Calcium/100 gm, and 208.8 mg Magnesium/100 gm fruit (Eromosele, Eniomoso, & Kukuzhiza, 1991).

![Figure 4. Carissa edulis](image4)

*Carissa edulis* and *Physalis minima* are fruits eaten fresh. They have 256 and 28.9 mg retinol equivalent beta-carotene, 10 and 25 mg Calcium/100 gm, 24 and 30 mg Phosphorus/100 gm fruit (Mustegooi, Kilkaufunda, & Kiremire, 2007). Making it a good partial source of beta-carotene based vitamin A.

Conclusions
As can be seen from the very brief description of the wild fruits discussed here, it can be seen that they are good sources of essential micronutrients, and can help to meet micronutrient malnourishment needs of people in developing countries. These fruits are in a position where they are well known, accepted and used by the society. It is therefore important to educate the society of the potential they can provide and promote their use for targeted groups like children, pregnant and lactating mothers and the elderly.

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