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INDIGENOUS WILD FOOD PLANTS IN HOME GARDENS: IMPROVING HEALTH AND INCOME - WITH THE ASSISTANCE OF AGRICULTURAL EXTENSION

Robert L. Freedman

Tucson, Arizona United States of America.

ABSTRACT

The wide-spread presence of home gardens, in developing nations is a strong foundation for food security, both in terms of quantity and quality. Indigenous wild food plants are a rich source of health-giving micronutrients, which are missing from highly refined fast/convenience foods the growing reliance on which has caused an ever-increasing occurrence of dietary-related diseases. A simple solution to resolving micronutrient malnutrition is the transplanting of neglected and underutilized plant species (NUS) into home gardens. These plants can also be sold in local markets providing additional family income. Agricultural extension personnel can play an influential role in promoting the transplanting process by presenting workshops for women farmers and home makers. Guidelines and resources for these workshops are given below.

Keywords: Indigenous wild food plants, women agriculturalists, women homemakers, nutritional status

INTRODUCTION

Home gardens are ubiquitous throughout the developing nations of the world. Their capacity to provide food, for families throughout the year, makes them a significant resource for increasing food security. It is also important to understand that food security is not an exclusively quantitative issue - it is equally a highly qualitative one. Increasing food supply must assure that the nutritional needs of those eating the food are also met. To this end, the use of micronutrient-rich Neglected and Underutilized Species (NUS) of Indigenous Wild Food Plants can guarantee improved nutrition for the large number of families suffering from the epidemic of often fatal, non-communicable dietary-related diseases, which have resulted from increasing reliance on highly-processed, fast/convenience foods. This paper focuses on the concept of transplanting micronutrient-rich NUS, into home gardens, for improved family health; and increased income, through selling surplus NUS, in local markets. To promote the transplanting concept, a workshop is described, for presentation, by agricultural extension personnel, to women farmers and rural home makers.

* Corresponding Author:

Email: freedmanbob@aceweb.com

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METHODOLOGY

As a basis for supporting the concept of transplanting micronutrient-rich traditional wild food plants into home gardens, an in-depth review was undertaken, of a wide range of literature on the subjects of underutilized indigenous wild food plants, global malnutrition, home garden horticultural practices, small business development, agricultural extension outreach to women, and workshop dynamics.

RESULTS AND DISCUSSION

Achieving global food security is not an exclusively quantitative issue. In order to assure adequate diets, for populations at risk, the qualitative dimension of nutritional value must be factored in. As will be noted below, there is a global epidemic of dietary-related diseases resulting from food intake which may provide satisfactory bulk/quantity, but which qualitatively is completely lacking in nutritional value.

From the qualitative perspective, the focus, in this paper, is on the widespread occurrence of insufficient micronutrient consumption; the effects, of this deficit, on human health; and how the problem can be rectified, by the use of readily available wild food plants. Prior to the Agricultural Revolution, all food plants existed only in the wild. When these plants began to be grown, within

the boundaries of permanent settlements, to make them more accessible for preparing meals, the history of horticulture began. It is the goal of this presentation to highlight the vast number of edible plants which still exist, 'in the wild,' in practically every ecological zone and which represent traditional food resources which have the capability to play a major role in offsetting global food quality insecurity.

Home gardens can provide a year-round supply of many foods used by families and this immediate accessibility to these foods and the gardens' potential for producing a diverse range of edible plants gives them a primary role in creating and maintaining sustainable food security (Bhattacharjee 2006; Oakley 2004; Khammounheuang (2004); Schippers 2001). This paper proposes a means to expand variety, in home garden-grown foods; to improve family nutritional status; and to provide a source of income, through the transplanting, into home gardens, of neglected and underutilized species of micronutrient-rich, indigenous wild food plants. In addition to these benefits, transplanting also supports conservation of agrobiodiversity (Engels 2002; Rengalakshmi (2002).

In Nepal, "An interview with the farmers of Kholagaun in Tanahun has reported that 40% of the total food is contributed by the wild sources." (Gautam *et al.*, 2004, p. 5. Joshi *et al.*, 2007) observe that "Besides gathering vegetables from the wild, their cultivation in home gardens plays an important role towards household food and nutritional security." And, for South Africa, Weinberger & Pichod [drawing on High and Shackleton (2000), report that "In a comparative value analysis of wild plant resources harvested from home gardens and arable plots against other domesticated crops, it was found that traditional vegetables (both domesticated and wild) contributed 31% of the value of all plants grown on residential plots. Transplanting NUS also provides a means for guaranteeing ready access to species, which are becoming scarce locally; or are no longer available and require time-consuming trips to gather, as a result of the destruction of their habitats, due to environmental degradation, agro-industrialization or urbanization. So, through transplanting, home gardens can provide the opportunity to cultivate and domesticate valuable, micronutrient-rich crops for the future (see, for example, Kimber 1978). This observation, from Mozambique, concisely recognizes this: "Some plants are now very scarce in the vicinity of the communities and there is a

real danger that they may be wiped out if their consumption is not checked and if they are not replaced. It would be a good idea, therefore, to encourage the communities to have a small plot either as a community or as a family where they can grow some of the plants..." (Mapaura & Chapana ca. 1998).

Although transplanting wild food plants was the basis of the Agricultural Revolution, little documentation exists of this practice, in modern times. The most comprehensive report is the study by Gautam *et al.* (2009), for Nepal. While several other papers document the practice, in northeast Thailand, Kenya, Guatemala and South Africa they give little detail. See Moreno-Black *et al.* (1996); Moreno-Black & Somnang (2000); Price (1997); Ogoye-Ndegwa & Aagaard-Hansen (2003); Azurdia & Leiva (2004); Morimoto (2013) and Shackleton (2013). An inexpensive way to eliminate ill-health caused by nutritional deficiencies, particularly in rural areas of economically developing nations, is to promote the consumption of micronutrient-rich Neglected and Underutilized Species of Indigenous Wild Food Plants. Another example, again, from Nepal (Gautam *et al.*, 2004, p. 68) describes this, under the heading 'Role of Nutrients from Home Garden,' "...home garden can serve as nutritional garden for family needs. A diversified home garden with at least 8 to 12 diverse species can contribute nutritional requirement, particularly, leafy vegetable rich in iron, vitamin A, vitamin C, vegetable protein, and dietary fiber. Moreover, food grown at home garden is culturally preferred and valued for safe and fresh for home consumption. Home gardening can be combined with neglected and underutilized traditional crops for providing variety of food and fruits. A similar opinion, regarding the desirable qualities of home-garden-grown food is expressed by Native North American gardeners: "Even when households have access to commercially grown fruits and vegetables, as on the Hopi Indian Reservation in northern Arizona, many of those gardeners told us that they prefer produce from their own gardens because it is fresh, flavorful and not contaminated with agrochemicals." (Soleri & Cleveland, 1992). And, in this regard, G.C. Krishna (*ibid.* p. 63) has written, in the section titled: 'Home Gardening as a Household Nutrient Garden,'"Home gardening can improve nutritional status more specifically on micronutrients status of women and children and poverty reduction, which is one of the appropriate Food-

based approaches, could be an essential part of the long-term global strategy to alleviate vitamin A and iron deficiencies..." Home nutrition gardens have also been innovated, in Nigeria (Adedoyin & Taylor, 2000); Zimbabwe (Brazier no date); and Bhattacharjee *et al.*, 2006), write about the potential "...to convert idle village land into community nutrition gardens."

Seemingly, then, the most logical way to start the re-introduction of wild food plants, into contemporary diets, is to grow them in home gardens. This is being done, in Nepal. "In many home gardens...a large number of wild species have been domesticated for their unique use-values such as medicinal properties, vegetables during dry seasons, etc." (Gautam *et al.*, 2009).

Research shows that many indigenous wild food plants are rich sources of micronutrients, which are destroyed, when fresh plants are subject to industrial processing for commercial sale. Restoring these health-sustaining substances to daily diet will offset the destructive consequences of consuming few if any fresh vegetables and fruits; and large amounts of refined carbohydrates, hydrogenated vegetable oils and/or animal fats, which has caused the epidemic of often fatal, non-communicable diseases noted above (Grivetti & Ogle 2000; Ogle *et al.*, 2001). The seriousness of the absence of micronutrients, in the diet, is confirmed, in this excerpt from an article in the British medical journal, *The Lancet*: "Insufficient vegetable and fruit consumption causes 2.7 million deaths annually worldwide and belongs to the top ten risk factors contributing to mortality." (Ezzati *et al.*, 2002; Iannotti *et al.*, 2009).

After considering these perspectives, on the transplanting of traditional wild food plants, one additional and complex question remains: i.e., which of these many plants, growing in diverse eco-zones, ought to be selected for domestication? The basic criterion, for selecting and evaluating NUS, is their nutritional value, therefore, compositional analysis is the primary requirement, for determining the most desirable species for new crops research (Burlingame 2000; Kuhnlein 2003; McBurney *et al.*, 2004; Mnzawa, 2004; Barucha & Pretty 2010). The significance of such analysis has been emphasized, by several writers: Altschul (1968), Grivetti (1981) and Robson & Elias (1978); Longhurst (with regard to wild food plants in general; and has been further emphasized by Burlingame *et al.* (2009). Commenting from an African perspective, Dansi *et al.*

(2012) observe incisively "Acquiring nutrient data...for food species and varieties is essential for financial supports for research oriented on the neglected crops...since most of the institutions that support research in developing countries directly or indirectly specify "major crops" in their grant announcements...Both farmers and agricultural technicians listed as important reasons of neglect the lack of a national promotion policy of the neglected crops, the lack of organized markets as it is the case for cotton and maize, the susceptibility to pests and diseases and the lack of improved cultural practices and varieties."

Some of the earliest plant nutrient content analyses were done, over 100 years ago, for Indian famine food plants; and these occasionally showed unusually high values, for a variety of essential micronutrients. King (1869), a surgeon, attached to the Marwar Political Agency, published notes on famine foods used in the Jodhpur area, of the State of Rajasthan, which historically has been prone to severe and recurrent famines. A decade later, another physician, Shortt (1878), recorded famine plants used in the Madras region of southern India; and Gammie's (1900) paper, recorded famine food plants eaten in the Bombay Presidency. Four years later, Hooper (1904) published his compositional analysis of famine food plants; and, in the same year, two more British physicians, Paton and Dunlop (1904) published similar data. At that time, however, the field of analytical chemistry was still in its early formative stage, so these old data require confirmation. Read's (1946) study, on Chinese famine food plants, was the next most substantive contribution to this literature. It was not, however, until Abdelmuti (1991) published his Ph.D. dissertation, on famine foods, of the Sudan, that NUS compositional analysis reached its highest level. In this regard, The significance of such nutritional analysis of famine food plants has been highlighted, by Bhandari (1971) "It is therefore urged that all wild grains and vegetable produce and barks consumed as famine foods be scientifically examined by qualified nutrition officers with reference to their chemical composition and caloric value..."

Regarding NUS nutritional analysis, there are several consistently overlooked factors, in reports for both NUS as well as staple food crops., which must be understood, by analytic chemists: 1) the plant sample's Linnean identities must be correct; 2) the accuracy of previously published analytical results always must be questioned,

owing to the fact that such data, are often "recycled," i.e., taken from previously published literature and used as base-line comparisons, which rarely include detailed information regarding the analytic procedures employed. The result is an unavoidable lack of consistency, due to the absence of analytic methodological standardization. This very serious problem -the absence of standardization - can only be resolved, by following proven procedural techniques. The monograph, by Garfield & Southgate (2003) is considered the authority for all laboratories doing compositional analysis. Equally important is the necessity to use certified reference materials as the baseline for standardization of laboratory measurements, in order to eliminate any question about the accuracy and reliability of the analytical results (Barucha & Pretty (2010). Many published studies also do not specify the edible portion or information about preparation of the food sample, prior to analysis. Modern plant chemical analyses must document these factors, both of which can affect the analyzed concentration of particular nutrients. A review of deficits in food compositional analysis procedures has been written by McBurney (2004) and is also recommended to scientists doing this work. The author thanks Dr. Catherine Phillips, Ph.D., Director of the Food Analysis Laboratory Control Center, at Virginia Polytechnic Institute, in Blacksburg, Virginia, U.S.A.; and Mr. Rory McBurney, doctoral candidate, in the School of Anthropology and Conservation, University of Kent, United Kingdom, for the valued input, on this subject. Against this background, the author has developed a workshop, for use by agricultural extension agents to promote the practice of transplanting IWFPs, into home gardens. The intention of the workshop is to train extension personnel to educate rural women agriculturalists and homemakers, regarding the nutritional and health significance of micronutrient-rich NUS (see, for example, Iannotti et al 2009) and their potential for generating income. There is a demand for these IWFPs. For example, in Kenya, it has been observed that "Currently ALVs [African Leafy Vegetables] [are] priced [sic.] (prized ?) delicacies in Nairobi and many other parts of the country." (Gotor & Irungu 2010). The workshop focus on women is supported, in this observation, by the same authors (ibid.), "Women have continued to be the main actors in ALV production and marketing." And The International

Labor Organization data show, "With regard to agriculture, women are estimated to produce up to 80% of the food in Africa. Yet, when it comes to agricultural inputs and services, the share going to women is meagre: they receive only 7% of agricultural extension services..." (ILO 2012). This is echoed, in an FAO report "Women are the backbone of domestic work and the household economy as well as in most production, processing and storage activities, and marketing of agricultural products. This reality is often ignored, overlooked, or forgotten in putting together agricultural extension programmes. Evidence from observations in the field highlights the role of women in developing various activities of crucial importance to production and marketing of agricultural products." (Rivera 2003). And, in a comprehensive analysis of women and extension, Jiggins *et al.* (1998) state ." Agricultural extension services still do not attach much importance to reaching women farmers or women on the farm" The workshop can thus expand women's agricultural productivity as well as the extension services available to them.

The workshop has four themes: 1) nutrition education to explain the importance of micronutrients, in the diet; and how IWFPs can make families healthier; 2) ethnobotany (for extension personnel) provides a broad overview of the anthropology of plant uses; what kind of questions to ask, to find out about NUS IWFPs; how to gather and record information about plants from community members; 3) guidelines for starting and operating a small business, to sell IWFPs; and 4) sources of funds, to provide the capital needed to open a small business.

For the nutrition education component, the primary resource is the FAO (no date) training package, created specifically for the context of home gardens; and the document, by Brazier (no date) developed for use by extension workers, in Zimbabwe. The section on ethnobotany gives extension agents an understanding of how different cultures use plants; how to elicit information about local plants; how to collect plant samples, for scientific identification; how to record the information given by knowledge holders; how they recognize NUS, in the field; how the plants are gathered; processed for eating; how they are cooked; and with what other foods they are eaten.

For establishing a small business, the FAO-sponsored manual Handbook on Small Enterprises for Hill Tribe People in Thailand (Pongwat *et al.*, 2003) can be

adapted, where relevant cross-culturally. Another resource is the International Labor Organization (ILO) training program, Start and Improve Your Business (ILO no date). Finally, in addition to securing market space; making arrangements for transporting plants to the market; having tables or counters for product display; as well as scales; and plastic or paper bags for customers to carry away plants purchased, and a place to keep money from sales, the most important part of operating a small business is record-keeping. This is not only true to provide information, about business expenses and to know about profit and loss, but will be indispensable when applying for startup funds or creating a cooperative. Barahona's (1995) paper looks carefully at bookkeeping deficits, in the context of women-owned small businesses. A unique resource, for this business responsibility, is the manual by Murcia (1985).

Beginning a small business will always require some available capital. How much will vary depending on circumstances. There are a variety of possible sources for startup funding and each can be investigated, for further information. One source may be national government agencies with oversight for women's issues; on the international level, numerous nations have agencies devoted to providing technical and financial support, for the development of a wide range of micro- and small scale businesses. Some examples include the Swedish International Development Cooperation Agency; Swiss International Development Agency; and the Norwegian Agency for Development Cooperation. For a more expanded list of development agencies, see

http://en.wikipedia.org/wiki/List_of_development_aid_agencies. Another resource for possible funds are micro-credit organizations. Grameen innovated this model which has been replicated by many other lenders. Microcredit makes small loans available, to individuals, in the poorest areas of the world, to begin businesses charging very low interest rates.

The attractiveness of starting a small business, to sell home garden-grown IWFPs, is validated, by Gockowski *et al.* (2003), for the Cameroon. The authors investigated the importance of African leafy vegetables, for urban and peri-urban livelihoods, in Yaoundé. They found a high level of participation, by women, in marketing, since little capital is required for entry, allowing even the poorest households to participate.

A further potentially valuable resource, for small business funding is the creation of a cooperative. This is illustrated, by an example, from the Kiambu District, in Kenya. Ngugi *et al.* (2007) show how farmer groups successfully penetrated the high-value segment of markets for leafy indigenous vegetables through collective action and collaboration with a support system." And "Farmers organized in groups were able to realize profits higher by 35 to 72 per cent compared to farmers not organized in groups." With cooperation and support from extension personnel, the workshop described here provides the tools for educating rural women agriculturalists about a simple and cost-effective way to be responsible and accountable for their families' health while simultaneously creating the opportunity into produce cash income. All of this occurs within the community of women as food growers and in their role as the selectors and preparers of food, for their families. There is also a way to publicize and obtain support, for the transplanting project, from the wider community, by means of what is referred to as 'social marketing. The resource recommended for this is the manual Social Marketing of Vitamin A-rich Foods in Thailand, by Smitasiri *et al.* (1993). Although the research and its application were done in Thailand, the ideas it contains can adapt to other cultures.

CONCLUSION AND RECOMMENDATION

Based on the documentation reviewed here, transplanting traditional wild food plants into home gardens is shown to be an easily innovated, cost-effective way to improve family health and income. The transplanting concept only requires dissemination and this can be effectively accomplished by agricultural extension personnel, because of their expertise in the fields of agriculture and horticulture; and their close professional relationships with local communities families and women small-holders. To introduce the transplanting model, it is recommended that agricultural extension policy makers, in both the private sector (i.e. universities, NGOs) and such international organizations as Crops for the Future [www.cropsforthefuture.org] and public sector (local, regional and national governmental agencies) establish criteria for selecting communities where pilot transplanting projects can be established.

REFERENCES

- Adedoyin, S. Fola & Taylor, O.A. (2000). Homestead nutrition garden project: an extension communication for eliminating Vitamin-A deficiency

- (VAD) among poor household in Nigeria. Nigerian Journal of Nutritional Science 21(1-2), 34-40.
- Altschul, Siri von Reis. (1968). Unusual food plants in herbarium records. *Economic Botany* 22:293-296. Anonymous. no date. Causes and symptoms of Vitamin A deficiency. <http://voices.yahoo.com/causes-symptoms-vitamin-deficiency-7357652.html>
- Aphane, J., Chadha, L.M. & Oluoch, L.M. (2002). Increasing the consumption of micronutrient-rich foods through production and promotion of indigenous foods. FAO-AVRDC International Workshop proceedings, Arusha, Tanzania 5-8 March. AVRDC-The World vegetable Center, Shanhua, Taiwan. AVRDC publication No 03-561 pp.77
- Attig, G.A., Smitasiri, S.; Ittikom., K.; & Dhanamitta, S. 1991. "Promoting home gardening to control vitamin A deficiency in northeastern Thailand." Presentation at the International Workshop on Household Garden Projects held by the Asian Vegetable Research and Development Center (AVRDC), the Users Perspective with Agricultural and Rural Development (UPWARD) and the International Development Research Centre (IDRC) <http://www.fao.org/docrep/V1610t/V1610t04.htm>
- Barahona, Iris Villalobos. (1995). Women's Micro- and Small-Scale Enterprises' Emergence, Features and Limits: A Costa Rican Experience. In: Dignard & Havet. 1995. Pp. 145-157.
- Bhandari, M.M. (1971). "Famine foods in the Rajasthan desert." *Economic Botany* 28,73-81.
- Bharucha, Zareen & Pretty, Jules. 2010. The roles and values of wild foods in agricultural systems. *Philosophical Transactions of the Royal Society Biosocial Sciences* 365:2913-2926.
- Bhattacharjee, L.; Phithayaphone, S. & Nandi, B.K. (2006). Home gardens key to improved nutritional well-being. FAO Regional Office for Asia and the Pacific. Publication 2006/14
- Brazier, Anna.. no date. Healthy Harvest. A training manual for community workers in good nutrition and the growing, preparing, and processing of healthy food. Washington, DC: United States Agency for International Development Office of Foreign Disaster Assistance.
- Burlingame, B. (2000). Editorial. Wild Nutrition. *Journal of Food Composition and Analysis* 13,99-100.
- Burlingame, B. (2006). Biodiversity and Nutrition: a common path toward sustainable diets The Cross-cutting Initiative on Biodiversity for Food and Nutrition. *Journal of Food Composition and Analysis* 19(6-7),477-770 (September).
- Burlingame, B. Charrondiere, U.R. & Mouille, B. (2009). Food composition fundamental, To the cross-cutting initiative on biodiversity for food and nutrition. *Journal of Food Composition and Analysis* 22
- Burlingame, B. & D. Sandro. (2012). Sustainable Diets and Biodiversity. Directions and Solutions for Policy, Research and Action. FAO Rome: Food and Agriculture Organization. Nutrition and Consumer Protection Division.
- Dansi, A., R. Vodouhè,, Azokpota, P., Yedomonhan, H., Assogba, P., Adjatin, A., Loko, Y.L., Dossou-Aminon, I. & Akpagana, K. (2012). "Diversity of the Neglected and Underutilized Crop Species of Importance in Benin." *The Scientific World Journal*. <http://www.hindawi.com/journals/tswj>
- Dignard, Louise & Havet, Jose, eds. (1995). Women in Micro- and Small-Scale Enterprise Development. Boulder, CO and San Francisco, CA: Westview Press.Engels, Jan. 2002. Home gardens. A genetic resources perspective. In: Watson & Eyzaguirre, eds. 2002. Pp. 3-9.
- Eyzaguirre, P. & L. Olgaa. (2004). Introduction. In: Eyzaguirre & Linares. 2004. Pp. 1-28.
- Eyzaguirre, P. & Linares, Olga, F., eds. (2004). Home Gardens and Agrobiodiversity. Washington, DC: Smithsonian Books.
- Ezzati, F, Lopez, A. D., Rodgers, A., Hoorn, S. V. & Murray, C. J. L. (2002). Selected major risk factors and global and regional burden of disease. *Lancet* 360 No. 9343. Pp. 1347-1360
- Fanzo, J. & M. Federico. (2012). Ensuring agriculture, biodiversity and nutrition remains central to addressing the MDG1 hunger target. In Burlingame & Bernini. 2012. pp. 44-53.
- FAO (no date). Nutrition and Biodiversity. Rome: Food and Agriculture Organization of The United Nations. <ftp://ftp.fao.org/docrep/fao/010/i0112e/i0112e08.pdf>

- FAO (Food and Agriculture Organization of the United Nations). no date. Improving nutrition through home gardening. A training package for preparing field workers in SE Asia. Rome: Italy. 49+21+37+4 Section1Pp.9-16; Section 2 Pp. 12 Information Sheet 5 Food and Nutrition Problems Section 3 Home Garden Technology Leaflets Leaflet 3 - "Growing plants for daily nutrition: Pp. 6-10
- FAO. (1996). Agricultural Cooperative Development. A Manual for Trainers. Rome: Food and Agriculture Organization of the United Nations.
- Flyman, M. V. & Afolayan, A. J. (2006). The suitability of wild vegetables for alleviating human dietary deficiencies. South African Journal of Botany, 72,492-497
- Frison, E. A., Smith, I. F., Johns, T., Cherfas, J. & Eyzaguirre, P. B. (2000). Agricultural biodiversity, nutrition and health. Food Nutr. Bull. 27,167-179
- Gammie, George Alexander. 1902. "A note on plants used for food during famines and seasons of scarcity in the Bombay Presidency." India. Botanical Survey. Records, 2(2),171-196.
- Garfield, H.; Southgate, D.A.T. (2003). Food composition data. Production, management and use. (Second edition) Rome, Italy: United Nations Food and Agriculture Organization
- Gautam, R., S. Bhuwon & S. Pratap. eds. (2004). Home gardens in Nepal. Proceedings of a national workshop. 6-7 August, 2004. Pokhara: Nepal.
- Gautam, R., Sumwar, S., Subedi, A., & Shrestha. P., (2009). "Home gardens and their roles in domestication of wild and uncultivated plant genetic resource in Nepal." in Jaenicke 2009. Pp. 677-684.
- Glew, Robert S.; Amoako-Atta, Boakye; Ankar-Brewoo, Gloria; Presley, Jack; Chuang. Lu-Te; Millson, Mark; Smith, Barrett R.; Glew, Robert H. (2009). Non-cultivated Plant Foods in West Africa: Nutritional Analysis of the Leaves of Three Indigenous Leafy Vegetables in Ghana." Food 3,39-42
- Glew, R.S. Amaoko-Atta, B. Ankar-Brewoo, G. Presley, J. Chuang, L-T. Millson, M. Smith, B.R. & Glew, R.H. (2010). "Furthering an understanding of West African plant foods: mineral, fatty acid and protein content of seven cultivated indigenous leafy vegetables of Ghana." British Food Journal, 112,1102-1114.
- Gockowski, J., Mbazo'o, J., Mbah, G. & Moulende, T. M. (2003). 'African traditional leafy vegetables and the urban and peri-urban poor.' Food Policy, 28,221-235
- Gotor, E. & Irungu, C. (2010). The impact of Biodiversity International's AfricanLeafy Vegetables Program in Kenya. Impact Assessment and Project Appraisal, 28(1),41-55. [Taylor & Francis online]
- High, C. & Shackleton, C.M. (2000). The comparative value of wild and domestic plants in home gardens of a South African rural village. Agroforestry Systems, 48,141-156.
- Hooper, D. (1904). "Analyses of Indian pot-herbs of the natural orders Amarantaceae, Chenopodiaceae, and Polygonaceae." Agricultural Ledger (Calcutta),(6),423-434.
- Iannotti, Lora; Cunningham, Kendra & Ruel, Marie. (2009). Improving Diet Quality and Micronutrient Nutrition Homestead Food Production in Bangladesn. IFPRI Discussion Paper 00928. Washington DC: International Food Policy Research Institute
- ILO (International Labor Organization). (1996). Rural Women in Micro-enterprise Development: A Training Manual and Programme for Extension Workers. Geneva: International Labor Office.
- ILO (International Labor Organization). (2012). Empower rural women - end poverty and hunger: the potential of African cooperatives. Coopafrica Leaflet IDW2012. www.ilo.org/public/english/.../africa/.../coopafrica_leaflet_iwd2012.pdf
- ILO (International Labor Organization). no date. Start and Improve Your Business Programme. Fact Sheet. Job Creation and Enterprise Development Department Small Enterprise Development Program'me <http://www.ilo.org/images/empenstatic/seed/SIYBfs0307.pdf>
- Jiggins, J., Samanta, R.K & Olawoye, J. E. (1998). Improving women farmers' access to extension services. In Swanson et al. 1998. Chapter 9.
- Johns, T. (2003). "Plant biodiversoty and malnutrition: simple solutions to complex problems.a global strategy linking plant genetic resource conservation and human nutrition." African Journal of Food, Agriculture Nutrition and

- Development, 3(1),45-52.
- Joshi, K., K. & Maass, B. L. (2007). Traditional, neglected vegetables of Nepal: Their sustainable utilization for meeting human needs Trpentag 2007. University of Kassel - Witzenhausen and University of Gottingen October 9-12, 2007 Conference on International Agriculture
- Khammounheuang, K., P. Saleumy, P. Kirjavainen, L. Nandi, M. Dyg & Bhattacharjee, L. (2004). Sustainable Livelihoods for Human Security in Lao PDR: Home Gardens for Food Security, Rural Livelihoods, and Nutritional Well-being. *Regional Development Dialogue*, 25(2), 203-233.
- Kuhnlein, Harriet V. & Receveur, Olivier. (1996). Dietary change and traditional food systems of indigenous peoples." *Annual Review of Nutrition*, 16, 417-44
- Kuhnlein, H. V. (2003). Micronutrient Nutrition and Traditional Food Systems of Indigenous Peoples". *Food, Nutrition and Agriculture*, 32, 33-37. Rome: Food and Agriculture Organization of the United Nations. <ftp://ftp.fao.org/docrep/fao/005/y8346m/y8346m04.pdf>
- Lawal, B.O. & Jibowo, A.A. (2006). Impact of household food security and nutrition programme on the nutritional status of in Oyo State, Nigeria. *Nutrition and Food Science*, 36(5), 325-336.
- McBurney, R., P.H. G. Caroline, P. Alison, A. Greenberg, David C., (2004). "The nutritional composition of African wild food plants: from compilation to utilization." *Journal of Food Composition and Analysis*, 17, 277-289
- Mapauro, A., & C. Christopher. (1998). Famine food plants of Macossa and Tambara Districts of Mozambique. Mutare Zimbabwe: GIZ [Deutsche Gesellschaft fur Internationale Zusammenarbeit. Microfinance Gateway <http://www.microfinancegateway.org/p/site/m/home/>.
- Mnzava, N.A. (1997). Vegetable crop diversification and the place of traditional species in the tropics. In: Guarino, L. (Ed.), *Traditional African vegetables*, Rome, Italy: International Plant Genetic Resources Institute.
- Moreno-Black, G., S. Prapimpom & T. Sompong. (1996). "Cultivating continuity and creating change. Women's home garden practices in northeast Thailand." *Agriculture and Human Values*, 13(3),3-11.
- Moreno-Black, G. & Somnasang, P. (2000). In times of plenty and times of scarcity: non domesticated food in in northeastern Thailand. *Ecology of Food and Nutrition*, 38, 563-586.
- Morimoto, Y. (2013). Personal communication re Gotor & Irungu (2010). "it is common practices that local farmers collect/pick some seeds of ALVs from the crop fields or, along roads, water streams/rivers, and plant or transplant (the case of tubers and fruit/medicinal trees) into their home gardens." mainly for family use.
- Joshi, N., M. Brigitte, & K. Katja. (2009). *Inventorying Diversity, Use and Conservation Status of Indigenous Fruit and Nut Species of Nepal for Developing 'Conservation Through Use' Strategies*. www.tropentag.de/2009/proceedings/node93.html
- Oakley, E. (2004). "Home gardens: a cultural responsibility." *LEISA Magazine*, 20(1). March <http://www.agriculturesnetwork.org/magazines/global/valuing-crop-diversity/home-gardens-a-cultural-responsibility>
- Ogle, B.M. (2001). Wild vegetables and micronutrient nutrition. Studies on the significance of wild vegetables in women's diets in Vietnam. Ph.D. dissertation. Uppsala. Sweden: University of Uppsala.
- Ogle, B. M., P. H. Hung & H. T. Tuyet. (2001). "Significance of wild vegetables in micronutrient intakes of women in Vietnam: an analysis of food variety." *Asia Pacific Journal of Clinical Nutrition*, 10(1), 21-30.
- Ogoye-Ndegwa, C. & Aagaard-Hansen, J. (2003). "Traditional gathering of wild vegetables among the Luo of western Kenya - a nutritional anthropology project." *Ecology of Food and Nutrition*, 42,69-89.
- Olaiya, C. ; Adebisi, J. (2010). Phytoevaluation of the nutritional values of ten green leafy vegetables in South -Western Nigeria. *The Internet Journal of Nutrition and Wellness* 9(2).
- Paton, D. N. & D. J. Crawford. (1904). "The nutritive values of some uncultivated foods used by the Bhils during recent famines." *Agricultural*

- Ledger,(6),37-73.
- Pongwat, Pattareepan; Women and SME Department; & Credit Union League of Thailand. (2003). Bangkok: Credit Union League of Thailand Ltd. and Micro Economic Development Project www.fao.org/docrep/006/ad491e/ad491e00.htm
- Pollard, R. & F. Michael. (1997). Social Marketing of Vitamin A in Three Asian Countries. Washihgton, DC: The Manoff Group
- Premchander. S. & Polman, W. (2004). Promoting women's cooperative businesses in Thailand. Bangkok: Food and Agricultural Organization of the United Nations Regional Office for Asia and the Pacific.
- Price, L. L. (1997). "Wild plant foods in agricultural environments: a study of occurrence, management, and gathering rights in northeast Thailand." *Human Organization*, 56(2), 209-221.
- Rao, P., Jacob, C.M. & Ramasastri, B.V. (1969). "The nutritive value of bamboo seeds." *Journal of Nutrition and Dietetics (Coimbatore)*, 6(3), 192-195.
- Rengalakshmi, R. C. (2002). Rural and Tribal Women in Biodiversity Conservation, Chenmai: M. S. Swaminathan Research Foundation/Bangkok: FAO Regional Office for Asia and the Pacific.
- Rivera, W. M. & Q. H. Kalim. (2003). Agricultural Extension, Rural Development and the Food Security Challenge FAO. Natural Resources Management and Environment Department Rome: FAO
- Robson, J. R. K. & E. Joel. (1978). The nutritional value of indigenous wild plants: an annotated bibliography. Troy, New York: The Whitston Publishing Co.
- Schippers, R. (2001). "Domestication of indigenous wild food plants." In: The Potential of Indigenous Wild Foods Workshop Proceedings, 22-26 January 2001. Text page: 47; PDF frame: 58. Funding provided by: USAID/OFDA Implementation provided by: CRS/Southern Sudan
- Schonfeldt, H.C. & Pretorius, B. (2011). The Nutrient Content of Five Traditional South African Dark Green Leafy Vegetables - A Preliminary Study. *Journal of Food Composition and Analysis* 24 (8)
- Sena, L.P., Vanderjagt, D.J., Rivera, C., Tsin, A.T.C., Muhamadu, I., Mahamadou, O., Millson, M., Pastuszyn, A., & Glew, R.H. (1998). Analysis of nutritional components of eight famine foods of the Republic of Niger." *Plant Foods for Human Nutrition*, 52(1),17-30.
- Shackleton, C., P.M.W. & Drescher, A. W. eds. (2009). African Indigenous Vegetables in Urban Agriculture. London, UK; Sterling, VA: Earthscan.
- Shortt, J. (1887-1888). "List of wild plants and vegetables used as food by people in famine times." *Indian Forester* 3,232-238.
- Smitasiri S., Attig G.A., Valyasevi, A., Dhanamitta S., Tontisirin, K. (1993). Social Marketing. Vitamin A-Rich Foods in Thailand. A Model Nutrition Communication for Behavior Change Process. Bangkok: Institute of Nutrition, Mahidol University. Soleri, D. & Cleveland, D. 1992."Household gardens as response to change." *ILEIA Newsletter* March. Pp. 11-12. [Centre for Information on Low External Input and Sustainable Agriculture]
- Somnasang, P. & Moreno-Black, G. (2000). Knowing, gathering and eating: attitudes about wild food plants in an Isan village in northeastern Thailand. *Journal of Ethnobiology*, 20(2), 197-216.
- Swanson, B. E., Bentz, R. P. & Sofranko, A. J. eds. (1998). Improving agricultural extension. A reference manual Rome: Food and Agriculture Organization of the United Nations
- Tadele, Z & Assefa, K. (2012). Increasing food production in Africa by boosting the productivity of understudied crops. *Agronomy*, 2, 240-283
- Watson, J.W. & Eyzaguirre, P.B., eds. (2002). Home gardens and in situ conservation of plant genetic resources in farming systems. Proceeding of the Second International Home Gardens Workshop, 17-19 July 2001. Wizenhausen, Federal Republic of Germany. Rome: International Plant Genetic Resources Institute
- Weinberger, K. and Msuya, J. (2004) Indigenous Vegetables in Tanzania: Significance and Prospects. Technical Bulletin Number 31. Asian Vegetable Development and Research Center: Taiwan/Shanhua
- Weinberger, K. & Pichod, G. (2009). Marketing of African Indigenous Vegetables along Urban and Peri-Urban Supply Chains in Sub-Saharan Africa. In Shackleton et al (2009). Pp. 225-242.
- World Health Organization. (2002). Globalization, diets and non-communicable diseases. Geneva: World Health Organization.