Herald Journal of Agriculture and Food Science Research Vol. 4 (3), pp. 014 - 020 October, 2015
Available online http://www.heraldjournals.org/hjafsr/archive.htm

ISSN : 2350 – 2193

Full Length Research Paper

Adoption of community based cultivation of medicinal plants for management of HIV/AIDS in Coast region, Tanzania

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Received January 07, 2015 **Accepted August 29, 2015**

Abstract

The Institute of Traditional Medicine (ITM) managed to sensitize community based cultivation of three important plants namely *Moringa oleifera, Aloe vera* and *Hibiscus subdariffa* to small scale farmers in Kongowe ward, Coast region Tanzania. Main objective was to promote commercial cultivation of medicinal plants for production of herbal medicine and food supplements to the HIV/AIDS patients with food shortage and poor health services. Sensitization was achieved through series of theoretical and practical field training between 2005 and 2013 on production of quality herbal raw materials with medicinal and nutritional value. The imparted knowledge was on production of raw material, processing, value addition and marketing. The adoption was demonstrated by 100% of trainees able to cultivate medicinal plants and 25% able to produce value added herbal products. Nevertheless, the success is constrained with lack of facilities for producing value added products and less confidence to penetrate urban markets. It is recommended that ITM should guide pioneer farmers through the establishment phase by linking them up with potential partners willing of providing logistical and technical support. Farmers at Kongowe ward now should be given free access to the available facilities at the institute at the affordable agreements to enable them initiate production.

Keywords: Commercial cultivation, Herbal medicine, Food supplement, vulnerable communities, value added products

INTRODUCTION

The search for potential herbal medicines that can be used for the management of HIV/AIDS is an option that has been considered by a number of researchers since the onset of the pandemic (Ali *et al*. 2005). One of the important components in the management of HIV/AIDS patients is availability of reliable and adequate nutrition that ensures maintenance of good health and constant repair of the ailing immune system. It is generally acknowledged that traditional herbal medicinal preparations provide an easily accessible, reliable and possibly cheap alternative therapy to a number of patients with various disease conditions (WHO 2005a).

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The use of herbal medicines could contribute significantly towards the management of opportunistic infections and supply of nutritional supplements to cope with the devastation of immunodeficiency (WHO, 2005b).

Apart from directly catering for the needs of the patients, the plants can also serve as a means for generating income, and thus alleviate poverty in line with aspirations of the Tanzania National Strategy for Growth and Reduction of Poverty (NSGRP). Malnutrition is closely linked with poverty and affects a large segment of the society, especially pregnant women and children. A new target group needing special nutritional considerations are HIV/AIDS patients. Although anti-retroviral drugs are now firmly established in developed countries, their availability to all people in developing countries like Tanzania is inadequate and not affordable. The main objective was emphasis on healthy diet habits, which includes using

locally available and reliable nutritional supplements to avert contracting opportunistic infections. This is one of efforts to stimulate local commercial cultivation, packaging and marketing of herbal products for use and for generation of income. The nutritional needs of HIV/AIDS patients, pregnant women, and children are the main concerns.

The study targeted three plants namely *Hibiscus subdariffa* Rottle*r* (Malvaceae)*, Moringa oleifera Lam.*, (Moringaceae) and *Aloe vera* (L.) Burm.f. (Aloaceae). These three plants are reputed for their medicinal and nutritional properties and are recommended as a source of nutritional supplements, particularly for HIV/AIDS patients who would also derive the benefit of protection against opportunistic infections (Baum *et al*. 2010).

Hibiscus subdariffa also known as Roselle is a native to Old World Tropics, but now it is cultivated throughout the tropics. In Tanzania it is being cultivated in some areas of Kilimanjaro, Morogoro, Coast and Dodoma regions. The plant is reported for a number of medicinal uses including arteriosclerosis, intestinal antiseptic, aphrodisiac, astringent, cholagogue, demulcent, digestive, diuretic, emollient, purgative, refrigerant, resolvent, sedative, stomachic, and tonic. Roselle is a folk remedy for abscesses, bilious, cancer, cough, debility, dyspepsia, dysuria, fever, hangover, heart ailments, hypertension, neurosis, scurvy, and strangury, anticancer, emollient, diuretic, refrigerant, sedative, antiscorbutic, untihypertensive, stimulate intestinal peristalsis, emollient, soothing cough remedy (Salama and Ibrahim, 1979, Amgad *et al.* 2013).

Aloe vera is one of the oldest known therapeutic herbs and is renowned worldwide as a healing plant. The plant contains a variety of amino acids, enzymes, vitamins and minerals and it comes closer than any other known plant to the duplication of life's essential substances in the biochemistry of the human body. *Aloe vera* is a stimulant to the immune system, a powerful anti-inflammatory, and analgesic and is able to speed up cell growth. *Aloe vera* contains a large number of mucopolysaccharides (basic sugars), which are found in every cell in the body and contains large numbers of nutrients including vitamins E, C, B1, 2, 3, and 6 as well as minerals like Fe, Mn, Ca and Zn. Seven essential amino acids and fatty acids are also found in *Aloe vera* (Verma *et al*. 1976, Makkar and Becker. 1996, Limaye *et al.* 1995).

Moringa oleifera is well distributed in Africa and Asia. Leaves and pods of *Moringa oleifera* can be an extremely valuable source of nutrition for people of all ages. For example, for a child aged 1-3, a 100 gram serving of fresh leaves would provide all his daily requirements of calcium, about 75% of iron and half of protein needs, as well as important supplies of potassium, B complex vitamins, copper and all the essential amino acids. As little as 20 grams of fresh leaves would provide a child with all the vitamins A and C s/he needs. Twenty (20) grams of fresh leaves will satisfy all the daily requirement of vitamin C of pregnant and lactating mothers. For both infants and mothers, pods can be an important source of fiber, potassium, copper, iron, choline, vitamin C and all the essential amino acids. Six rounded spoonfuls of leaf powder will satisfy nearly all of a woman's daily iron and calcium needs during times of pregnancy and breast-feeding (Càceres *et al*. 1990, Càceres *et al.* 1991, Càceres *et al.* 1992, Ram *et al.* 1994, Ezeamuzie *et al.* 1996).

These plants also have rewarding medicinal and nutritional values for the health benefits of both the vulnerable groups and the whole community, and are adapted to diverse climatic conditions of Tanzania. This adaptability is an opportunity for small scale farmer aspiring for new investments. Regrettably, such an investment has limitations among rural Tanzanians because they are not among common traditional food crops. Few small scale farmers are growing them just for a limited use. In the meantime, demand and market is gradually rising in parallel with the growing awareness on their health benefits. The main objective of this study was to promote cultivation, consumption, value addition and marketability of *Moringa oleifera, Aloe vera* an*d Hibiscus subdariffa* as medicine and food supplements for income generation and support for HIV/AIDS patients, pregnant mothers and children.

METHODOLOGY

Sensitization on the use of herbal nutritional supplements

One hundred pioneer farmers in Kongowe ward in Coast region were selected randomly by the help of ward leaders to participate in the study. Group discussions were used to register expectations of farmers on cultivation and marketing of herbal supplements to the vulnerable groups in their ward. Perceptions on management of HIV/AIDS patients were also recorded through open dialogue. Sensitization on the use of herbal materials as a source of nutritional supplement was achieved through series of workshops and seminars between 22/5/2005 and 2013 years.

Promotion of cultivation of *Hibiscus subdarifa, Moringa oleifera* and *Aloe vera*

Participatory method was used whereby farmers performed hands-on practicals in the demonstration farms. Demonstration plots were established in a familiar environment of farmers domicile. Main activities displayed on site were on good harvesting techniques and solar drying of herbal materials. Eight hectares of land were ploughed and successfully planted with *Moringa oleifera, Hibiscus subdariffa* and *Aloe vera.* Four hectares were

Table 1: Registered responses of farmers on herbal supplement for improved health

Response	Percentage of respodents
To get the knowledge on packaging, use and marketing of products from *Moringaoleifera*, *Hibiscus subdariffa* and *Aloe vera*	76%
To be assisted to get loans for production of herbal products	26%
To be assisted to get capacity of meeting the huge and available local markets for *Hibiscus subdariffa*	2%
To get knowledge on how to serve vulnerable groups of the community including children, pregnant and HIV/AIDS patients by usingherbal food supplements	5%
Possibilityof getting fliers on packaging and marketing of herbal materials	17%
Establish a network on packaging of herbal materials	52%

planted with *Hibiscus subdariffa* and about 3200 seedlings of *Aloe vera* were planted. Training manuals for cultivation and processing of *Hibiscus subdariffa, Moringa oleifera,* and *Aloe vera* were developed and made available to farmers at a nominal fee of Tshs 1500. Farmers were also trained on suitable spacing, record keeping on the yield, anticipated risks, and organic farming techniques. The involvement and success of each participant was recorded for later evaluation.

Production of value-added herbal medicines

All farmers were involved in value addition practicals. Participation was voluntary for those who would grasp techniques involved in processing of plant material at mini industrial scale. The engaged participants were trained in development of formulations from extracts of *Hibiscus subdarifa, Moringa oleifera* and *Aloe vera* such as capsules, packaged powders, juices, topical preparations and teas. Standardization of products using TLC and HPLC including development of product chromatographic finger prints. Trainees were assisted to acquire simple equipment for extraction, drying, formulation, and packaging of medicinal plant products. Plastic packaging materials were used to package raw Rosella calyces and powdered Moringa leaves. Two packet sizes, 50 g and 100 g of Rosella calyces, and Moringa leaves were made and labeled properly.

RESULTS

Responses of farmers to sensitization on the use of herbal nutritional supplements

Seven expectations of the trainees were recorded as indicated in Table 1 above. Each participant was provided with a plain paper and asked to write down all the expectations according to the presented subject. Papers were collected and responses tallied.

Promotion of cultivation of herbal and nutritional supplement plants

Through seminars and workshops, the interest was awakened and 100% of participants indicated willingness to participate in cultivation of Rozella. Twenty percent of the farmers were involved in the harvesting of the *Hibiscus subdariffa* that was grown in the trial phase at Kongowe farm in Kibaha region. Farmers requested for brochures on cultivation and processing of the selected crops. They also advised that they should be linked up in to the network of various farmers unions and food processors.

Promotion of solar drying techniques

After the theoretical training, about 100% of all farmers were able to dry medicinal crops in the available solar driers. The practical skills were demonstrated after theoretical lectures on values of appropriate drying as opposed to traditional direct drying in sun. Farmers observed and appreciated colour tone of herbal material dried using solar drier as compared to direct sun dried materials. In solar drying, colour of leaves was better preserved. Farmers were informed that drying using direct sunlight destroys oxidizable constituents like vitamins and reduce the nutritional value. Solar drying is mild, preserves fragile nutrients, and results to appealing product in appearance and texture. Three demonstration solar driers were constructed at Kongowe in Kibaha which

are now being used to dry Moringa leaves and Rosella.

Organic farming

The benefits of organic farming was upheld by the all trainees. Some were using industrial fertelizers and pestcides before for cereal and vegetable growing. Nevertheless, after training on the negative effects of industrial farm inputs, farmers opted the use of farming practices free from synthetic fertelizers and pestcides**.** The effect of comercial cultivation as charactarized by clearing of forests, extensive use of agrochemicals, confined pastoralism, monocroping, uses of geneticaly modified seeds was explained. Though comercial cultivation results into high yields at start, soil erosion are common, increased use of toxic agrochemicals, pollution is common. Other characteristsics of comercial farming were explained as disregard of landraces, replication of genetically modified seeds, depletion of soil fertility, dependency on modified seeds, rapid decline in productivity with time, not sustainable for small scale farmers who are unable to afford agro-industrial chemicals, diseases resulting from systemic chemicals such as cancer, hypertension, diabetes, in born deformities are common.

Adoption of value-addition and marketing of standardized herbal medicines with therapeutic and nutritional potential.

Out of all the 100 farmers, 25% were able to follow on practical aspects of value addition. From the training, engaged farmers were able to produce various products from Moringa, Rozella and *Aloe vera* such as Rozella juice, tincture, various medicines, creams, Jam, wine and nutritive flour. Farmers demonstrated the step by step preparation of Rosella wine. The training involved all steps from acquisition and preparation of raw calices, fermentation, use of various equipments such as refractometer for measuring sugars, hydrometer, pH meter, balance measure, suitable containers, thermometer, tea spoon, wooden stirrer, large aluminum pan, large basin or a big bowl, pipe for air outlet, filter, charcoal stove, and hydrometer/ refractometer. Demonstration was done after which trainees were allowed to make production on their own. Training also involved preparation of ointment for bacterial and fungal skin diseases by using *Aloe vera* extract, lime, avocado oil and clean water. A lot of interest was shown by participants, and some indicated interest to invest in processing products for export to the neighboring countries. Workshop participants were informed that 80% of Tanzania population are farmers growing diverse crops, but the main shortcoming in processing as such about 30% of crops are lost. The training was targeted at establishing founder group for food processing in Tanzania starting with Coast region.

DISCUSSION

Sensitization on the use of herbal nutritional supplements

It was imperative to register perception and expectations of farmers prior the actual training for moderation and flexibility of the course contents. The analysis of the farmer's expectations indicates that immediate concern and focus of trainees is more on income generation and poverty reduction through processing, value addition and packaging of targeted herbal materials than service delivery to the targeted vulnerable groups (see Table 1). This is because most trainees who are expected to serve the vulnerable groups are similarly economically challenged. Of all the 100 participants to the project, only 2 participants were large scale farmers though not engaged in medicinal cultivation previously. The rest were low earning peasants mainly growing food crops for subsistence. Though 100% of all farmers opted for cultivating some suggested crops, the quest for farming skills did not feature in the list of their expectations. Small scale farmers are eager to engage in value addition of farm crops for better financial gain than direct involvement in primary production in farms. The frustrations of farmers to continue farming results from exceptionally low yields or missed seasons experienced with regular food crops (informal communication with farmers). Not many farmers imagined that medicinal plants are a viable source of income which can be adopted without demand for a very heavy investment. Many farmers in Coastal region in Tanzania are predisposed to traditional food crops such as cassava, rice and Cow pea while the major source of herbal medicines remains largely to be wild collection. Nevertheless, there is a potential that coastal communities are very skilled in processing of spices for their favored rice recipe commonly known as pilau, an experience which can be translated into the processing of medicinal herbs and value addition for health improvement and income generation.

When asked to relate the symptoms of the HIV/AIDS patient, most trainees had fair knowledge on AIDS as health condition well known for causing severe weight loss. They could recall the illness that was at first called "slim" because sufferers became like skeletons. Their perception basing on body weight was in congruent to report by (Mills, 2005 and Batterham, 2005) that people with HIV tend to expend more energy leading to severe body weight. They burn around 10% more calories while resting, compared to those who are uninfected. Moreover, participants claimed that symptomatic health degeneration for immunosupressed varies greatly among

individuals. This is in accordance to report by (Tang, 2005) that it is no exception that no two individuals with varying nutrition will have same rate of health degeneration, in such a case, various micronutrients have been linked to changes in the rate at which HIV infection progresses to AIDS. Low levels of vitamin A, vitamin B12, vitamin E and selenium seem to accelerate progression of AIDS (Kupferschmidt, 1998). This justifies inclusion of the selected plants that abounds with vitamins and minerals as one of the cheap way to stabilize health of the target vulnerable in rural settings. *Aloe vera* as food supplement is rich in vitamins E, C, B1, 2, 3 and 6, minerals including Fe, Mn, Ca, Zn, amino acids, enzymes, it is a leading life giver in human body, detoxifier, purgative, pain relief, stimulate cell growth and boost immunity due to the presence of "mannan polysaccharides" (Davis and Leitner, 1989, Davis and Rosenthal, 1989b, Sato, 1990, Eshun, 2004).

Although the medicinal benefits of herbal supplements were emphasized, the caution was also raised in parallel that ssome foods and herbs interact with antiretroviral drugs, potentially increasing the risk of treatment failure or side effects. Harmful interactions have been observed between certain drugs and some of the foods promoted as nutritional therapy for people living with HIV, which otherwise may be beneficial as part of a balanced diet. Notable examples are St John's Wort, African potato, Sutherlandia, garlic, vitamin C and grapefruit juice (Mills, et al., 2005a, Mills et al., 2005b)

Apart from the direct medicinal benefits, participants were sensitized on additional ecological and agronomical benefits of the selected plants. For example, Moringa has very fast growth, resistance to drought, its diverse ecological zones in the country and multiple uses to human and livestock (Duke, 1978, 1979). Seeds of Moringa also produce cooking oil. Rozella has other economic benefits such as source of juice, jam, jellies, sauces, wine. Young leaves are taken as vegetable. Calices are used for food coloring, seeds are aphrodisiac, fruits are edible, fibers are used for ropes and seeds are extracted for oil (Verma *et al*. 1976).

Farmers appreciated the benefits of organic farming as opposed to synthetic fertilizers that have negative effect to farm production. Fertelizers deplete soil fertility by killing soil flora and fauna and micro-organisms resposible for natural soil fertility (Zehndel *et al*. 2007). The crop yield using industrial fertilizers is not sustainable, a farmers are compeled to use industrial fertilizer consecutively and later, good yield is not achieved even after application of the same fertilizers. Natural decompsing orgsnisms are killed resulting in lowered decomposition rate of organic matter for plants nutrition, low moisture retention, compaction of soil and weakening of crops (Worthington 2001, Badi *et al*. 2006, Rembialkowska, 2007)

Promotion of cultivation of herbal and nutritional supplement plants

Involvement of the community has become a success story, a number of individuals at Kongowe Kibaha have now started growing Rosella on their own farms. The knowledge has spilled over to some farmera who were not part of the training. An NGO based in Kilosa in Morogoro has joined hands with the ITM to promote organic farming of Rosella. The successsful threashold recorded 200 kg of Rosella sold by pioneer farmes to the Institute. Jipe Moyo, a group of people living with HIV who are based in Dodoma joined efforts with ITM to promote hebal nutritional supplements among HIV patients. They participated in a workshop for promotion of cultivation of herbal nutritional supplements after the encouraging progress shown by very anthustiastic farmers. Farmer were jointly involved in exhibitions of packed Rosella and Moringa products to the Dar es Salaam International Trade Fair Exhibitions in July, 2006.

Adoption of production of value-added and marketing of standardized neutraceutical herbal products.

One hundred percent of the engaged farmers adopted cultivation of *Hibiscus subdariffa* over *Moringa oleifera* and *Aloe vera* due to available market in Dar es Salaam city. In one side, the fraction of farmers who adopted cultivation of medicinal plants in Kongowe Tanzania is slightly different from a similar initiative in Northern Iran where farmers who adopted cultivating medicinal plants was only 50% of the 90 selected farmers, adoption trends in Iran was largely affected by number of socio-economic factors including yearly income, sex, education level, family size, number of possessed animals and marriage status (AH *et al*. 2010). The difference is attributed to the genesis of the idea, whereas in Kongowe Tanzania, some of farmers themselves called for the training while in Iran the intervention was introduced by the researchers. Though all participants in Kongowe adopted cultivation of the selected crop by 100%, only 20-25% of all the participants adopted value addition and marketing of Rozella crop. Value addition involve bit of technical undertaking by using some sophisticated facilities, this scared about 75% of the trainees who were older above 40s, the 25% fraction who opted for value addition practices was from the younger age group below 40s and optimistic entrepreneurs. Again this is in congruent to the observation in Iran where socio-economic factors have the influence in adoption of cultivation of non traditional medicinal crops. In Kongowe, such conceptual variations divided participants into two groups of farmers and processors. One group (processors) will not unnecessarily get involved in primary production rather, will buy crops from farmers in

order to consolidate processing and value addition for improved quality and income.

Meanwhile, small scale farmers at Kongowe who have adopted cultivation of herbal medicines are encouraged to grow and sell the crop to the Institute of Traditional Medicine as their first market. Currently, the institute is able to buy all Rozella from farmers for product formulation. One farmer (Mrs Nzulunge) has been successful in selling Rozella calyxes to the Institute, and realizes an income of Tshs 6,000 per kilograms of dry calyx. The pioneer cohort of trainees are allowed to use Institute labels for packed rosella calyces to promote income generation. This is a direct source of income to the farmers who are selling raw materials to the Institute. Most of these farmers were inspired to start the business after attending the training programme that was initiated by the Institute of traditional Medicine. Farmers are using the institute's drier at the time of abundance, the solar dried crops have good color and taste and consequently have high marketing value. One person involved in the cultivation and processing of Rosella requested to be facilitated to acquire a low cost solar drier from an NGO known as AMKA. AMKA has more than 10 years experience in linking producers with buyers. For years, AMKA has worked with several partner organizations such as Tradecraft Exchange – UK, APT – UK, Fair Trade Assistance – Netherlands, Aid to Artisans – USA and DFID to strengthen the independence of businesses, promoting fair trade, build export markets, improve and control products quality, promote sustainable development and maintain market outlets.

CONCLUSION

It is demonstrated that 100% of farmers adopted cultivation of medicinal crops and especially *Hibiscus subdarrifa* while 25% adopted value addition and commercialization of medicinal crops for income generation and improved health of the vulnerable groups such as pregnant women, children and AIDS/HIV patients. The production may have an industrial component since the roselle calyx is used for production of wine, juices, and in the confectionery industry. Although vulnerable groups were the targeted beneficiaries, it is generalized that the whole community should be the target of herbal nutritional supplement.

RECOMMENDATION

Farmers should start using herbal products themselves at the household level. Herbal preparations do not only target the sick or other vulnerable groups, as everybody needs healthy living to avert the onset of diseases

Strategy is proposed to assist farmers to access reliable markets as many farmers are now ready to start cultivation and preparation of value added products. In order to assist farmers initiate production of good quality Herbal products at Kongowe-Kibaha, it is advisable that AMKA Trust (Collaborator) be involved in introducing, production, supervision, quality processing and packaging of the products. This is to give the best quality and consistency of the products. The quality of products depends on the quality of inputs and crop management that will be done by AMKA. AMKA will provide technical advice on planting, economics, record keeping, hygienic processing, packaging and labelling and marketing of the envisaged products.

Basing on the techniques acquired, farmers will be able to invent various herbal products, and therefore, their intellectual rights should be observed. Formal agreements to be drafted for every agreement made

The arrangements to be in place to ensure production and supply of quality seeds. The Institute of Traditional Medicine to take leading role in producing and supplying seeds to farmers. The ministry of Agriculture should also register cultivation of herbal medicines among priority crops of economic importance to the nation

Such an investment cannot be accomplished overnight, the institute of Traditional Medicine should liaise with the responsible government organs and other development partners for sustainable training programmes. Before new trainees are recruited, the pioneer farmers should be assisted to the end to make sure they start the process and become trainers to other local colleagues. The institute to link up pioneer farmers with the supporting organs for continuity of the programme through research dissemination workshop of potential stakeholders, or else every effort reached so far will dissolve forever.

ACKNOWLEDGEMENT

Rockefeller is appreciated for funding the project. AMKA and various trainers at the Institute of Traditional Medicine made this study a success.

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Citation: Otieno JN, Moshi MJ, Mbwambo ZH P,. (2015) Adoption of community based cultivation of medicinal plants for management of HIV/AIDS in Coast region, Tanzania Herald J. Agric. Food Sci. Res. Vol. 4 (2), pp. 14 – 020